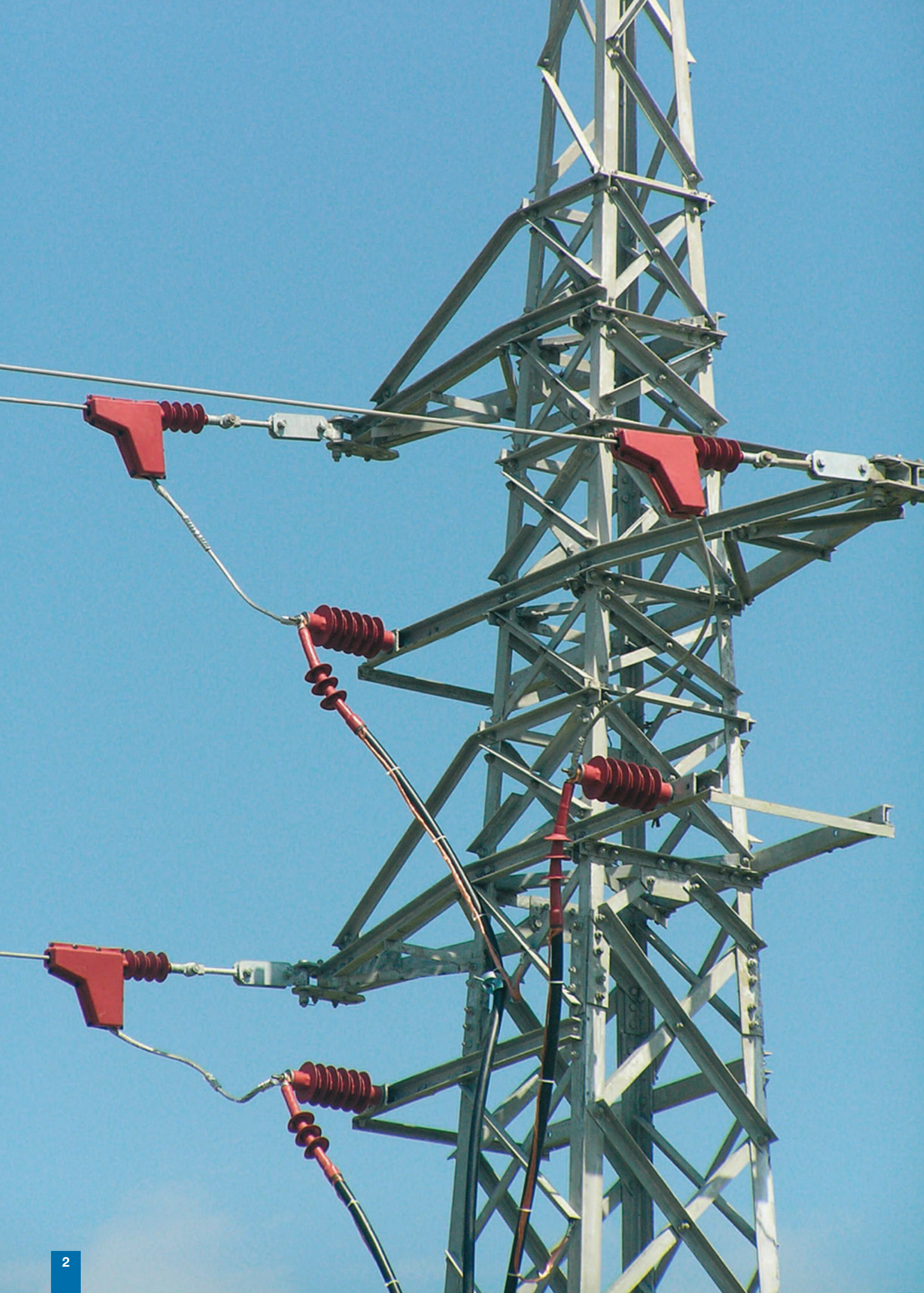


Energy Division

## LV and MV Metal-Oxide Surge Arresters







## Tyco Electronics Energy Division

Safety and reliability are vital in high-voltage products and Tyco Electronics Energy Division is committed to pioneering improvements in performance for our customers at all levels. Our development teams work to generate a superior range of high performance products. All products developed using our extensive service experience and within the constraints of international standards including IEC, IEEE, ANSI and many national standards. More than 35 years of systematic research into new materials to provide solutions for the electrical power industry resulted in a wide range of products and materials.

A unique combination of properties resulted with:

- Non-tracking and low erosion rates in polluted and non-polluted environments
- Long term weatherability, resistance to thermal ageing
- UV resistance
- Chemical resistance
- Tough, tear and impact resistance
- Proven field experience, in all environments over 35 years

We offer surge arresters for medium voltage power distribution systems that are designed to reliably protect your

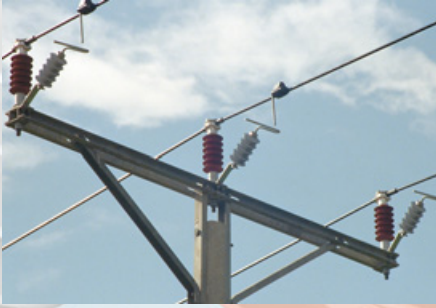
valuable assets from overvoltage. They withstand severe outdoor exposure over long operating lifetimes and help maintain service reliability in both overhead and underground installations: Our arresters have passed the most rigorous tests (IEC 60099-4, ANSI C62.11, IEC 61643).

The metal oxide varistors used in the arresters provide high energy absorption and low residual voltages. Multiple high current lightning and long duration switching surges are absorbed without noticeable changes in the arrester characteristics or stability.

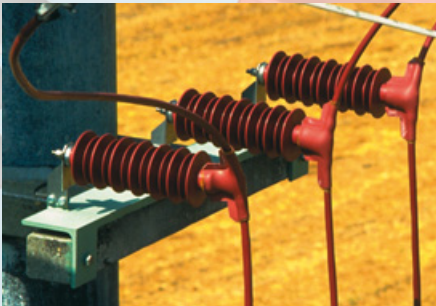
### Overview of ZnO surge arresters offered by Tyco Electronics Energy Division

Type	Rating [kA]	Line discharge class	Application	Continuous voltage [kV] from to		Page No.
MV arresters for outdoor application						
HDA	10	1	Outdoor	3	41	5
OCPO	5	n.a.	Outdoor	3	29	6
OCP1	10	1	Outdoor	3	29	6
OCP2	10	2	Outdoor	3	41	6
Arresters for protection systems						
CLX	10	1	Outdoor	3	36	7
MV arresters for indoor application						
RDA	10	1	Indoor	3	26	8
SPA	10	1	Indoor	3	36	8
MPA	10	1	Indoor	3	6	8
CPA	10	1	Indoor	3	6	8
RSTI-SA	5, 10	n.a.	Indoor	12	24	9
LV arresters						
LVA	10	n.a.	Outdoor	0,28	0,44	10, 11
Arresters for railway application						
HE60	10	n.a.	Outdoor	1	6	12

## Metal Oxide Surge Arresters



Tyco Electronics Energy Division started the development of polymeric housed surge arresters in the early 1980's under the brands Raychem and Bowthorpe. Since then we have a proven service experience across the globe, operating in the worlds toughest environments.



Tyco Electronics Energy Division polymeric zinc oxide surge arresters have been designed and tested to meet our customers' toughest environmental conditions and to meet the requirements of IEC 60099-4. Our gapless polymeric designs have been in service since 1994 and now the open cage series builds on this experience and know how.

Tyco Electronics Energy Division has developed and supported arresters for applications including: Indoor and outdoor application, cable sheath protection, motor and switchgear protection and rail.

All our arrester cores are manufactured using ZnO varistors, which display excellent thermal and current handling characteristics due to the guaranteed homogeneity of the varistor volume. This thermal behavior yields products with:

- Excellent TOV performance
- Safe, non-shattering failure in the short circuit test by pre-failing to higher fault currents.
- High energy handling capability



### **Tyco Electronics Energy Division arrester benefits:**

**Tested in accordance with IEC 60099-4 at independent accredited laboratories**

**Excellent protection margins**

**Direct molded housing to prevent moisture ingress**

**Low residual voltages**

**High-energy handling**

**Excellent TOV performance**

**Safe non-shattering short circuit behavior to higher current levels**

**Maintenance free**

**TERT proven polymeric housing: (Tracking and erosion resistant)**

**Excellent cantilever and tensile performance**

**Excellent mechanical, vibration and impact withstand capability**

**Quality design and manufacturing, ISO 9001 and 14001 compliant**

## Medium-voltage arresters for outdoor applications: HDA; Heavy Duty Arrester. HDA-MA (LA), HDA-M (ML)

At the core of the Raychem HDA design is our ZnO varistor disk, which has excellent electrical characteristics and thermal stability. The resulting new varistor and HDA design combination has resulted in excellent energy handling and TOV performance.

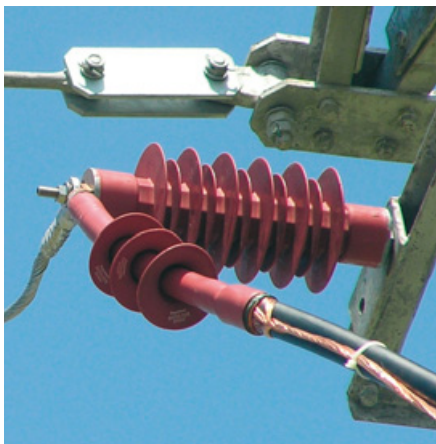
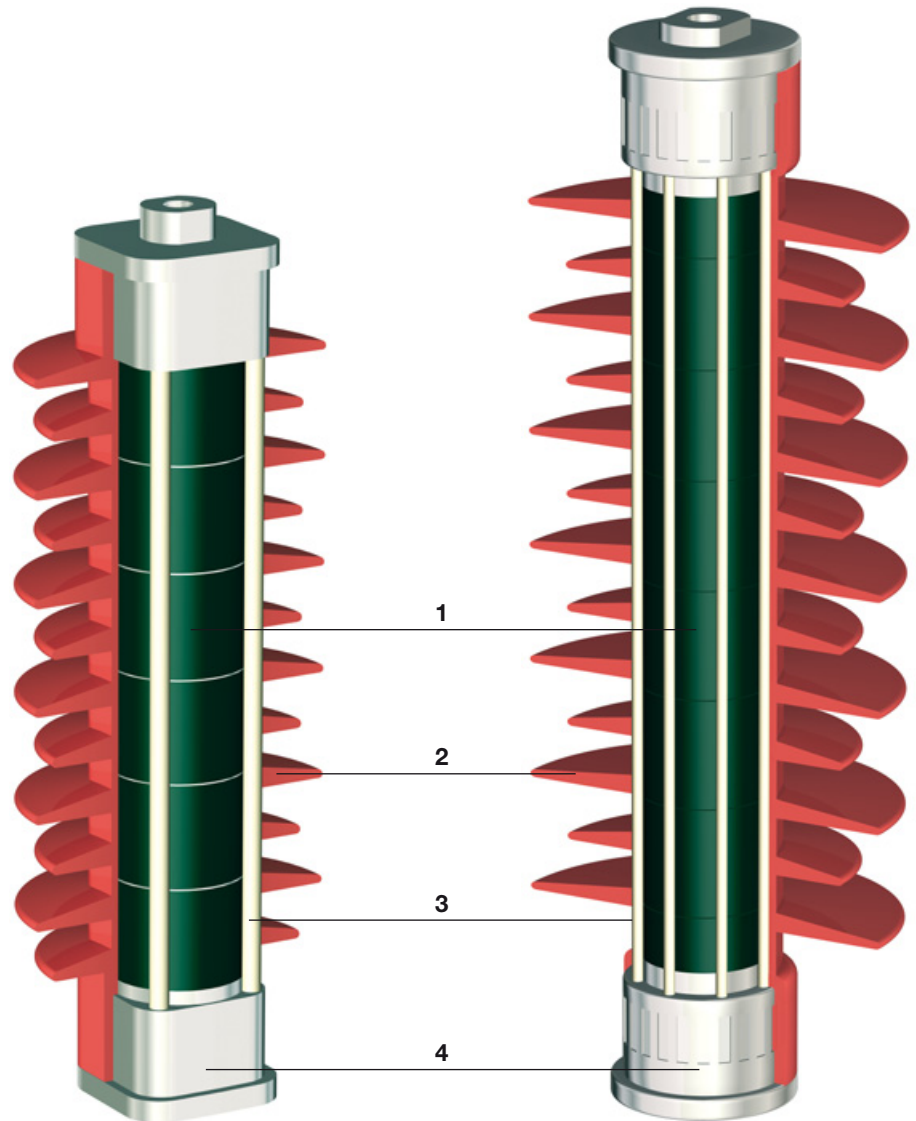
The construction of the HDA design comprises of:

- 1 ZnO, (Zinc Oxide) varistors
- 2 Raychem proprietary EVA housing
- 3 Flame retardant FRP structure
- 4 Corrosion resistant aluminium fittings

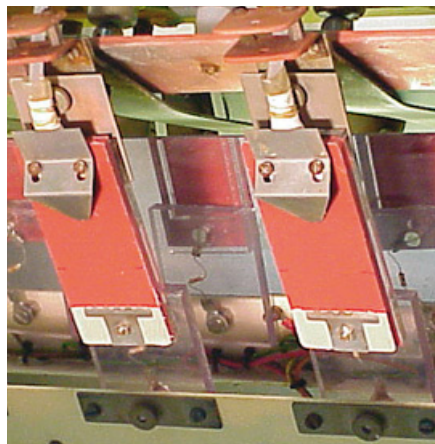
The crimped structural construction ensures light weight product with optimal mechanical strength. The manufacturing process ensures void free construction and optimum interface sealing. This is achieved by bonding the EVA housing directly to the ZnO discs and corrosion resistant aluminium fittings using a Raychem proprietary bonding solution.

The polymeric housing was developed using the knowledge accumulated over 35 years of internal materials science expertise and experience, resulting in an optimum shed profile and a material with excellent tracking and erosion resistance.

A large number of mounting and connecting accessories are available to meet individual requirements.



HDA arrester supporting the MV cable termination on a riser pole



Raychem EVA material during the TERT



Excellent hydrophobicity of EVA



## Medium-voltage arresters for outdoor applications: OCP; Open Cage Polymeric series arresters

OCP is the latest gapless, zinc oxide arrester family from Bowthorpe. The OCP development was based on 25 years of internal experience in arrester design and manufacture within the Tyco Electronics Energy Division. The final "OCP" qualification was performed in independent laboratory facilities in Europe.

The construction of the OCP design comprises of:

- 1 ZnO, (Zinc Oxide) varistors
- 2 Bowthorpe proprietary silicone housing
- 3 Flame retardant FRP structure
- 4 Corrosion resistant aluminium fittings

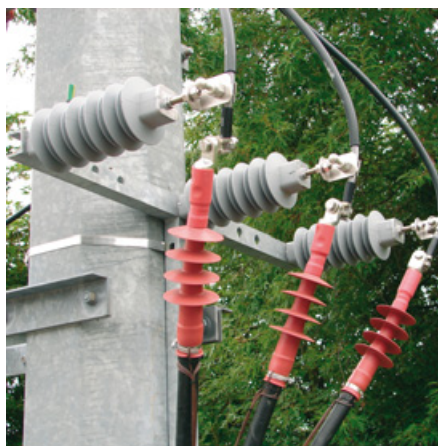
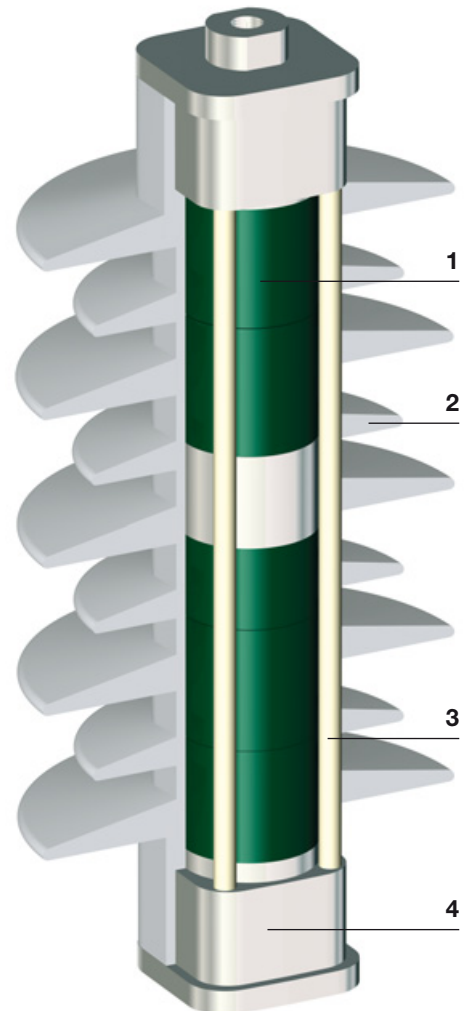
<b>OCP0</b>	Protection of MV networks and equipment from moderate lightning and switching surge related over-voltages in areas with relatively low iso-keraunic levels. Available from 3 kV up to 29 kV of Uc.
<b>OCP1</b>	Recommended as a protection from lightning and switching over-voltages in areas with relatively high iso-keraunic levels. Available from 3 kV up to 29 kV of Uc.
<b>OCP2</b>	Class 2 surge arrester to use with more severe lightning and switching overvoltage conditions. Available from 3 kV up to 41 kV of Uc.

OCP cores are manufactured using ZnO varistors, which display excellent thermal and current handling characteristics due to the guaranteed homogeneity of the varistor volume.

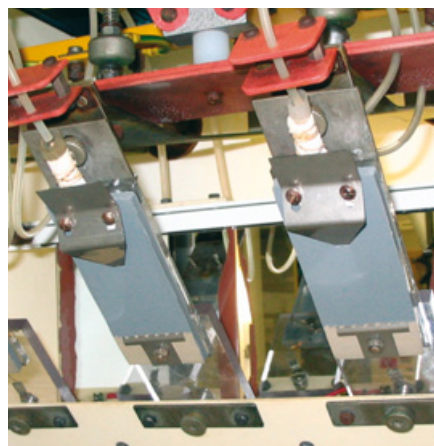
Features of our new hydrophobic silicone OCP design are:

- Alternating sheds for excellent pollution flash over resistance
- Excellent TERT performance

A large number of mounting and connecting accessories are available to meet individual requirements.



OCP arrester supporting the MV cable termination on a riser pole



Silicone housing material during the TERT



Excellent hydrophobicity of silicone

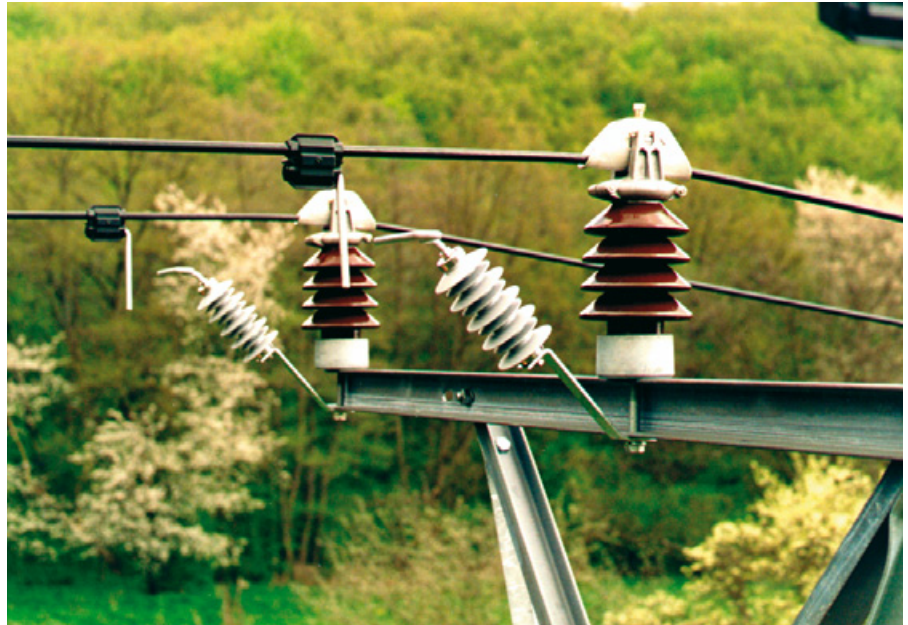
## Medium-voltage arresters for covered conductor overhead lines: CLX

Customers today, have very high requirements for reliability and they are not prepared to accept power interruptions in general and particularly any which might exceed one hour duration.

CLX is designed to use as a lightning protection in overhead lines with covered conductors. In a case of surge on the network due to lightning, the power arc tends to be concentrated at one position along the conductor close to the insulator. This generally leads to complete burn down and dropping of the conductor, which can cause a real threat to the public. CLX guides the lightning discharge current ground, prevents the insulator from flashing over and stops the high energy of the power frequency follow-on current.

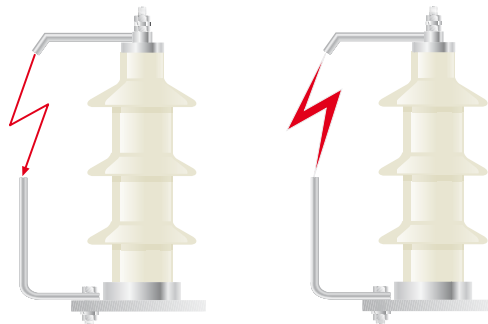
This makes it attractive also for bare conductor distribution systems. Even in case of accidental bridging CLX will not cause a phase-to-ground fault. The CLX device contains a Metal Oxide Resistive Element and an external series gap to isolate the Metal Oxide Resistive Element (MORE) from the system. The CLX device is installed next to the line / post insulators and can be adapted to the system. The series gap is adjustable using various brackets, electrodes and connectors.

Tyco Electronics Energy Division offers engineering support to optimize the use of CLX.



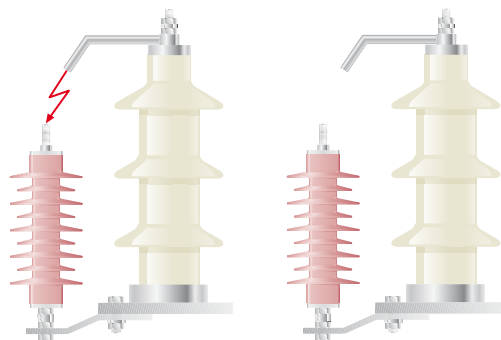
### Without CLX

Lightning protection with arcing horns. In case of lightning overvoltage, burning arc leads to permanent tripping out of a line.



### With CLX

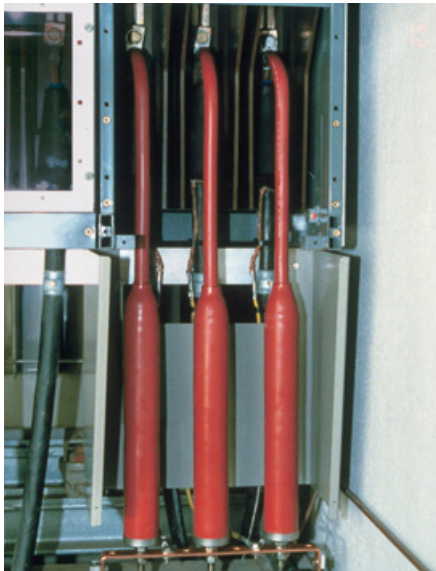
MORE stops follow on current within a half cycle of power - frequency voltage and prevents the line from outage.



## Medium-voltage arresters for indoor applications: RDA, SPA, CPA and MPA

Our indoor arresters are designed to allow installation of the arresters under the restricted space conditions typically found in switchgear and transformer applications.

The SPA is a compact arrester with high mechanical strength. The housing material is fully track resistant and able to provide flashover resistance in damp indoor conditions.



Gas insulated switchgear with RDA arrester and RICS adapter.



High-voltage cable sheath protection system CPA  
Designed to the specific requirements in cable sheath protection.



The SPA type arrester is also available with a thick-wall insulated, integrated line lead (SPA-I), which allows reducing considerably the clearances between the arresters and earth. SPA-I arresters are the ideal solution for retrofitting switchgear with arresters. The line lead is available in lengths of 250 mm, 500 mm and 750 mm.

Modern gas-insulated switchgear connected to combined underground and overhead distribution networks are sensitive to effects like transient voltage doubling. An arrester installed right at the cable end will clamp the voltage to a level which does not put the switchgear at risk.

CPA arresters installed in a cubicle to protect HV cable sheath cross bonds. A robust, non tracking housing plus the high energy handling capabilities of the Raychem arrester family make it the ideal choice for the designer.

For motor-connection boxes  
MPA type

Designed for the specific requirements of electric motors. A robust, non-tracking housing plus the high energy handling capabilities of the Tyco Electronics Energy Division arrester family make it the ideal choice for the designer.





## Medium-voltage arresters for indoor applications: RSTI-SA; Screened, separable surge arrester

The screened gapless surge arrester is a "T"-shaped product. It is designed for direct connection onto outer cone bushings in accordance to EN50180 or EN50181 with interface type "C" or for parallel connection mating to the rear entry of the base screened connector system RSTI designed for system voltage up to 24 kV.

The insulation of the screened surge arrester is made of a highly modified silicone rubber characterized by high tracking resistance, elongation at break and non-flammability.

A thin walled screen is permanently bonded onto the insulation and protects the connection system against unintentional contact.

The active part is a metal oxide arrester which meets the requirements of IEC 60099-4 for separable and dead-front arresters.

The combination of screened connector and surge arrester exceeds CENELEC HD 629.1 S1 requirements, which includes BS, VDE and other international specifications.

Easily accessible rear plug with capacitive test point.

Few accessories required for system test and earth connection.

Complete kit including screened surge arrester, threaded pin and ground lead for three phases facilitates installation and storage.



### Product Features:

- Tested in accordance with IEC 60099-4 (May 2004)
- State of art - gapless design
- Excellent protection margins
- Low residual voltages
- Excellent short circuit performance
- Excellent TOV performance
- Maintenance free

## Low-voltage gapless arrester: LVA

Raychem low voltage surge arresters provide protection for low-voltage overhead lines, consumer in-house supplies, distribution transformers and other systems.

They are designed for applications in which protection against direct contact is not necessary.

Insulated adapter modules are available for use in insulated overheadline systems and on low voltage bushings of distribution transformers.



- Suitable for indoor and outdoor use
- Integrated disconnecter and 1 m line lead
- Housing and lead is flame retardant and UV resistant
- Easy to identify failure indicator
- Easy to install (no tools required)
- Large selection of standard accessories
- CE certified
- Tested according IEC 61643-1 + Amd.1 and EN 61643-11

### Operation including disconnecter and indicator

Normal operating condition



The gapless metal-oxide varistor incorporated in the surge arrester reliably imposes low-value limits on surges caused by atmospheric over-voltages and switching transients, thus protecting the insulation of the consumer-side networks and equipment. The varistor has a very short response time (typically <math><100\text{ ns}</math>) and can safely handle high-current impulses up to 100 kA, 4/10  $\mu\text{s}$ .

Fault – arrester disconnected from system



The arrester's nominal discharge current is 10 kA. The metal oxide varistor is enclosed in a sturdy, weatherproof polymer housing. Numerous tests have confirmed the durability of the housing, even when exposed to extreme temperature fluctuations and contamination. The LVA surge arresters are in compliance with requirements Class II as defined by IEC 61643-1.

The integral disconnecter disconnects the arrester from the network if an overload occurs, caused, for example, by a lightning strike in the vicinity or an impermissible voltage excursion in the system. If this happens the rating plate on the underside of the arrester is displaced and remains dangling on a supporting tie, allowing for easier location of the arrester which must be replaced. The ground connection itself remains securely in position.



**Low-voltage gapless arrester:  
LVA**



Overhead line



Transition: insulated overhead lines  
to cables



Distribution transformers

## Arresters for railway applications: HE60

### For D.C. Applications

#### Type HE 60

These DC-type surge arresters are particularly suitable for protection against overvoltages caused by lightning and switching in both DC railway systems and network up to 4.5 kV.

The low residual voltage and high-energy capacity of the metal-oxide varistors ensure safety and reliability even under the most extreme conditions.

Thanks to its rugged, compact design, the arrester is capable of withstanding extreme mechanical stress (vibrations, shocks, pressure, torsion). HE 60 surge arresters have been tested in compliance with the CENELEC standard for surge arresters in DC networks for railways EN 50123-5, 2003. Further tests have been carried out to examine the sealing properties of the arrester and its resistance to mechanical stress and fire.



### For A.C. Applications

#### Type HDA / OCP

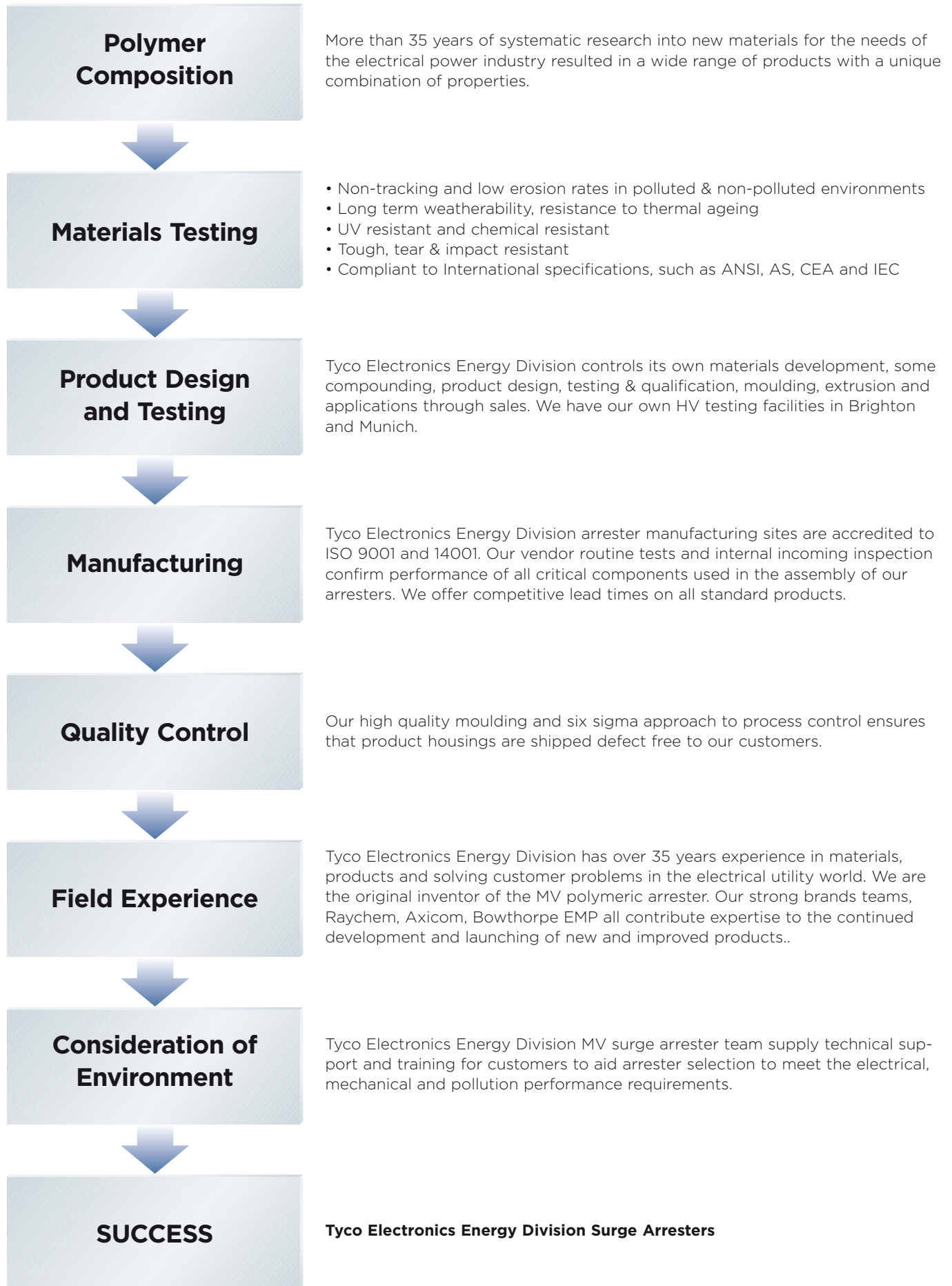
For installation on locomotive and other rolling stock Tyco Electronics Energy Division offers special design solutions. Please contact your sales representative for further information.

For application on outdoor catenary please select the appropriate outdoor surge arrester documented on page 5 and 6.





## The complete solution...



## 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 Energy Division, 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. We carry out requalification testing on a regular basis.

Quality assurance at Tyco Electronics Energy Division 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 and ISO 14001. Our vendor routine tests and internal incoming inspection confirm performance of all critical components used in the assembly of our arresters.



Automated routine test facility for Metal-Oxide Surge Arresters in the manufacturing area



All of the above information, including drawings, illustrations and graphic designs, reflects our present understanding and is to the best of our knowledge and belief correct and reliable. Users, however, should independently evaluate the suitability of each product for the desired application. Under no circumstances does this constitute an assurance of any particular quality or performance. Such an assurance is only provided in the context of our product specifications or explicit contractual arrangements. Our liability for these products is set forth in our standard terms and conditions of sale. Axicom, Bowthorpe EMP, Raychem, TE Logo and Tyco Electronics are trademarks.

## Tyco Electronics Energy Divison

With 4000 employees and more than 10.000 customers world-wide, the Energy Division represents a very significant part of Tyco Electronics. Based in headquarters in Ottobrunn, near Munich, Germany, the Energy Division is a global supplier to power utilities and power industry customers, to equipment manufacturers and transport systems. These customers are served by dedicated R&D teams, sales representatives in more than 80 countries, a professional marketing organization and 25 manufacturing sites in five continents.

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