Connecting Power with Reliability
**Electrical Products Division**

**Vision**
To be the most preferred engineering solution provider to our customers in the Power Transmission and Distribution sectors, by offering technically superior products and services, at prices, that offer the best value for money in their class.

**Core Values:**
Focus on customers.

*Develop a committed and responsive community of Employees, Distributors and Vendors.*

Embrace growth and productivity through Innovation and Entrepreneurship.

Communicate openly and demonstrate integrity in all our activities.

Demonstrate passion for performance through anticipation, speed and flexibility.

Protect the environment and contribute to society around us.
Enhancing the reliability of cable networks 4

Low Voltage Terminations & Joints 5

Medium Voltage Terminations 6

Switchgear Terminations 7

Medium Voltage Joints 8 - 9

72kV High Voltage Terminations 10

72kV High Voltage Joints 11

Raysulate 12 - 13

Cerasafe 14

Polipro 15

Services 16 - 17

Tool and Accessories 18

Capabilities 19
Enhancing the reliability of cable networks

Raychem RPG Limited offers a comprehensive range of cable accessories for all types of cables. The most innovative utilities and industries including mining, marine, railways and offshore around the world, use Raychem Heat Shrinkable Power Cable Accessories.

Designed to withstand environmental extremes and high pollution levels over long operating lifetimes, they help maintain service reliability in both, overhead and underground installations.

Raychem has developed specially formulated insulation materials that resist tracking and degradation caused by erosion, ultraviolet light and other environmental stresses.

Raychem Heat Shrinkable Accessories have been designed to perform under different climatic conditions all over the world. They have proven field experience of over 40 years.

PRODUCT FEATURES
Basic design and material research have been improved systematically over the last four decades. Through research, in close co-operation with our customers, has produced new materials for the electrical power industry. The result is a wide range of products with unique combination of properties such as:

- Increased resistance to thermal ageing
- Insulation thickness memory
- Shape memory
- Excellent resistance to surface electrical activity
- Improved UV performance
- Electrical stress control
- Void-free inter-facial bonding
- Impermeability to cable oils
- Moisture blocking
- Improved flame resistance
- Elastomeric technology
- Mechanical connecting systems
Low Voltage Terminations & Joints

Raychem Low-Voltage Terminations

The terminations are designed for 3 and 4 core polymeric insulated cables with or without armour of 3 and 4 core paper insulated cables including cables with reduced neutral conductor.

Consistent performance in harsh environments such as extreme temperatures, atmospheric pollution, and ultraviolet light has proved the reliability of Raychem terminations.

Product Features & Benefits

- Heat shrink technology
- Quick and easy installation
- Solutions for all cable constructions

Raychem Low Voltage Joints

Raychem products offer excellent insulating and sealing performance with heat shrinkable and resin materials. These proven materials form the basis of straight and branch joints for voltages up to 1kV.

- Simple and fast installation - no curing time
- Immediate backfill
- Immediate energisation
- Unrestricted shelf life (-50°C to +50°C)
- Excellent electrical insulation
- Outstanding environment resistance
- Proven mechanical strength
- Re-entry for isolation of feeder
- Slim profile
Medium Voltage Terminations

Raychem heat shrinkable termination systems for paper and polymeric insulated cables up to 33kV

Recognition of Raychem heat shrinkable material advantages for cable jointing was the starting point for the development of special polymers for use at high voltages. The resulting materials possess exceptional resistance to prolonged electrical stress and weathering, and are also capable of being shrunk down quickly to fit and seal a cable, using only a commonly available gas torch.

Product Features & Benefits
- Heat shrink and elastomeric technologies
- Impedance stress control system
- Proven anti-tracking, erosion and UV resistant insulating material for indoor and outdoor applications
- Easy and highly reliable installation
- Range taking
- Suitable for crimped, soldered and mechanical lugs
- Resistant to breakage and vandalism
- Solutions for all cable constructions

Biterm Terminations
Raychem RPG's new design of Biterm Termination has the following features and benefits.
- Fewer components - less time to install, lesser chance of errors in installation.
- More reliable
- Tested at CPRI as per IS 13573 with latest amendments.

Uniterm Terminations
(Modern technology terminations)

Product Features & Benefits
- High performance termination material
- New varistor stress control system
- Compact design
- Few components
- Simple to install, high reliability
- Mechanical robustness
- Universal application
- Range taking
- No shelf life limitation
- More economical

Raychem's Uniterm Terminations are designed to suit modern compact equipments with less space for cable compartment. A single component replaces three heat shrinkable components (non-tracking tubing, stress control tubing, and skirts).
Switchgear Terminations

Universal adapter system installed for all types of cables and switchgears

Medium-voltage Switchgear Connection System

Raychem heat-shrink and cold-applied systems for switchgear with standardized bushings for 250A and 400/630A have been installed by utilities and industrial organisations worldwide for more than 40 years.

Product Features & Benefits
- Heat-shrink and elastomeric technologies
- Right-angle insulated boots
- Straight insulated boots
- Separable screened adaptor systems for 250A and 400/630A
- Separable insulated adaptor systems
- Suitable for crimped and mechanical lugs
- Easy and highly reliable installation
- Solutions for all cable constructions

Raychem re usable Screened Elbow and Straight Connectors

Product Features & Benefits
1. Screen body with integrated stress control
2. Capacitive test point
3. Earthing eye
4. Retainer connection point
5. Compression pin connector
6. Rayvolve or Heat Shrinkable sealing system
Medium Voltage Joints

Raychem Medium Voltage Joints
Millions of Raychem heat shrinkable medium voltage joints have been installed on paper and polymeric cables worldwide in the most severe service conditions, and under high electrical, thermal, mechanical and environmental stresses.

Product Features & Benefits
- Heat-shrink technology
- Prefabricated components
- Easy and highly reliable installation
- Applicability to different conductor and connecting techniques
- Accommodation of tolerances, range-taking
- Suitable for different conductor cross sections and cable constructions
- Solutions for all cable constructions

Design of joints
The connectors are insulated and sealed with thick-wall heat-shrinkable tubings and mastics. The armour or copper tape shielding is rebuilt with wraparound metal case or with copper mesh. A solderless earth connection provides electrical connection to the armour or copper shielding. The outer protection and sealing is performed by an adhesive coated heat-shrinkable tubing. Joints type POLJ are supplied with mechanical connectors, joints type EPKJ and SMOE are supplied without connectors.

Raychem Elastomeric Technology
The elastomeric joint component is supplied in an expanded form, in which the heat-shrinkable outer wall tubing holds the insulation layer at a wide diameter.

Application of heat causes the outer wall tubing to shrink, allowing the insulating layer to contract at the same time and closely fit the joint. Rubber like characteristics of the material enables the joints to follow thermally induced dimensional changes of cable insulation.
Medium Voltage Joints

Raychem Heat Shrinkable 11kV-33 kV jointing system for polymeric and paper cables and transitions

A universal system
Cable preparation and installation techniques for Raychem high voltage joints are identical to those for Raychem heat-shrinkable terminations. The same basic design is also shared by Raychem joints for paper insulated cables. In this respect, too, the heat-shrinkable system sets new standards of efficiency and simplicity.

Electrical field control
The stress control tubing has precisely defined impedance characteristic which smoothens the electrical field over connector and cable screen ends. During installation of the tubing, its shrinking action compresses the special void filler (yellow) into position round the screen ends and connector. Pencilling of insulation at the connector is not necessary.

Product design
The design of a single-core joint for polymeric insulated cable is described here. The same design principles are used for 3-core and paper insulated cables.

Insulation and screen
The elastomeric sleeve provides correct thickness of insulation (red) in one step. The insulation screen is provided by the outer wall of the sleeve, which is of heat-shrinkable conductive polymer (black). This technique saves installation time and ensures flawless bond between joint insulation and screen.

Mechanical strength
for steel wire or tape armoured cables. Raychem joints incorporate a light-weight impact-resistant galvanised steel joint case which is quick to install and provides earth fault current capacity.

Metallic shielding
Tinned copper mesh of adequate cross-section provides electrical continuity of insulation shield across the connection area.

Outer sealing
Heat used to shrink the outer sleeve causes pre-coated adhesive to melt and flow, resulting in lasting moisture and corrosion barrier on the cable oversheath.

Installation procedure
A pre-packed set of components is slid over the prepared cable cores and outer sealing sleeve is parked over the cable. After jointing the conductors, connector and screen ends are electrically smoothened with void filling compound. Stress control tubing and elastomeric components are positioned over the connector and shrunk into place. The cable shield is reinstated with copper mesh and the oversheath by adhesive-coated sealing sleeve. Kits are supplied with illustrated step by step instructions.
72kV High Voltage Terminations

Raychem High Voltage Joints and Terminations

Using its knowledge and experience in the field of material design, Raychem has pioneered some of the most important technical advances in cable accessory technology. Heat shrinkable accessories are well accepted for medium voltage distribution by utilities, equipment manufacturers and industrial users throughout the world for over 40 years.

High performance material

Raychem terminations are made of a specially formulated material with excellent tracking and erosion resistance characteristics. Accelerated and natural weathering tests which are constantly carried out at Raychem facilities and independent test sites around the world have demonstrated that terminations are UV and water resistant, and perform reliably even when exposed to sudden temperature variations. Tracking and Erosion Test as per ASTM D2303 and IEC112 confirm the material properties to be suitable for operation in severe climatic conditions.
**72kV High Voltage Joints**

Raychem 72kV elastomeric heat shrinkable joints, a unique system, gives the transmission engineer ease of installation previously only available for medium voltage accessories. 72kV joints from Raychem set the standard for simplicity and reliability.

**Product Features & Benefits**

- Heat shrink and elastomeric technologies
- Cross-bonding, shield-break and external grounding facilities
- Link boxes for cross-bonding
- Mechanical lugs and connectors
- Joints and terminations have been proven by extensive use in the field
- Testing to international standards under the supervision of independent testing institutes
- Suitable for all polymeric cables

**Designed for easy jointing**

The Raychem joint design comprises of a connector that allows even large cross-sections to be jointed with two dual wall, heat shrinkable sleeves.

Heavy walled co-extrusion of two layers of red insulation forms the inner sleeve. the outer sleeve consists of a thick layer of red insulation co-extruded under a black outer conductive layer which act as the joint screen.

**Controlled torque connector (Mechanical Connector)**

The connector design allows cables to be jointed without special tools, heat treatment or filing off after installation. Shear head bolts ensure pre-engineered electrical connection.

**Cross-Bonding**

The elastomeric Raychem 72kV joints are suitable for all polymeric cables and can accommodate various cross-bonding shield break and external grounding arrangements.

**Earth Link Boxes**

For HV joints with facility of copper link, cable entry sealing and Sheath Voltage Limiters (SVL) for earth connection and cross-bonding.

**Application**

- Direct grounding
- Single point bonding
- Cross-bonding
- Cross-bonding and transposition
- Sheath voltage limiters (SVL)

**Features**

- Compact design
- Stainless steel
- Hermetically sealed
- 1-phase and 3-phase boxes
- Sheath voltage limiters (SVL)
Raychem Insulation Enhancement Systems

Raychem’s BBIT/BPTM and HVBT heat shrinkable busbar insulation tubings and tapes provide insulation enhancement and flashover protection. These products can be used on aluminium and copper busbars of circular or rectangular cross-sections. Wall thickness is controlled by the heat shrink process.

BPTM provides flashover protection up to 25kV, whilst the thicker walled BBIT protects up to 36kV. High voltage tests on busbars insulated with BBIT/BPTM tubing demonstrate significant reduction in clearances over conventional air insulated systems.

- Substation protection systems
- Overhead line protection
- Protection and heavy wetting flashover protection
- Bus insulation for low and medium voltage applications
- Customer designed composite hollow insulators
- Operating rods for high voltage equipment
- Suitable for all polymeric cables

Remedy for pollution flashover of insulator

Raysume Creepage Extenders increase the flashover performance of insulators by reducing surface electric stress and leakage current, and increases the electric strength of insulators.

Installation of creepage extenders:
- increase creepage length
- improve insulator shape
- add high performance polymeric material to the creepage path.

Raychem’s Creepage extender installed on a insulator

Raychem Heat Shrinkable BPTM tubings and HVBT tapes are used for providing insulation where the clearances are inadequate.

Raychem’s BCIS vacuum formed sheath used for preventing accidental flashovers due to birds, animals, reptiles, etc.

Insulation of Switchyard with BBIT, BPTM, HVBT and BCIS components

Raychem’s Red Rigid Barrier Board (RRBB) used for phase segregation, to provide higher insulation and protection from flash overs.
Raychem's Silcab-T is designed to be "re-usable terminal protector" with facilities for on-line testing.

The modern switchgears are designed for compactness having small cable compartments with reduced clearances. They require additional protection between phase to phase and phase to ground clearances while connecting cables to bushings.

**Copper and Aluminium Insulated Busbars**

New designs of switchgear for voltages up to 36kV follow the principle of reducing size as much as possible. Insulated busbars provide maximum protection, particularly in constricted spaces, against flashover and accidentally induced discharge. Choosing the right busbar insulation can be difficult. Many conventional insulating materials require heavy investment in tooling and do not meet manufacturers' requirements for performance and reliability.

To solve this problem, Raychem RPG has developed series of heat shrinkable tubings for use on aluminium and copper busbars of circular and rectangular cross-sections. These busbar insulation tubings are currently used in switchgear cabinets throughout the world.
Metal Oxide Gapless Surge Arrester Distribution Class 9kV & 18kV - 5kA.

Metal Oxide Gapless Surge Arresters have been type tested at CPRI as per relevant Indian Standard. Manufactured at our ISO 9001/ISO 14001 certified facility for quality you can trust for life time. Cerasafe Metal Oxide Gapless Surge Arresters manufactured by Raychem RPG Limited complies to Indian National Standard IS:3070 (Part 3) and International Standard IEC 60099-4.

**Diagram Details:**
- Hexagonal Bolt
- Hexagonal Nut
- Washer
- Rubber Washer
- Rating Plate
- Aluminium End Cap
- Strip Spring
- Disc Separator
- ZnO Disc
- Spacer
- Porcelain Housing
- Square Washer-M10
- End Plate Rubber Gasket
- Mounting Clamp
- Disconnector
- Earthing

**Specifications Table:**

<table>
<thead>
<tr>
<th></th>
<th>9kV 5kA</th>
<th>18kV 5kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CSO 0905</td>
<td>CSO 1805</td>
</tr>
<tr>
<td>Weight</td>
<td>2.5 - 3.0 kg.</td>
<td>4.0 - 4.5 kg.</td>
</tr>
<tr>
<td>Height &quot;A&quot;</td>
<td>228.5 mm</td>
<td>370 mm</td>
</tr>
<tr>
<td>Height &quot;B&quot;</td>
<td>310.0 mm</td>
<td>466 mm</td>
</tr>
<tr>
<td>Creepage Distance</td>
<td>300 mm min.</td>
<td>600 mm min.</td>
</tr>
<tr>
<td>Phase to Phase</td>
<td>230 mm min.</td>
<td>330 mm min.</td>
</tr>
<tr>
<td>Phase to Earth</td>
<td>180 mm min.</td>
<td>280 mm min.</td>
</tr>
</tbody>
</table>
Powerline Protector for Low Voltage applications

Your insurance against
- Power thefts by hooking
- Power outages due to short circuit
- Untoward electrocutions

Anti-theft
Designed with material properties to prevent tapping of overhead bare lines by hooking and other means.

Outage Prevention
Designed to prevent electrical outages caused by trees coming in contact with overhead lines.

Untoward Accidents
Designed to provide necessary insulating cover on bare conductor to prevent accidents due to electrocution.

Cost Effective
Designed to insulate existing bare overhead lines without costly replacement expenditure.

Installation
Possible to install in live condition with help of special tools.

Anytime, anywhere installation, low cost, minimum hassles

FEATURES
- Sleeve to tubular Interlock design
- Light weight small spool length
- Material
- Cross Linked Polyethylene
- U.V. and abrasive resistant
- Excellent di-electric properties
- Thermal endurance
- Resistant to bird excrement
- Excellent water repellent property

BENEFITS
- Ease of installation. Install directly onto the existing line.
- No need for long shut down. No modification of existing overhead lines.
- No scrapping of existing conductors.
- Install as per required length. No need for bulk procurement. Ease of transportation to remote sites. Ease of storage.
- Unlimited Shelf life and excellent weather resistant.
- No deformation under exposure of sunlight and not prone to abrasion during installation.
- Prevents potential accidents where line is close to habitation.
- Ability to perform under high temperature
- No effect on product life and performance.
- No weight gain during monsoon and loss of insulation.
Services

Our qualified staff of engineers, technologist and EHV cable technicians enable Raychem RPG to provide one stop, multi-discipline solutions to power industry all over India.

Services provided by Raychem RPG include
- Route selection and thermal surveys
- Cable structure and support system designs
- Grounding and sheath bonding designs
- Cable installation
- Failure analysis
- Installation of cable joints and terminations
- Cable Spiking and Hipot testing
- Emergency repair services
- Contract maintenance (Cable network maintenance services)
- Customised Insulation solution
- Audits and consultancy of Cable Networks with Utilities and Industries
- Thermo scanning
- Training programs for engineers and jointers
- Partial Discharge Testing

Grounding and sheath bonding designs for EHV cable network

Rayline centre provides cable management for distribution system

EHV 132kV cable installation work

Installation of EHV cable joints
Services

Technical Audit for determining healthiness of cable networks in utilities and industries

Improper lug connection resulting in heating up

Surface tracking - choice of inferior material for termination

Partial discharge at screen cutback

ThermascanTM

D.O. Fuse Assembly insulated with BCIC component at Reliance Energy, New Delhi

D.O. fuse before insulation

D.O. fuse after insulation
Tools and Accessories

Mechanical connectors, lugs and repair sleeves are designed for use in low and medium voltage applications. Only three sizes cover conductor sizes from 25\,mm$^2$ to 400\,mm$^2$.

<table>
<thead>
<tr>
<th>Features &amp; Benefits of mechanical lugs and connectors</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide application range</td>
<td>Only three sizes cover conductor cross-sections from 25,mm$^2$ to 400,mm$^2$ and can be used for almost every type of conductor and material</td>
</tr>
<tr>
<td>Bodies made of a high tensile, tin plated aluminium alloy Bolts made of special aluminium alloy</td>
<td>Good contact properties Connection between copper and aluminium conductors is possible</td>
</tr>
<tr>
<td>Compact design</td>
<td>Requires little installation space, particularly for large sizes</td>
</tr>
<tr>
<td>Shear bolts with pre-determined shear torque, hexagon head and specially shaped contact ring</td>
<td>No torque wrench necessary Head shears off when a specific level of torque is applied High tensile strength</td>
</tr>
<tr>
<td>Lubricated bolts</td>
<td>Reduces friction Converts tightening torque into contact force for maximum effect</td>
</tr>
<tr>
<td>Special features of mechanical connectors Chamfered edges available with and without oil barrier</td>
<td>Suitable for up to 36kV and adaptable to existing joint designs oil stop when used in transition joints</td>
</tr>
</tbody>
</table>

Heat Shrinkable Wraparound sleeves are a fast, versatile and permanent method of repair for damaged cable outer sheaths. Upon application of heat, the sleeve shrinks and adhesive melts and bonds to the cable sheath, creating permanent seal against moisture entry into the cable.

Wraparound sleeves are useful for repairs to cable outer sheaths where it is not possible to use tubular sleeves.
Raychem RPG is accredited to ISO 9001: 2000 and ISO 14001 Standards for its manufacturing activities in state-of-the-art plants located at Vasai, Kalher and Rabale, Navi Mumbai.

- These plants are supported by computerized testing facilities and advanced engineering laboratories.
- The Vasai plant houses fully equipped high voltage laboratory capable of testing products having facility of 200kV High Voltage, Impulse and Partial Discharge testing.
- A new manufacturing facility was recently set up for Busbars, Surge Arresters and Insulators - The BUSI Factory at Vasai.
- Product Management facility for EPD Division at Vasai includes a training school for conducting programs for customers, staff and operators. The facility also includes a technical library, product installation laboratory as well as display center for EPD’s wide range of products.
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