



# TERMINATION KIT



**Tab 4**



# Proven Solutions

## Increase Reliability

3M supplies everything required to reliably terminate a wide range of cables. In addition to tape termination kits, 3M also provide one-piece Cold Shrink Silicone insulation kits for shielded cables up to 66kV. Superior silicone rubber insulators ensure high moisture and contamination resistance.

Over 35 years ago, 3M pioneered Cold Shrink technology. Since then, field use and laboratory analysis have repeatedly proven its merits and reliability. Through constant innovation, we have refined Cold Shrink products making them better than ever. They are easier to apply and built to withstand even the most punishing environmental conditions. Enhanced performance at a lower installed cost continues to make 3M the preferred choice for Cold Shrink Solutions.



# 3M Technology and The Human Factor

## Technology Produces Quality Products For The Job

### It slips on quickly and shrink tight

Cold Shrink kits provide fast and easy terminations. The 3M Cold Shrink delivery system keeps the termination pre-stretched until the installer is ready to use it. Just a light pull removes the inner core, and the pre-stretched tubing instantly shrink to form a tighter interface with the cable than force-fit or heat shrink devices can provide. This provides a quick secure fit for the life of the cable. Excellent for high humidity environment up to 35KV Class.

### Uncompromising Materials Technology

Superior silicone rubber insulators both skirted for outdoor applications and non-skirted tubular for protected or indoor applications provide excellent resistance to wet and dry contaminants and moisture because of it's non-carbonizing and hydrophobic properties.

### Improved wet leakage and track resistance

- Unique insulator design gives increased protection against tracking and flashover.
- Skirt diameters are varied to prevent water drops from establishing a continuous wet leakage path.
- Smooth surface of silicone rubber ensures a minimum amount of contamination will adhere to the termination.
- When water comes in contact with silicone, it beads up and runs off the skirt, rather than wetting these surface. Thus, a less conductive path is formed and leakage currents lowered.
- When leakage currents and arcing occurs on the surface, the ash formed by erosion of the silicone insulator is non-organic and non-conductive. Thus continued degradation is deterred.

### Increased Reliability

- Silicone rubber is specially formulated for high conformability, high compressibility and retains its elasticity throughout extreme temperature range. This highly flexible one piece insulation enables termination to operate safely even in bent position.
- The Hi-K Stress tube redistributes the electrical field over the entire surface of the insulator. This eliminates the bulky stress cones and the unnecessary length giving a compact design, ideal for use in confined spaces.
- One piece termination - no extra parts, adaptors or special tools or heat needed.



**The Human Factor makes it easy to install, requiring minimal skill.**

**AS EASY AS 1, 2, 3 .....**



Position the Sheath Seal and unwind the core.



Slide on the Re-jacketing Sleeve.



Completed termination.

**Result:** *Less failure rate due to human or workmanship error*

### Versatile

Each 3M Quick Term II series kits will handle a wide range of cable and conductor sizes. There is the option to choose skirted or tubular and conversion from single core to three core and inverted applications.

The 3M Brand Re-jacketing Sleeves are a series of silicone rubber insulators incorporating inner-expandable polyester braid designed to reduce sliding friction and deliver the insulator onto the cable.

Re-jacketing sleeves are designed to protect three-conductor power cable phase legs from exposure to moisture, corrosion, ozone, ultra-violet radiation, physical contact and other hazards associated with the termination operating environment.

### Selection Chart For QT-II Single-Core XLPE Shielded Cable

VOLTAGE	APPLICATION	3M PRODUCT NUMBER	Conductor Size Range (sq. mm)	Primary Insulation O.D. Range (mm)	Cable Jacket O.D. Range (mm)
5-15KV	OUTDOOR	5632K	10 - 50	8 - 17	14 - 23
		5633K	70 - 120	16 - 23	20 - 30
		5635K	150 - 300	21 - 34	25 - 41
		5636K	400 - 630	28 - 42	33 - 48
		5637K	500 - 800	35 - 50	33 - 61
5-15KV	INDOOR	5622K	35	11 - 17	-
		5623K	50 - 95	14 - 22	-
		5624K	95 - 240	20 - 33	-
		5625K	400 - 630	28 - 46	-
Up to 24KV	INDOOR	5633K	35 - 50	16 - 23	20 - 30
		5635K	70 - 120	21 - 34	25 - 41
		5636K	185 - 240	28 - 42	33 - 48
		5637K	300 - 630	33 - 50	38 - 61
Up to 24KV	OUTDOOR/ INDOOR	5691K	35 - 50	16 - 23	20 - 30
		5692K	70 - 120	21 - 34	25 - 41
		5693K	185 - 240	28 - 42	33 - 48
		5694K	300 - 630	33 - 50	38 - 61
Up to 35KV	INDOOR	5691K	35 - 70	16 - 23	20 - 30
		5692K	120 - 185	21 - 34	25 - 41
		5693K	185 - 300	28 - 42	33 - 48
		5694K	400 - 500	33 - 50	38 - 61
		5684-3 MAL	630 - 800	33 - 53	38 - 75
Up to 35KV	OUTDOOR/ INDOOR	5696K	35 - 70	21 - 34	25 - 41
		5697K	120 - 185	28 - 42	33 - 48
		5698K	240 - 400	33 - 49	38 - 61
		5608 MAL	500 - 630	46 - 75	-

## Selection chart for 3M "Quick Term II" Cold Shrink Silicone Rubber Termination Kit for Indoor 3 Core XLPE / SWA / PVC Cables

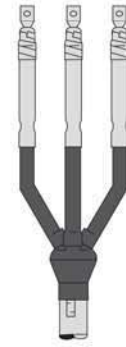
### Up to 11KV

(Silicone Rejacketing Sleeve/Dark GreyBoot/QT-II Version)

Kit Number	Cable Insulation Range (mm)	Cable OD Range (mm)	Cable Conductor Size (mm <sup>2</sup> )*	
			3.3 / 6.6KV	11KV
62-RS 41-3 MAL	12 - 18	30 - 49	16 - 50	-
62-RS 42-3 MAL	15 - 24	37 - 67	70 - 150	35 - 95
62-RS 43-3 MAL	20 - 33	49 - 79	120 - 240	120 - 185
62-RS 44-3 MAL	26 - 41	64 - 109	240 - 500	240 - 300

Termination phase lengths can be customised via end extension,  
S = max. 350mm L = max. 600mm (x) = custom lengths

\*cable insulation O.D. & outer diameter



11KV Indoor 3C Termination

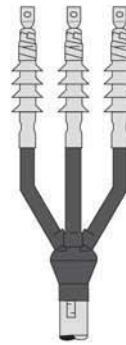
## Selection chart for 3M "Quick Term II" Cold Shrink Silicone Rubber Termination Kit for Outdoor 3 Core XLPE / SWA / PVC Cables

### Up to 22KV Indoor Application

(Silicone Rejacketing Sleeve/Dark GreyBoot/QT-II 4 skirted Version)

Kit Number	Cable Insulation Range (mm)	Cable OD Range (mm)	Cable Conductor Size (mm <sup>2</sup> )*		
			3.3 / 6.6KV	11KV	22KV Indoor
62-RS 41-4 MAL	-	30 - 49	-	-	-
62-RS 42-4 MAL	16 - 20	37 - 67	70 - 150	35 - 95	35
62-RS 43-4 MAL	20 - 33	49 - 79	120 - 240	120 - 185	50 - 95
62-RS 44-4 MAL	26 - 41	64 - 109	240 - 500	240 - 400	120 - 240

\*cable insulation O.D. & outer diameter



11KV Outdoor Termination

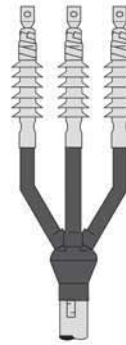
## Selection chart for 3M "Quick Term II" Cold Shrink Silicone Rubber Termination Kit for Indoor 3 Core XLPE / PVC Cables

### Up to 33KV Indoor Application

(Silicone Rejacketing Sleeve/Dark GreyBoot/QT-II 6 skirted Version)

Kit Number	Cable Insulation Range (mm)	Cable OD Range (mm)	Cable Conductor Size (mm <sup>2</sup> )*	
			22KV	33KV
64-RS 41-3 MAL	21 - 34 (K6S)	48 - 78	50 - 95	70
64-RS 42-3 MAL	21 - 34 (K6S)	64 - 109	120 - 240	95 - 150
64-RS 43-3 MAL	28 - 42 (L6S)	64 - 109	300 - 400	120 - 240
64-RS 44-3 MAL	33 - 50 (M6S)	66 - 119.4	-	240 - 300

\*cable insulation O.D. & outer diameter



33KV Indoor / 22KV Outdoor 3C Termination

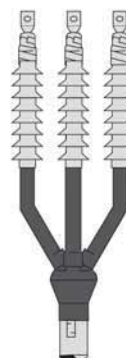
## Selection chart for 3M "Quick Term II" Cold Shrink Silicone Rubber Termination Kit for Indoor / Outdoor 3 Core XLPE / PVC Cables

### Up to 33KV Outdoor Application

(Silicone Rejacketing Sleeve/Dark GreyBoot/QT-II 8 skirted Version)

Kit Number	Cable Insulation Range (mm)	Cable OD Range (mm)	Cable Conductor Size (mm <sup>2</sup> )*
			33KV
64-RS 41-4 MAL	21 - 34 (K8S)	49 - 79	70 - 120
64-RS 42-4 MAL	28 - 42 (L8S)	60 - 109	120 - 240
64-RS 43-4 MAL	33 - 50 (M6S)	66 - 119.4	240 - 300

\*cable insulation O.D. & outer diameter

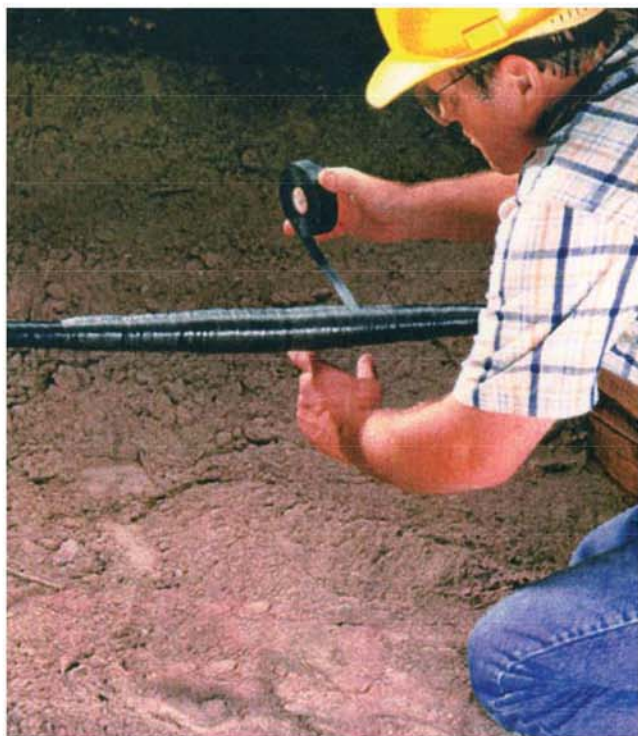


33KV Outdoor Terminations



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# Scotch Tape Joints for Aerial Bundle Cables



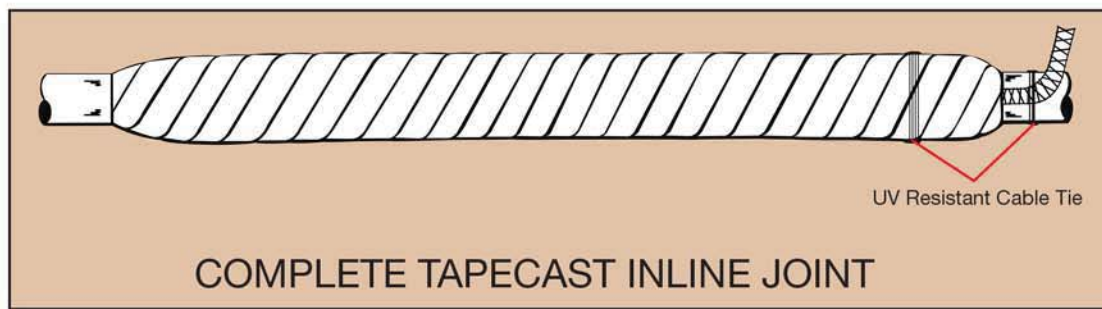
## Design Features :

- Consists of a combination of various 3M tapes to provide the electrical insulation build back the semi conductive layer, stress control and shielding properties of the joint.
- 3M self-bonding tapes provides a void free insulation build-back for voltage withstand and moisture protection.
- Uses Constant force springs for continuity of the armour and shielding of the cable.
- 3M Rubber and Mastic tapes are used to provide the additional overlap on the cable jacket.
- Laboratory tested and field-proven design. Meets the requirements of IEEE 404, VDE 0278, IEC 60502 and CENELEC HD 629 Standards.
- Detailed drawings and instructions are supplied with each kit.

With 3M Scotch Tape Joints, you can insulate and moisture-proof any odd shaped and sized cable ... from 1KV up to 35KV. It is used for joining XLPE insulated single and three core cables with Aluminium or Copper conductors.

The Scotch Tape Joints for aerial cable application utilizes 3M Electrical Vinyl Professional Use and Premium grade tapes that are UV and weather resistant as well as UL Approved. It also provides the flexibility to incorporate the tape splice design with resin re-jacketing for a 3M "Tapecast" resin pressure method or Mold and compound type splice for buried underground application which needs additional mechanical strength.

All 3M Scotch tape Splices are rated for 90°C with 130° emergency overload provisions.



# 3M Armorcast Structural Material

To give additional mechanical and UV protection on the Aerial Cables, 3M provides the option to combine the completed tape joint with with 3M Armorcast Rejacketing Kit No. AR-2.



Installation of AR-2 is quick and easy. No need for flame, electricity or chemicals. Perfect for all hazardous environments, including manholes.

3M Armorcast Structural Tape is a flexible fiberglass knot fabric strip saturated with resin syrup. No heat is required in the installation process, just water. It forms a tough durable covering that cures in 20 minutes. Provides structural strength, as well as cable and splice protection. For use on any cable jackets and sheath repair. The tacky, stretchy fiberglass reinforced material adheres both to itself and to polyethylene or lead sheaths.

- **Simple application.** Quick and easy to apply without mess
- **Water activated resin.** Gives control of set time
- **Durable.** Strong, long-life, water-resistant and hard wearing
- **Light weight.** The fiberglass construction of the tape allows for excellent mechanical protection without extra weight stress on the cables
- **Tack free.** Gives ease of roll unwind during application
- **Resistant** to moisture, fungus, acid, alkali, ozone, sunlight, gasoline and high temperatures
- **Conforms** to irregular shapes and maintains the rigidity and shape



Step 1



Step 2



Step 3

## Application Instructions :

- Wear a glove to protect your hands from the resin.
- Remove the roll from the foil pouch and dip in cool water, squeezing once. This will allow four to five minutes curing time. Option: You can also apply directly without first dipping in water. The curing time is longer if it is not dipped in water.
- Apply in a spiral motion. Overlapping by half to two thirds on each turn.
- Mold to aid lamination and cast strength. Use some water to help smoothen the surface.
- Let it cure and dry. Cables can be moved in 30 minutes time.



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# 3M™ Jointing Systems for Power Cable

## Resin Pressure Method (R.P.M.)



The resin pressure method (R.P.M.) Jointing System is well proven and was designed to make fast and simple joints on XLPE or paper insulated cables. This method is very versatile and adaptable to odd sized cable and different joint configurations like transition and branch joints. Applicable to a wide voltage range of cables from 1KV - 45KV.

The R.P.M. joint is based on liquid tight tape mold built around the joint. It provides outstanding moisture resistance, tough mechanical properties and excellent electrical insulation.

All the components required to make a resin pressure splice are conveniently supplied in a kit for. Components such as Scotch No. 23 tape for insulating, Scotchcast P-3F Spacer tape to build around the joint, plastic vinyl tape to form the liquid-tight mould and a final overwrap of Scotch Restricting tape to retain the shape of the mold under pressure as Scotchcast resin is pumped in from the E-4 Resin Pressure Gun. This two-part encapsulating resin is pre-measured and packaged in 3M's exclusive Unipak container for exact mixing ratios and to prevent contamination. When cured the resin will not run, ensuring a strong, dependable, high performance and long lasting joint.



Reliability Supply

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# 3M™ Jointing Systems for Power Cable

## Resin Pressure Method (R.P.M.)



Scotch No.13 Semi-conducting Tape being taped over the crimp connectors.



Scotch No.23 Insulating Tape being applied for cable insulation.



Resin being injected into the joint with the Scotchcast E-4 Resin Pressure Gun.

### SELECTION CHART FOR RESIN PRESSURE METHOD JOINTING KITS

VOLTAGES	TYPES OF JOINT		CONDUCTOR CROSS SECTION		
			UP TO 95 mm <sup>2</sup>	UP TO 185 mm <sup>2</sup>	UP TO 300 mm <sup>2</sup>
UP TO 1KV	STRAIGHT THROUGH JOINT	4-CORE XLPE / PVC CABLE	61-AT 42 (50-70)	61-AT 44 (120-150)	62-AT 46
			61-AT 43 (95-120)	61-AT 45 (185-240)	
*For Armored Cables, add MAL to the end of the kit description, eg. 61-AT 45 MAL					
UP TO 22KV	STRAIGHT THROUGH JOINT	3-CORE XLPE / SWA/PVC CABLE	62-AT 433-3 MAL	62-AT 443-3 MAL	62-AT 433-3 MAL
		3-CORE PILC MIND DSTA CABLE	92-A2-16/120 MAL	92-A2-150/185 MAL	92-A2-240/300 MAL
	TRANSITION JOINT	3-CORE XLPE CABLE TO PILC MIND CABLE	62-FT 432-3 MAL	62-FT 442-3 MAL	62-FT 452-3 MAL
	STRAIGHT THROUGH JOINT * Single core also available	3-CORE XLPE / PVC CABLE	63-A41-X-MAL	63-A42-X-MAL	63-A43-X-MAL
	TRANSITION JOINT	3-CORE XLPE TO PILC CABLE	63-A41-X-SGP	63-A42-X-SGP	63-A43-X-SGP
UP TO 33KV	STRAIGHT THROUGH JOINT * Single core also available	3-CORE XLPE / SWA/PVC CABLE	64-AT 530-3 MAL	64-AT 540-3 MAL	64-AT 550-3 MAL

ALL KITS ARE SUPPLIED WITHOUT CONNECTORS AND E-4 RESIN PRESSURE GUN  
ALL JOINTS MEET IEEE 404, VDE 0278, CENELEC HD 629 STANDARDS

NOTE: For other cable sizes, voltages and configurations, please contact your local 3M Representative who will be pleased to give you his assistance



Reliability Supply

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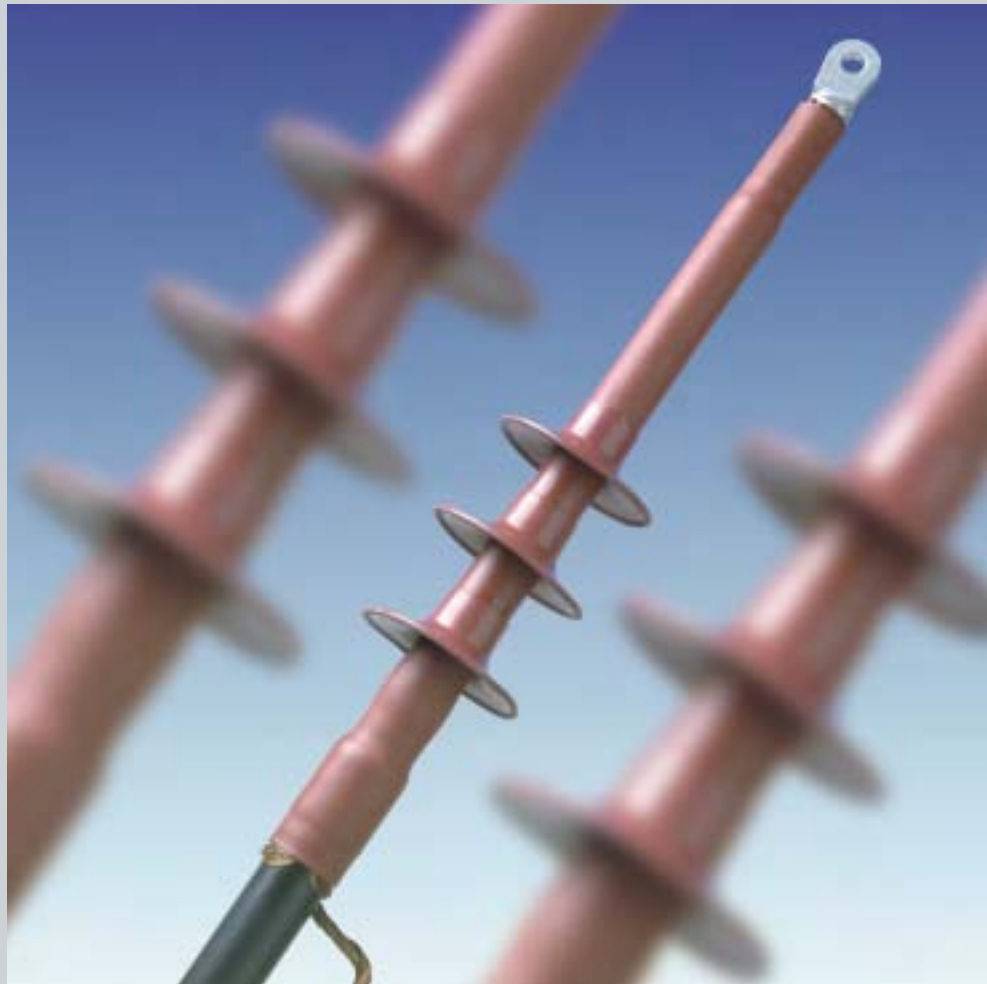
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## Heat-Shrinkable Termination System for Cables up to 36 kV

### Features:

- Universal termination family for 12-36 kV based on SCTM stress control technology
- All applications for polymeric and MIND paper on 1-core, 3-core, armoured and unarmoured cables
- Red non-tracking HVOT tubing provides excellent environmental protection
- Can be used in combination with RICS / RCAB / RSRB switchgear connection systems



## The Universal Medium Voltage Termination System for Polymeric and Paper Insulated Cables

Over the last three decades, engineers in utilities and industry around the world have specified of million's Raychem cable terminations at distribution voltages up to 36 kV. Raychem terminations have become identified with reliability because of their unparalleled long-term performance – where it really counts – in the field. Today there are many changes influencing the distribution of power at medium voltages. For example, the transition to new types of polymeric cable, distribution at higher voltages, and the widespread usage of compact switchgear.

Anticipating these industry changes, we have continued to extend and improve the product range, based on the extensive experience both in the field and at our outdoor test sites in coastal, polluted and desert environments. Now these developments are incorporated in a new generation of Raychem heat-shrinkable cable terminations, that are even easier to select and install, without compromising the reliability of proven materials technology. The improved system is simpler to use, because the basic termination components and installation steps are the same – even if your network operates with voltages of 7.2 to 36 kV; if you use 12 kV belted paper cable and 24 kV water-blocked single core polymeric cable; whether you make equipment connections in a cable box or in compact switchgear. Let's review the main advantages of the improved system:

### Universal Selection Procedure

- Simplified selection table allows quick selection based on conductor cross section and voltage class for either polymeric or MIND paper insulated cables (For MI draining oil cables, contact your local representative)
- Simple modification codes permit easy specification of optional accessory kits
- Enhanced range-taking ability means that one kit fits more conductor sizes, reducing stocking requirements
- Unlimited shelf life allows stocking of economic quantities without product spoilage

### Simplified Cable Preparation

- Improved treatment of screen cut back is compatible with all modern screen removal techniques
- No tapering of insulation required
- No polishing of polymeric insulation surface
- No special preparation of sectored, or eccentric conductors, or of cable that is curved after unreeling from the cable drum
- Cable preparation steps are similar to those for Raychem joints

### Simplified Installation

- Components are lightweight and non-shattering
- Clear instruction sheets
- Common installation procedure for polymeric and MIND paper cables
- Factory engineered kit permits rapid on-site installation
- No mechanical stress at insulation screen cutback
- Termination accommodates same bending radius as cable
- Visual confirmation of correct assembly sequence possible after installation
- Rain skirts can be installed to allow either top or bottom feed
- No soldering of earthing accessories required

### Outstanding Long-Term Reliability

- Fully sealed against water ingress from the environment or from within the conductor strands
- Polymeric materials load cycle with the cable without mechanically stressing termination components and sealants
- Unsurpassed performance in polluted environments, proven over three decades.

Raychem Cuxhaven, West Germany, long-term test site. Raychem terminations have been on test at this North Sea coast location for over two decades.



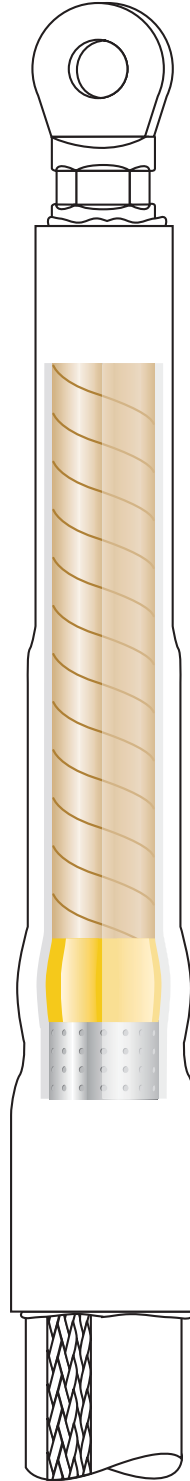
**Single Core Cable Termination System**



**Polymeric Insulated Cable Indoor Service**

- void filling compound
- stress control tubing
- non-tracking sleeve with sealant layer

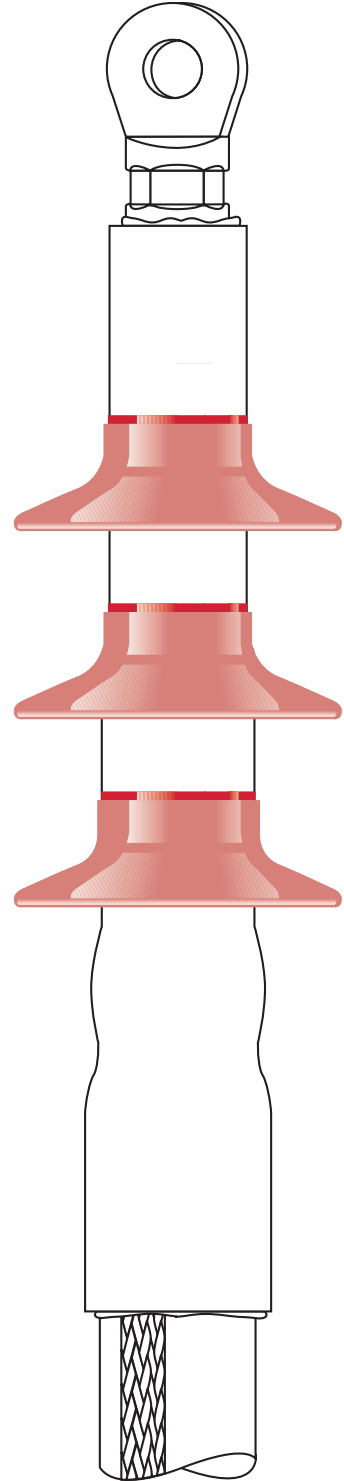
It's the same system for all types of polymeric cable



**Paper Insulated Cable (Mass Impregnated, Non-Draining) Indoor Service**

- oil barrier, insulating tubing (clear) installed over paper insulation

otherwise, installation is the same as for a polymeric insulated cable

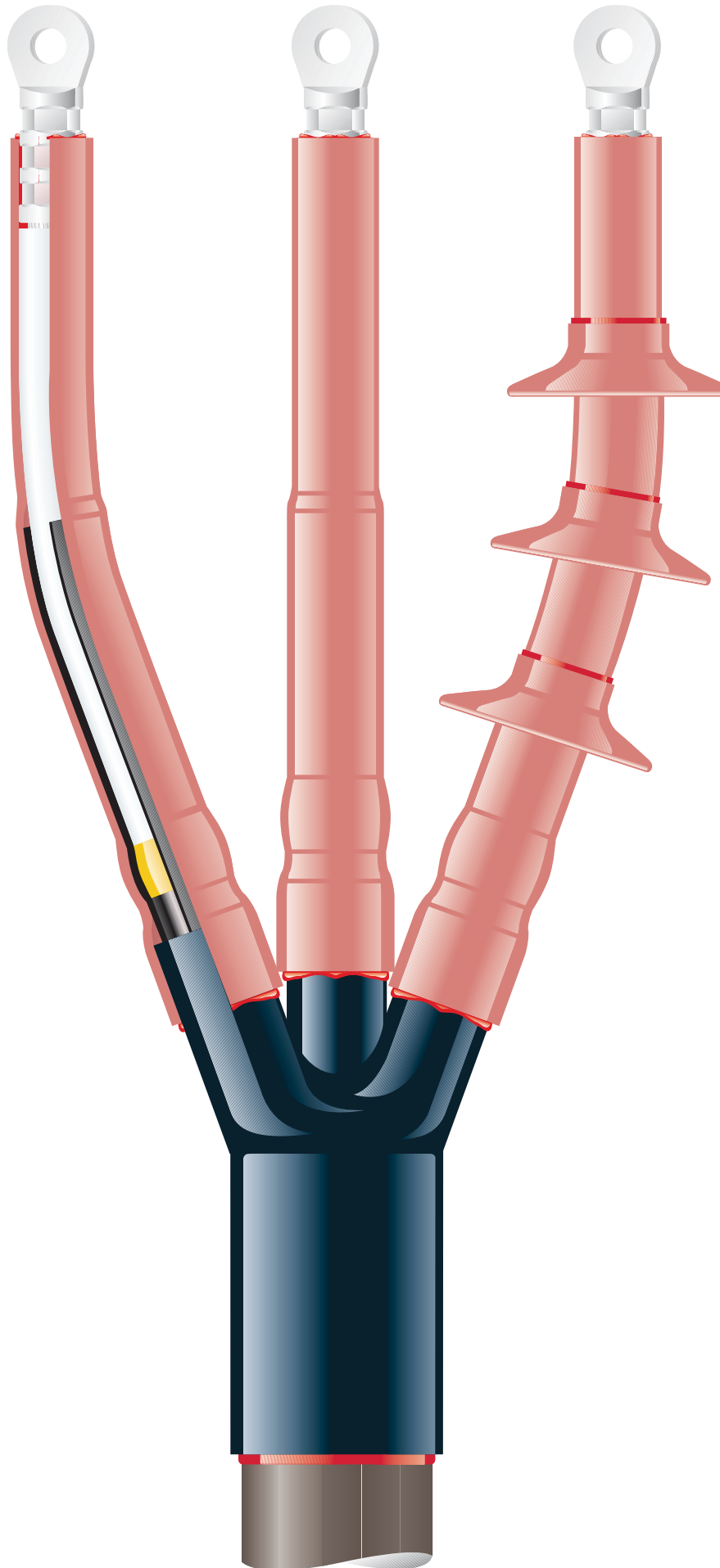


**Polymeric or Paper Insulated Cable Outdoor Service**

- rain skirts installed over non-tracking sleeve

otherwise, installation is the same as for an indoor termination

## Three-Core Cable Termination System



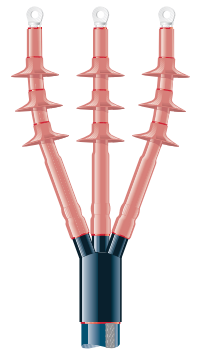
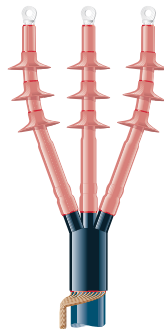
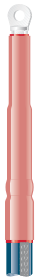
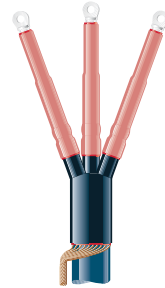
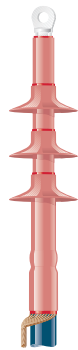
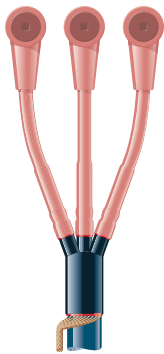
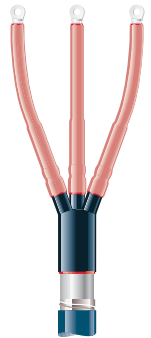
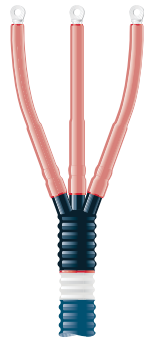
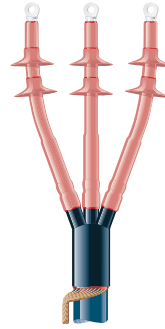
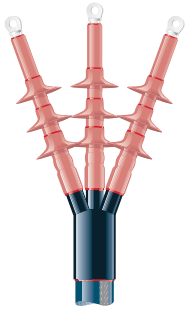
## Polymeric or Papier Insulated Cable Indoor or Outdoor Service

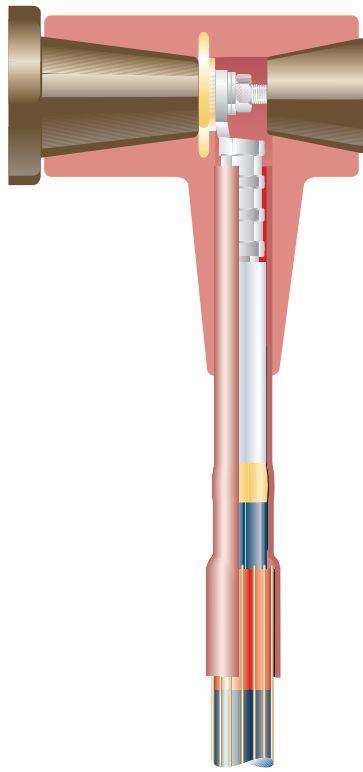
■ three-core breakout installed at end of cable overshooth

otherwise, installation steps are the same as for three single core terminations

The Raychem termination system is compatible with all types of armoured cable.

The system includes a complete range of solderless accessories for earthing insulation screens and cable armour and for grounding lead sheaths. Also available are insulators and support brackets, insulating boots for equipment connections and glands for easy entry to cable boxes. For more details please refer to the EPKT and IXSU Termination Systems Designer brochure.

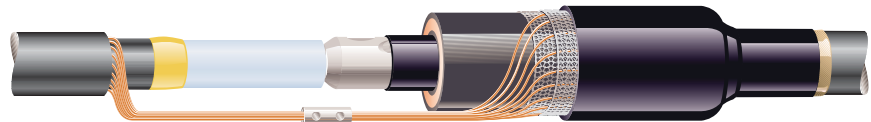




All our indoor terminations for polymeric or paper insulated cables can be used with RICS (Raychem Insulated Connection System). The RICS, fully insulated, right-angle and straight adaptors make it easy to connect any type of cable to modern compact electrical equipment. A special RICS, accommodating a ZnO Surge Arrester is now available as well as a low profile, one piece cable termination (IXSU), designed specifically for applications with very limited clearances between phases.

We have the universal jointing system for all types of paper and polymeric cable up to 36 kV. The same system allows transition joints between different tree-core paper cable and transitions from paper to polymeric cables. Trifurcations with any combination of cables are also easy with the Raychem jointing system.

For more information about joints and terminations up to 72 kV and other problem-solving products, call your local representative. We have field sales offices and offer technical support around the world.



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. ALR, AMP, AXICOM, B&H, BOWTHORPE EMP, CROMPTON INSTRUMENTS, DORMAN SMITH, DULMISON, GURO, HELLSTERN, LA PRAIRIE, MORLYNN, RAYCHEM, and SIMEL are trademarks.



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**Energy Division - a pioneer in the development of economical solutions for the electrical power industry. Our product range includes: Cable accessories, connectors & fittings, electrical equipment, instruments, lighting, insulators & insulation enhancement and surge arresters.**



April 2018









An ISO 9001:2015 & 14001:2015 Company

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## NOTES:

Lined area for notes, consisting of multiple horizontal lines.





# Delta Sama Jaya Sdn.Bhd.



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