



Energy Division

# Raychem Raysulate Insulation Enhancement Systems



## Tyco Electronics Energy Division

### Raychem Raysulate Insulation Enhancement System

The Energy Division, a global operating unit of Tyco Electronics, develops manufactures and markets products and systems for the electrical power industry. Today, the Energy Division employs approximately 3,500 people. Our products are extensively employed by power utilities and equipment manufacturers, in rail transport systems and in industry around the world.

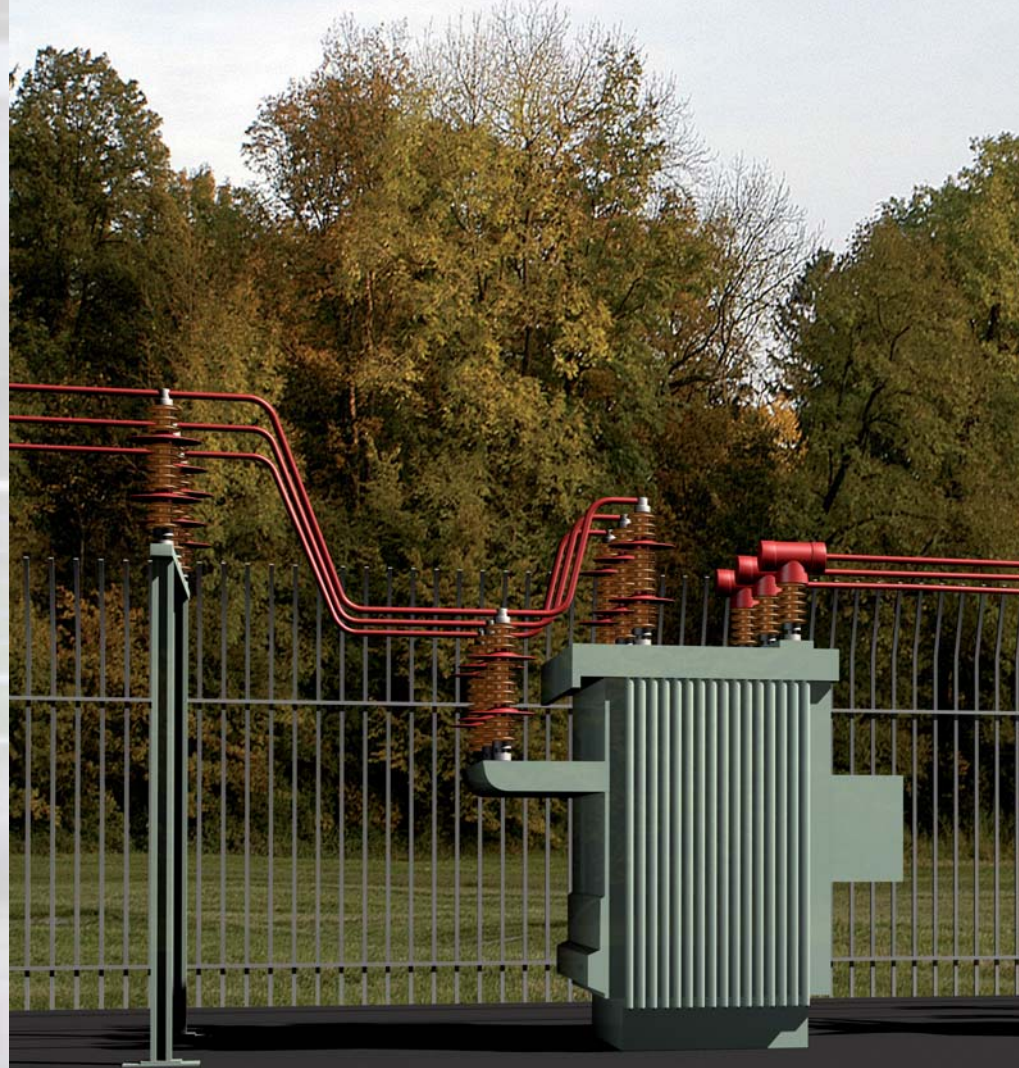
The Tyco Electronics Energy Division produces high voltage insulating products, cable accessories and protection systems for electrical supply companies and utilities, original equipment manufacturers and major industrial companies.

Safety and reliability of high voltage equipment is vital and Tyco Electronics is committed to improving performance for our customers at all levels. Tyco Electronics development teams work to create a superior range of high performance products and technologies for high voltage applications that are unmatched within the industry.

Some of the most common products and applications are shown in this brochure.

The range of Tyco Electronics products also includes:

- Cable Accessories
- Surge Arresters
- Insulators
- Connectors and Fittings



#### The Raychem Raysulate Insulation Enhancement System

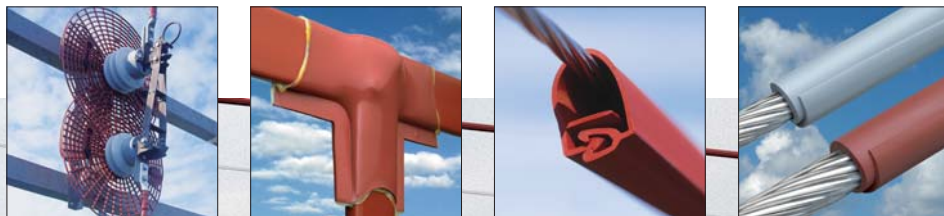
Network reliability is a priority for electrical utilities. Supply interruptions add to maintenance costs and affect customer service. Substation faults are particularly expensive: equipment is often damaged and difficult to repair or replace; specialized post-fault maintenance may be required, and significant customer "supply" lost. For over 30 years Raysulate products have been protecting substations and overhead distribution/transmission networks around the world by insulating vulnerable bare metalwork.

#### Protection from bird and animal outages

Birds and animals often enter substations and interfere with overhead lines causing faults by bridging air clearances. Outages occur especially on distribution equipment, where conductor spacings allow relatively small birds and animals to bridge phases.

The Raychem Raysulate system of tubes, tapes, sheets, preformed covers and barriers provide a proven, cost-effective and easy-to-install retrofit solution to bird and animal outages.





Distribution equipment with bare bus-bars, conductors and connections is always vulnerable to having phases or phase to ground accidentally bridged. As well as the obvious problems caused to the network, such events can also endanger protected wildlife. The best solution is one where the vulnerable bare metalwork is insulated and the wildlife can roam the substations and overhead lines (OHL) without damaging themselves or the equipment.

#### **The complete retrofit system**

The Raychem Raysulate Insulation Enhancement System includes product solutions for substations, overhead lines, and distribution and transmission applications. All products in the Insulation Enhancement System use the same crosslinking polymer technology that has given Raychem electrical products high performance and reliability for over 35 years.



## Substations



### **Raychem Medium Voltage Conductor Cover "MVCC"**

Raychem MVCC is a flexible cold applied wrap around insulation cover for use in short lengths on curved conductor or jumper leads. Secured with UV-stabilized cable ties it helps outage prevention caused by birds, animals and debris. Suitable for applications up to 25kV.



### **Raychem High Voltage Busbar Tape "HVBT"**

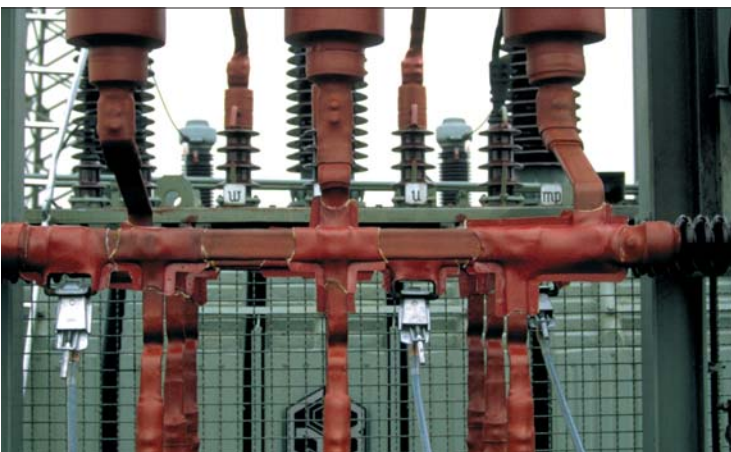
Raychem HVBT heat-shrinkable tape is ideal for use on complex shapes and where busbars cannot be disconnected. Raychem HVBT tape shrinks 30% longitudinally while a factory-coated hot melt adhesive flows and seals the layers of tape during installation. As with other components in the system, the adhesive does not bond to metal-work, allowing easy removal for inspection and maintenance.

Available in three widths: 25mm, 50mm and 100mm. A spiral-formed tape version, Raychem overhead line insulation tubing OLIT, is also available for ease of use on overhead conductors.



### **Raychem Medium Voltage Fusion Tape "MVFT"**

For cold applied applications Medium Voltage Fusion Tape is also available which performs the same function.



### **Raychem High Voltage Insulating Sheet "HVIS"**

Raychem HVIS heat-shrinkable sheet shrinks 25% in both directions enabling rapid and reliable insulation of T-joints, L-joints and difficult shapes. The sheet is a two-layer laminate with a heat-shrinkable backing and a hot melt adhesive. Raychem HVIS sheet is cut to size from a roll, held in place around the connection with metal clamps and shrunk with a gas torch until the adhesive flows, sealing the interfaces. Environmentally sealed joints can be made using Raychem sealing mastic. Available in 10 m rolls or cut sheets. Suitable for applications up to 36kV in two layers.

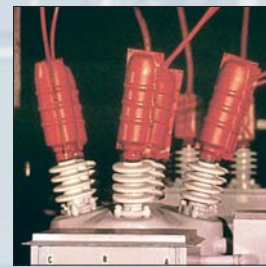


## Substations



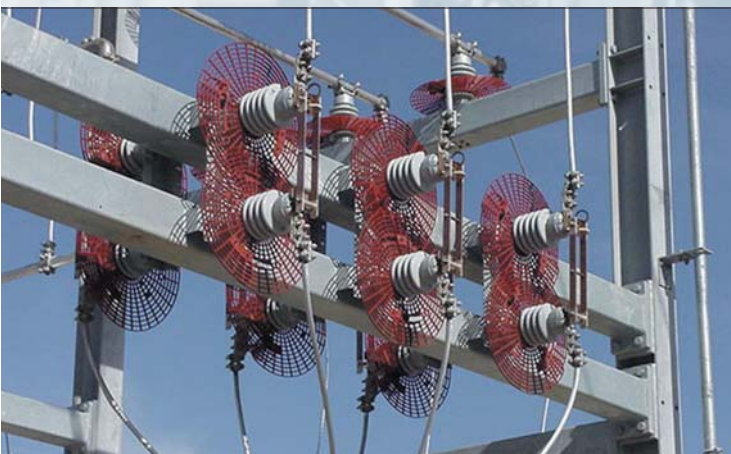
### Raychem Bus Connection Insulating Covers "BCIC"

A wide range of standard Raychem BCIC preformed covers is available for any substation equipment connections. Customised covers can be made simply and economically by forming one of the Raychem Raysulate materials. Standard covers can also be easily modified. Installation is easy with no need to disconnect busbars. Raychem BCIC covers are held in place with UV-stabilized plastic nuts and bolts, latches or cable ties, and be easily removed for maintenance. Suitable for applications up to 36kV.



Substation equipment is vulnerable to flashovers caused by accidental bridging of phases, or phase to earth. Usually made by birds, animals, vegetation or airborne debris, flashovers can be very expensive in terms of damage to equipment, reduced reliability and in some cases even electrocution of protected species.

Almost any event of this nature can be prevented by insulating the strategically vulnerable bare metalwork with a combination of Raychem Raysulate products.



### Raychem Bus Insulator Squirrel Guard "BISG"

The Raychem BISG squirrel guard is a rigid polymeric disc that fits between the sheds of post insulators and equipment bushings. It acts as a physical barrier preventing animals, such as squirrels and possums, from bridging the phase-to-ground clearance. The animal must climb over the Raychem BISG, therefore, preventing it from touching live conductors and earth planes at the same time. Installation is quick and simple, with no need to disconnect busbars, and can even be done live. The part is sized for core diameters from 60mm to 115mm and is suitable for applications up to 36kV.



## Overhead Lines



### Raychem Bird Protection Caps "BCIC"

The Raychem BCIC bird cap protects birds and other animals from live conductors on insulator crossarms. The flexible polymer means that most configurations of conductor attachment are easily accommodated. Installation is very simple, and tool free, some versions can be installed on an energized line. Suitable for applications up to 36kV.



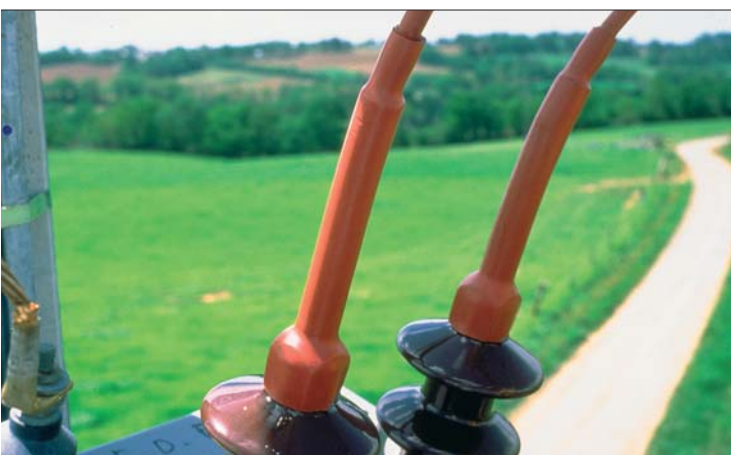
### Raychem Medium Voltage Line Cover "MVLC"

Raychem MVLC is a cold applied retrofit cover that insulates OHL against flashovers caused by birds, intermittent tree contact and clashing conductors. Installation is made from one position, even with an energized line, by driving it along the conductor by hand for up to 20 meters, or by an automated tool for longer distances. Raychem MVLC can be used in many other applications normally up to 36kV. For increased insulation levels, 40kV and above, information is available upon request.



### Spreader Rod and Conductor Protector Clip

Tyco Electronics Low Voltage Spreader Rods are used to maintain the required mid-span spacing of low voltage conductors and thus prevent clashing. The non-tracking rods are ideal for high pollution and coastal areas and also in areas of high wind.



### Raychem Overhead Line Insulating Channel "OLIC"

Raychem OLIC is a 'clip-on' insulating channel that provides flashover protection for overhead lines. Raychem OLIC-O sections clip over the conductor and are held in place with UV-stabilized plastic tie-wraps. Raychem OLIC-C sections clip over the conductor and are held in place with a removable and reusable closure rail. Raychem SMOUV and Raychem SMOE insulation kits combine and adapt standard parts for specific applications such as bushing insulation. Suitable for applications up to 25kV.



## Pollution/Heavy Wetting



### Raychem High Voltage Creepage Extenders "HVCE"

Raychem HVCE creepage extenders represent a long term solution to pollution flashovers by making a permanent addition to the creepage distance. This increases flashover voltage, reduces leakage current and surface electrical stress. Creepage extenders also improve the insulator shape and increase the strike distance. Heat-shrinkable creepage extenders are flexible polymeric skirts, coated internally with a track-resistant mastic for bonding to the insulator. These are available to fit insulators and bushings up to 500kV, with shed diameter 80mm to over 390mm.

Wrap around Raychem HVCE-WA creepage extenders are cold applied. There is no need to disconnect to install. These are available to fit insulators and bushings up to 500kV with shed diameter 100mm to over 600mm.



### Raychem High Voltage Booster Sheds "HVBS"

Raychem HVBS booster sheds are loose fitting polymeric collars for insulators and bushings, which are spaced from the porcelain skirt by short pegs and from the core by tongues. Booster sheds increase the diameter of the bushing in several places and break up long cascades of lightly contaminated water to prevent "heavy wetting" flashovers, which can occur during live-line washing or torrential rain. Available to fit insulator core diameters from 160mm to 770mm. suitable for applications up to 500kV.



### System Application

By using a combination of products distribution towers can be protected from flashovers and outages caused by birds. Targeting the most troublesome sections of OHL can reduce the number of incidents and save protected wildlife.

Regardless of the application it is possible to create a Raysulate solution for any accidental contacts or bridging problem.



# Indoor Equipment

## Recommended clearances

Tests on busbars insulated with Raychem BBIT/BPTM tubing have shown significant reductions in air clearance over conventional air-insulated systems. The most important requirements for the minimum spacing of the busbars is that the system must be free from audible corona at the AC Withstand test voltage and also withstands the Impulse test voltage. The possible air clearances are based on practical testing on a range of busbar sizes and configurations. The detailed clearance reductions and the application ranges for each of the products are listed in the data sheets. Further application data are available from your local representative and in our test reports.

The Raychem Raysulate Insulation Enhancement System is widely used for electrical insulation needs on enclosed buswork and for connections in switch-gear and electrical equipment. Whether the equipment is re-engineered or a newly designed busbar system, the insulation products provide highly flexible system for all shapes and sizes of conductor.

## Medium Voltage System



## Low Voltage System

The Raychem Raysulate Insulation Enhancement System also has an equivalent LV range of products. Colored in black and suitable up to 1kV.



## Clearance reduction

The tables indicate the clearance reductions that are possible using Raychem BBIT tubing. These are derived from BIL, AC withstand, DC withstand and discharge extinction tests. These clearances should not be adopted without testing by the user. Sharp electrodes and unusual geometries may require wider clearances.

### Round busbars

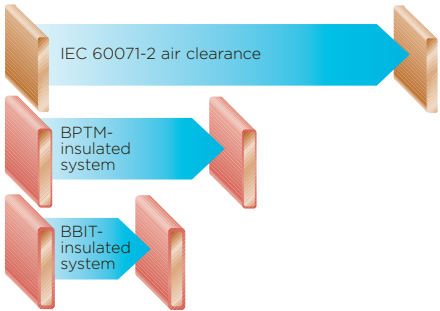
Rated voltage (kV)	Phase-phase (mm)	Phase-ground (mm)	IEC 60071-2 air clearance (mm)
12	30	40	120
17.5	45	60	160
24	60	90	220
36	100	160	320

### Rectangular busbars

Rated voltage (kV)	Phase-phase (mm)	Phase-ground (mm)	IEC 60071-2 air clearance (mm)
12	35	45	120
17.5	55	65	160
24	70	100	220
36	140	190	320

## Raychem "BBIT/BPTM" busbar insulation tubing

Raychem BBIT/BPTM heat-shrinkable tubings are suitable for use on long runs of rectangular or round busbars. These tubes shrink down to 40% of their original diameter and, due to excellent flexibility, conform tightly to a wide range of sizes. Raychem BBIT/BPTM tubing slides easily into place, even around several bends and on awkward shapes. Wall thickness is controlled by the heat-shrink process. Available to suit sizes of busbars from 5mm to over 250mm. Raychem BPTM is suitable for applications up to 25kV and Raychem BBIT up to 36kV.

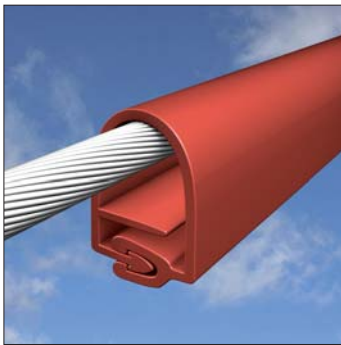




## Solutions for electrified railway systems



Tyco Electronics has used its experience from utilities and substations to provide a range of specialist cold applied retrofit products that can help prevent flashovers, outages and circuit breaker operations on the rail network. By insulating either the live equipment or earth planes from problems caused by wildlife, vegetation or airborne debris at areas of reduced clearance network reliability can be improved. The range of covers, barriers and sheets are easily installed and are suitable for 25kV applications



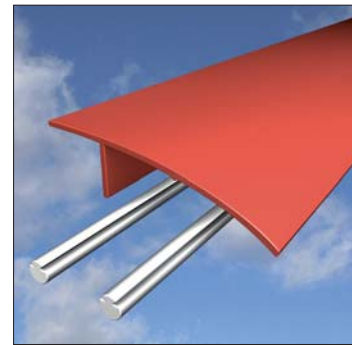
### Raychem Medium Voltage Line Cover "MVLC"

Provides insulation for catenary, droppers and associated conductors against contact with trees, birds, wildlife or even vandalism. Simple fast wraparound installation. Flame Retardant version available rated up to 40kV.



### Raychem "I" Beam Insulation Cover "IBIC"

Prevents accidental bridging between "I" section steelwork and live catenary or associated equipment by wildlife. Installation is clip-on, tool-free and fast.



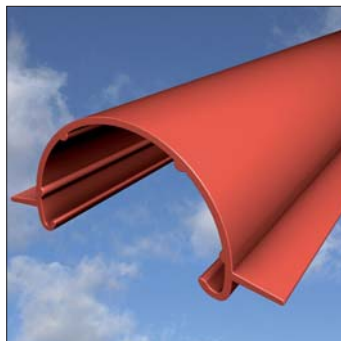
### Raychem Twin Contact Wire Cover "TCWC"

Provides an insulating platform above Twin or Single contact wires. Used in tunnels, under bridges or in stations where there is reduced clearance. Attaches to contact wire with industry standard clamps.



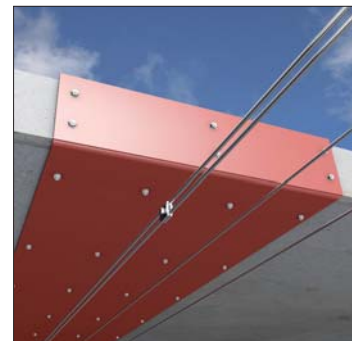
### Raychem Bus Insulator Squirrel Guard "BISG"

Can be mounted horizontally or vertically on any MV insulator or bushing, to prevent wildlife bridging phase to ground. Designed to eliminate accidental flashover on trackside substations and all associated equipment.



### Raychem Under Bridge Arm Cover "UBAC"

A range of covers to insulate the end fitting of horizontal insulators in tunnels and under bridges.



### Raychem Rigid Red Barrier Board, 3mm "RRBB"

A tough insulating board that can be secured to the underside of structures to insulate them from live equipment where there are reduced clearances. Raychem RRBB can be easily cut, drilled or formed on site to allow fitting to complex structures.



## ABOUT TYCO ELECTRONICS

Tyco Electronics Ltd. is a leading global provider of engineered electronic components, network solutions, specialty products and undersea telecommunication systems, with fiscal 2009 sales of US\$10.3 billion to customers in more than 150 countries. We design, manufacture and market products for customers in a broad array of industries including automotive; data communication systems and consumer electronics; telecommunications; aerospace, defense and marine; medical; energy; and lighting. With approximately 7,000 engineers and world-wide manufacturing, sales and customer service capabilities, Tyco Electronics' commitment is our customers' advantage. More information on Tyco Electronics can be found at <http://www.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.**

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