

HEAT SHRINK RAYCHEM TECHNOLOGY

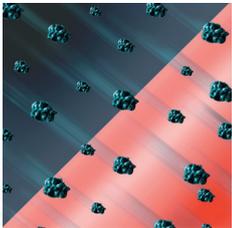
A PROVEN TRACK RECORD OF SOLVING
THE WORLD'S HARSHTEST CHALLENGES



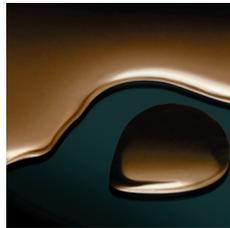
For more than 60 years, Raychem from TE Connectivity (TE) has supported the delivery of power for a wide variety of industries, applications and environments. With a proven track record of technical innovation, reliable performance, lower installation costs and exceptional technical support, TE provides heat shrink solutions for sealing and protection including tubing, tape, and insulation. TE pioneered the original heat shrink technology for energy applications and the industry continues to count on us to deliver the latest advances.

CONSTANT OPTIMIZATION OF PROVEN TECHNOLOGY

Our Raychem technology is based on specially-formulated thermoplastic polymer materials. Through our cost-effective manufacturing processes, TE can combine chemical additives with the polymers to create optimized solutions for various industry applications. The compounds for these materials are designed, selected, and mixed in TE's own compounding factories. Sophisticated process controls employed during extrusion, cross-linking and expansion ensure uniform wall-thickness before and after installation. Some of our significant technical advances include:



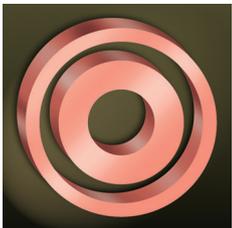
Resistance to surface electrical activity



Moisture protection oil barrier



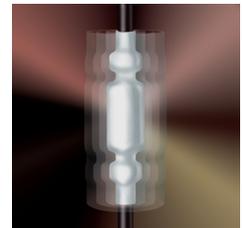
Void-free interfacial bonding



Electrical insulation shape memory



Environmental sealing and protection



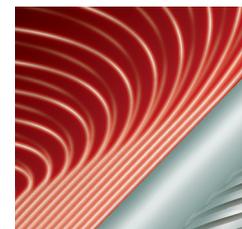
Mechanical protection



Flame retardant and fire resistant



Resistance to thermal aging and UV light



Electrical stress grading and conductivity

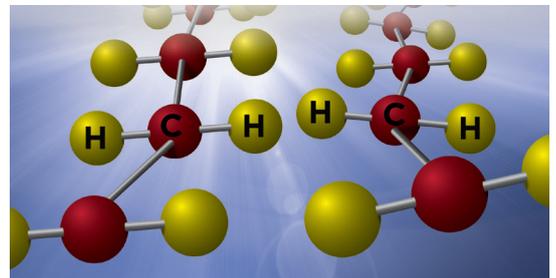
SUPERIOR ENGINEERING THROUGH POLYMER CROSS-LINKING TECHNOLOGY

Heat shrink material is comprised of polymeric materials (1) exposed to a high-energy electron beam that causes permanent cross-linking, or intermolecular joining, of adjacent molecules. Hydrogen atoms are separated from the polyethylene chains (2) and the carbon elements between adjacent chains establish connections joining together (3). Due to cross-linking, the heat shrink material loses its melting properties allowing it to be heated to temperatures beyond the crystalline melting point without melting. Above this temperature, heat shrink can be expanded and formed in shapes that will remain in position while the temperature decreases below the crystalline melting point again.

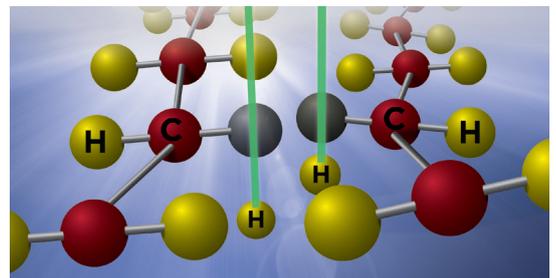
Heat shrink products are supplied in this expanded form in easy installation kits to our customers. When installers heat the products up again beyond the crystalline melting point, with a gas torch or hot air gun, the products shrink back to their original shape. This elastic memory remains in effect for the entire lifetime of the product allowing an unlimited shelf life under specific storage and warehouse conditions. As the polymeric materials shrink during installation, they also build up high pressure creating superb sealing and electrical behavior.

Cross-linking properties of heat shrink technology.

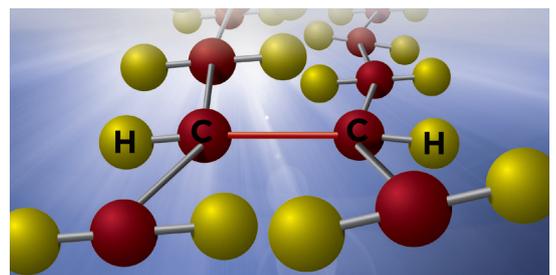
(1) Polyethylene chains



(2) Electron beams separating hydrogen atoms



(3) Carbon elements cross-linking



WEATHERING THE ELEMENTS AND THE TEST OF TIME

Our world-renowned Raychem materials and technology are well known for their high quality, reliability, and ability to withstand weathering processes like pollution and contamination, UV-light, salt fog and other extreme harsh environments. TE's highly durable heat shrink products are the perfect complement for TE's rugged and reliable cable product offering:

- Terminations
- Insulation
- Stress control
- LV MV HV applications
- Joints
- Tubing and molded parts
- Wildlife and asset protection

Proven Longevity: Decades of Data

TE's heat shrink products' advantage, their superior technology, enables their durability and long service life in harsh environments. They continue to perform robustly in the field more than 30 years after installation. Our data indicates:

- Most of the world's major energy utilities use TE products
- **60 years** of material science backing Raychem technology
- **40 years** of development and enhancements behind Raychem's cable accessories
- **30 years** without maintenance is typical for TE's heat shrink products
- This long service life significantly reduces the total cost of ownership

Powering Extraordinary Customer Experiences

When you partner with TE, you are getting more than reliable products. You are getting local support at 18 worldwide training centers, backed by the combined wisdom and experience of more than 7,000 engineers.

- As the leader in connectivity solutions, TE has more than 50 years of experience in the most diverse industries across the globe, and provides customers with tested and proven technologies for these industries.
- Our engineers and product teams provide some of the best expertise and specialized support. We support your team finding the best and most cost effective standard or tailor-made solutions to your design challenges and offer hands-on field support for stress-free installations.

A COMPREHENSIVE RANGE OF HEAT SHRINK TECHNOLOGY

MV JOINTS

MXSU is based on pre-engineered components including mechanical shear bolt connectors:

- Proven heat shrinkable stress control tubing
- The three-layer elastomeric joint component achieves tight interfaces and sealing due to high recovery force
- Oversheath replacement with thick-wall heat shrinkable tubing coated with hot-melt adhesive



MXSU

MV TERMINATIONS

IXSU / OXSU terminations are widely acknowledged in the industry for indoor and outdoor applications for polymeric cables up to 42 kV:

- One-piece termination
- Integrated stress control material in the termination tube
- Features a unique integrated ZnO-based stress control system
- Flexibility of usage for crimp or mechanical lugs



IXSU

OXSU

EPKT terminations for polymeric and MIND paper insulated cables from 7.2 kV up to 42 kV:

- EPKT-R universal termination family for 12 – 36 kV is based upon proven heat shrinking stress-control technology
- All applications for polymeric and MIND paper are on 1-core, 3-core, armoured and unarmoured cables
- Red non-tracking Raychem HVOT tubing provides excellent environmental protection



EPKT

WRAPAROUND SLEEVES

Tough, flexible, general purpose wraparound sleeves with good resistance to common fluids and solvents, excellent mechanical robustness and a high dielectric strength:

- Wraparound type **CRSM**, available for applications for cable oversheath repair
- Wraparound type **CNSM** (fabric reinforced), type **CFSM** (fabric reinforced, with Al water barrier) and type **RFSM** (fiber reinforced) available for applications for cable oversheath repair and joint re-jacketing
- 2:1 and 3:1 shrink ratio
- Fabric textile reinforced and fiber reinforced wraparound types available
- Very good chemical and solvent resistance
- Excellent physical and electrical performance



RFSM



Figure Caption: Rayfit tube used in MXSU joints - Combines 3 layered, thick-wall extrusion.

TUBING

Heat-shrinkable tubing **WCSTM** designed for insulation on Low Voltage applications:

- Heavy-wall tubing **WCSTM** for insulation in LV cable accessories (joints), sealing and mechanical protection on LV, MV and HV cables and accessories
- Medium-wall tubing **MWTM** for insulation in LV cable accessories (terminations), sealing and mechanical protection on LV and MV cable accessories
- Hardness harmonized with characteristics of modern cables
- Resistant to chemical agents
- Stabilized against UV rays
- Halogen-free, non-corrosive, free of lead, aluminum and heavy metals
- High tensile strength and mechanical robustness



WCSTM

TAPE

Heat-shrinkable, adhesive-coated tape which provides insulation enhancement and protection against accidentally induced flashover:

- Compatible with all Raychem MV insulation enhancement systems
- Indoor and outdoor use
- Anti-tracking properties
- Continuous operating temperature up to 90°C
- Versatile and flexible at temperatures as low as -40°C



HVBT

NUCLEAR TUBING

- Flame retarded and self-extinguishing
- Pre-coated with hot melt, radiation-resistant adhesive
- Electrical insulation up to 1000 V
- Suited for Class 1E wire and cable systems
- IEEE 383 and 323 compliant



WCSF

TE Connectivity (NYSE: TEL) is a \$12 billion global technology leader. Our connectivity and sensor solutions are essential in today's increasingly connected world. We collaborate with engineers to transform their concepts into creations - redefining what's possible using intelligent, efficient and high-performing TE products and solutions proven in harsh environments. Our 72,000 people, including 7,000 design engineers, partner with customers in close to 150 countries across a wide range of industries. We believe EVERY CONNECTION COUNTS - www.TE.com.

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- Substations
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