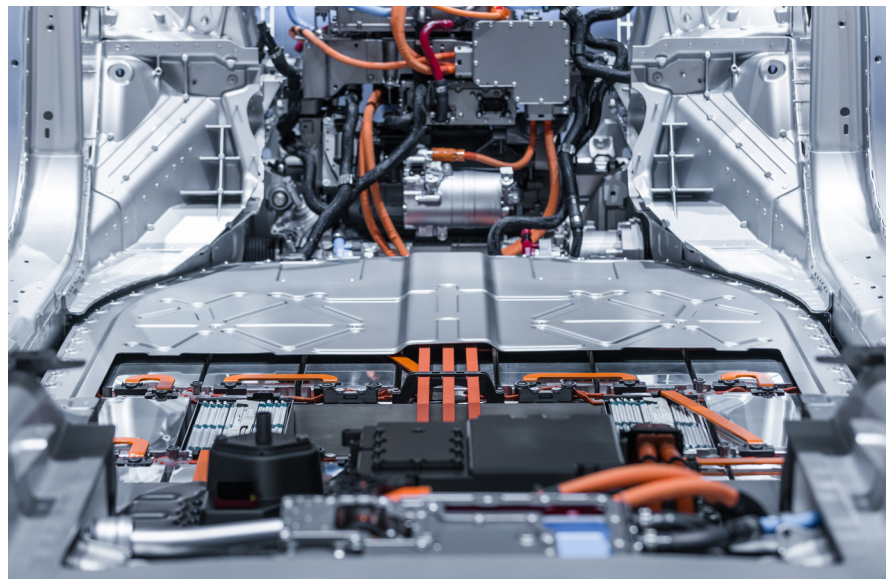
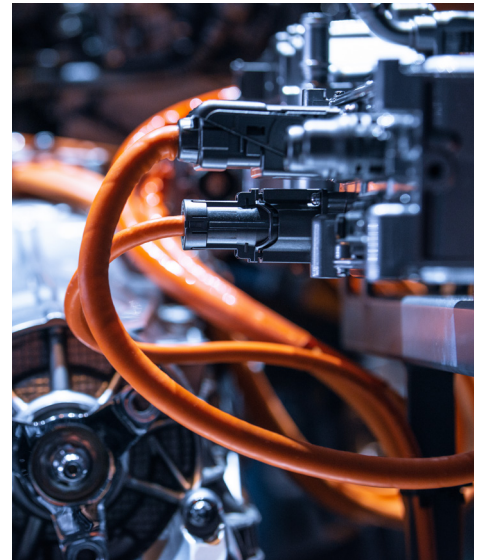


# PROTECTION PRODUCTS FOR THE AUTOMOTIVE INDUSTRY

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Heat Shrink Tubing  
Sealing and Protection Solutions



**PROTECTION SOLUTIONS FOR AUTOMOTIVE APPLICATIONS**

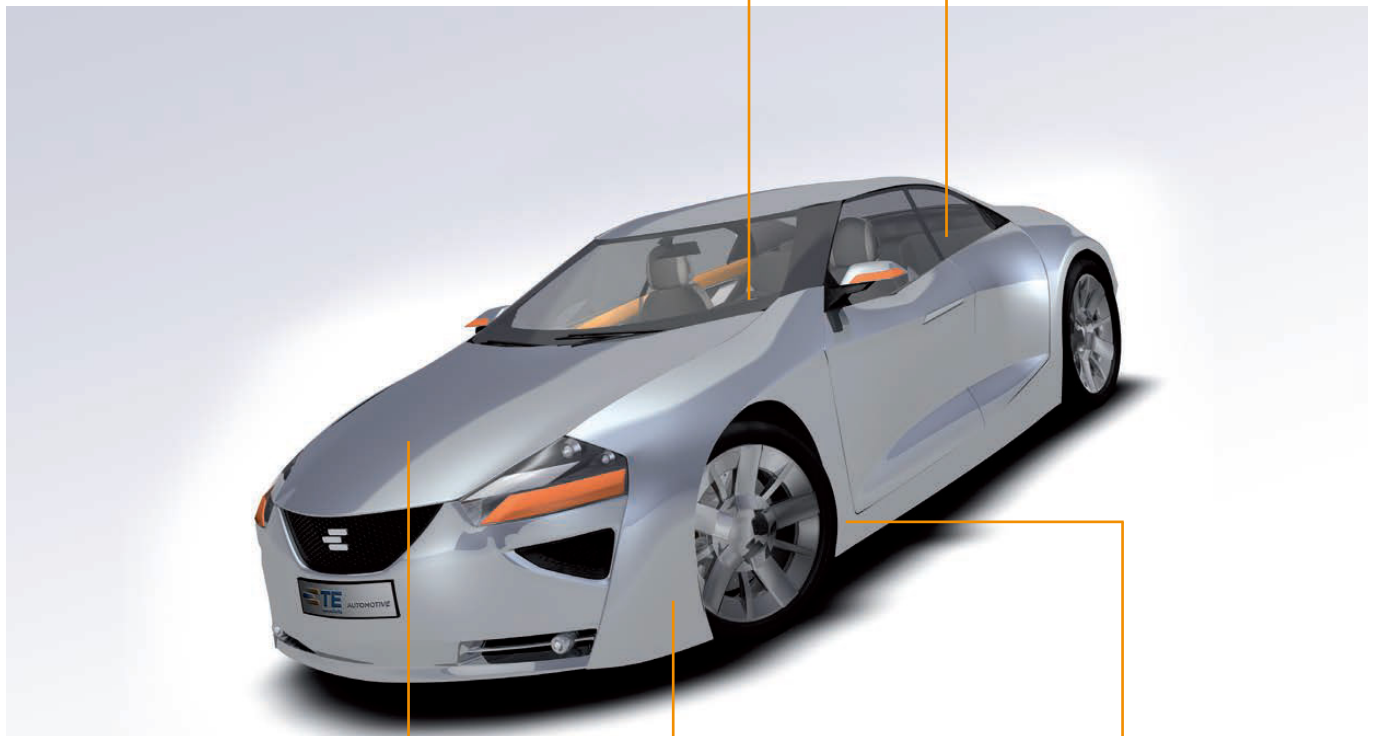
Heat Shrink Tubing



**Driver Information**



**Convenience**



**Powertrain Systems**



**Body & Chassis Systems**



**Safety & Security Systems**

# PROTECTION SOLUTIONS FOR AUTOMOTIVE APPLICATIONS

## Heat Shrink Tubing



Protection Products						
Introduction	6	✓	✓	✓	✓	✓
Core Technologies	7	✓	✓	✓	✓	✓
<b>Harness Design Applications</b>	10	✓	✓	✓	✓	✓
CRN tubing	11-12	✓	✓			✓
ES Caps	13-14	✓	✓	✓	✓	✓
FRAG tubing	15-16	✓	✓			✓
HTAT tubing	17-18	✓	✓			✓
LSTT tubing	19-20	✓	✓	✓	✓	✓
QSZH-125 tubing	21-22	✓	✓	✓	✓	✓
RayBlock 85 Sealing Kit	23-24	✓	✓			✓
RayBlock 105 Sealing Kit	25-26	✓	✓			✓
RBK ILS-125/RBK-ILS-125-NR50 tubing	27-28	✓	✓			✓
RBK RTP-125 tubing	29-30	✓	✓			✓
RBK VWS-125 tubing	31-32	✓	✓			✓
RPPM tubing	33-34	✓	✓			✓
RW-175 tubing	35-36	✓	✓			✓
RW-200/RW-200-E tubing	37-38	✓	✓	✓	✓	✓
SCL tubing	39-40	✓	✓	✓	✓	✓
SCT tubing	41-42	✓	✓	✓	✓	✓
VERSAFIT tubing	43-44	✓	✓	✓	✓	✓
<b>Mechanical Protection Applications</b>	46	✓	✓	✓	✓	✓
CGPT tubing	47-48	✓	✓	✓	✓	✓
HCTE tubing	49-50	✓	✓	✓	✓	✓
HET 5000 tubing	51-52	✓	✓			✓
NETM tubing	53-54	✓	✓	✓	✓	✓
RNF-100 tubing	55-56	✓	✓			✓
RNF-150 tubing	57-58	✓	✓	✓	✓	✓
RNF-3000 tubing	59-60	✓	✓	✓	✓	✓
RPPM tubing	61-62			✓	✓	✓
RPT-120 tubing	63-64	✓	✓			✓

**PROTECTION SOLUTIONS FOR AUTOMOTIVE APPLICATIONS**

Heat Shrink Tubing

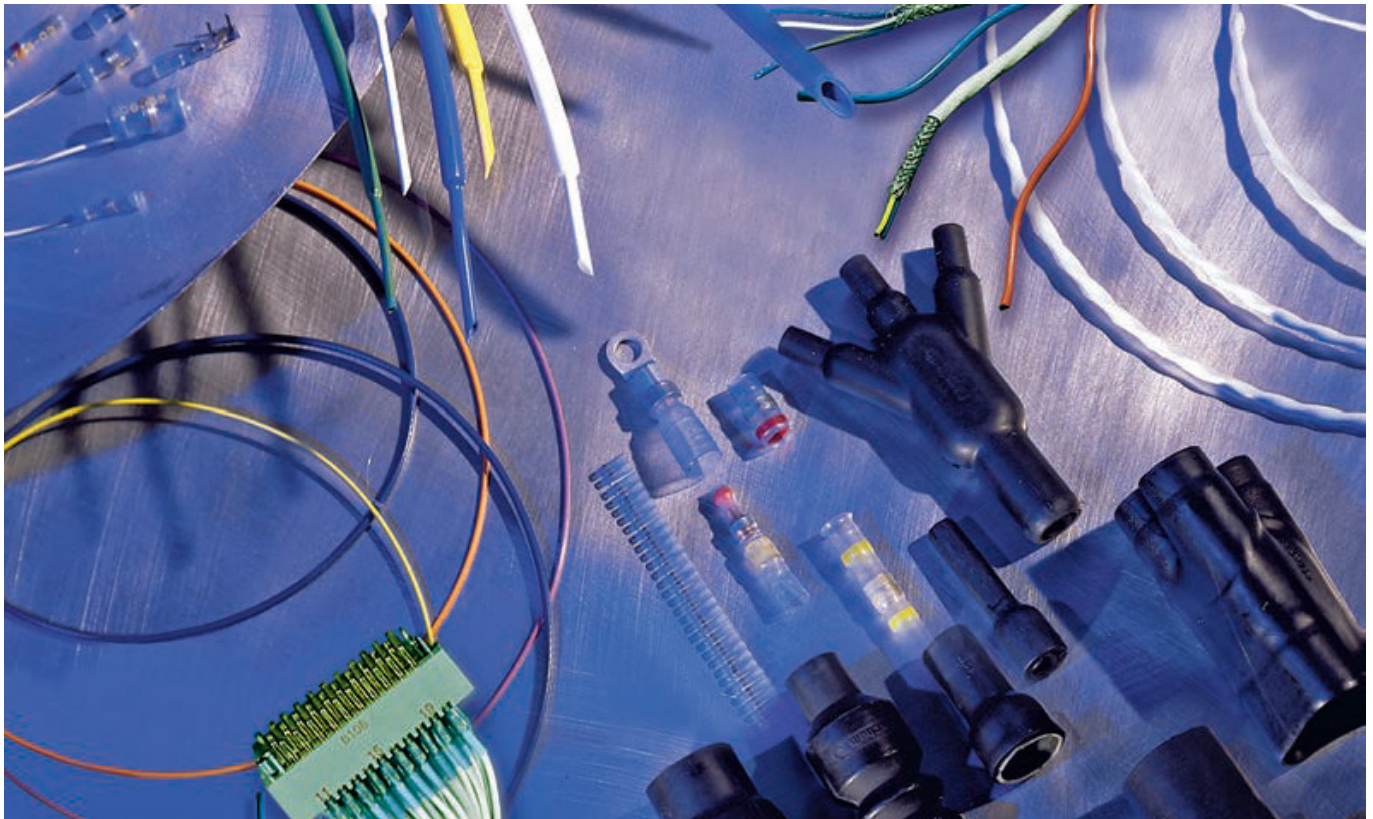


Protection Products						
<b>Fluid Management Applications</b>	66	✓	✓			✓
AP-2000 tubing	67-68	✓	✓			✓
ATUM tubing	69-70	✓				
DWTC tubing	71-72	✓	✓			✓
HFT 5000 tubing	73-74	✓	✓			✓
RPT-120 tubing	75-76	✓	✓			✓
TECT tubing	77-78	✓	✓			✓
<b>Application Equipment</b>	80	✓	✓	✓	✓	✓
RBK X1 Processor	81-82	✓	✓			✓
RBK X1C Processor	82-83	✓	✓			✓
XB-17 Belt Heater	83-84	✓	✓			✓
XB-19 Belt Heater	85-86	✓	✓			✓
XS-D1 Shuttle Machine	87	✓	✓			✓
Model 105 Tunnel Oven	88-89	✓	✓			✓
AD-3050 Seal Test Equipment	89-90	✓	✓			✓

## Engineering Notes



# INTRODUCTION



**Designed to be durable and engineered to be cost effective. The wide range of our tubing products is the way to provide effective electrical insulation, mechanical and environmental protection.**

TE Connectivity (TE) is one of the world's leading companies in developing, supplying and manufacturing high quality, technologically advanced, heatshrink protection products. Our products provide a perfect solution for your toughest engineering problems.

TE's Raychem tubings are made from uniquely formulated materials that have been enhanced by radiation cross-linking, a technology that TE Automotive, under the brand of Raychem, famously pioneered.

These easy-to-use products provide cost effective, proven solutions in a wide range of automotive applications from sealing and protecting electrical splices to providing mechanical protection for fluid management systems in harsh environments.

Our single wall tubings have a wide range of characteristics. Choose them wherever you need reliable insulation, strain relief, protection from mechanical abrasion and chemical abuse or an ideal way to identify or code components, or simply use them to enhance aesthetics.

Our adhesive-lined range shows its strength where sealing and encapsulation are critical requirements, as well as demonstrating many of the features of the single wall products. The inner adhesive can deliver a true seal against moisture and fluid ingress.

## Product Facts

- Simple and fast installation supported by a wide range of TE Automotive application equipment.
- Available in a wide range of materials, such as polyolefins, fluoropolymers and elastomers.
- Choose from tubings that are highly flexible or semi-rigid, designed for operation in high or low temperature environments.
- Halogen-free and flame retardant to meet a range of industry standards.
- Available in many sizes, constructions, lengths and colours.
- Available with shrink ratios of 2:1 up to 7:1.

## Core Technologies

### Core Technologies of TE Connectivity under the Raychem brand

Since its founding in the 1950s, and at that time known as “Raychem” material science expertise has pioneered many of the breakthrough technologies used to create today’s most advanced environmental sealing and protection systems.

TE’s Raychem heat-shrink products are in service throughout the world in automotive, telecommunications, power distribution, aerospace, defence, industrial and commercial applications. Renowned for their unrivalled performance and reliability in the most demanding of environments, they include a comprehensive range of automotive sealing and protection products.

Produced using Raychem state-of-the-art manufacturing facilities and processes, these products offer very cost-effective and robust solution to all your interconnection needs.

### Automotive Sealing and Protection Products

Raychem heat-shrinkable products from TE Connectivity have been developed to provide robust and reliable protection of automotive electronic components and electrical systems

Based on a broad range of cross-linked, shape-memory, polymeric materials, these products provide long-term protection against moisture ingress, corrosion, mechanical damage and extremes of temperature.

TE Connectivity’s experience of Raychem product design ensures a repeatable, reliable, shrink to fit installation, compatible with present day manufacturing processes. Adhesive precoatings on heat-shrinkable sleeveings and moulded shapes produce a positive watertight seal for wire-to-wire and wire-connector splices and terminations for both automotive and truck applications.

TE Connectivity’s Raychem brand of tubing was developed when our scientists pioneered the application of radiation cross-linking and the development of heat-shrinkable polymer products. Today, Raychem products from TE Connectivity are recognized worldwide for its expertise in these areas.

The Raychem brand of TE Connectivity tubings based on polyolefins, fluoropolymers and elastomers enhanced by radiation cross-linking and heat-shrinkability. When heated, the tubing shrinks to conform to almost any shape. Single wall tubings are available. Dual-wall tubings have an inner wall - either adhesive or an encapsulant - that melts and flows during installation heating to protect against environmental damage.

Heat-shrinkable products for the automotive industry may be used for a wide variety of applications including connector sealing, wire sealing and mechanical protection.

### Polymer Formulation

TE Connectivity’s Raychem formulations are blends of polymers and additives that are carefully designed to meet the stringent customer demands and international specification requirements.

The selection of polymers, flame-retardants, anti-oxidants, UV-stabilisers and other additives is of great importance for products to meet requirements on properties such as tensile strength, elongation at break, flame retardancy, continuous operating temperature, heat shock, heat ageing, flexibility, chemical and solvent resistance and shrink temperature.

A wide range of Raychem compounds by TE Connectivity are available to manufacture a complete range of heat-shrinkable products. Heat-shrinkable tubing manufactured with these compounds, will meet international standards & OEM approvals in many electronics markets.

TE Connectivity’s Raychem hot melt adhesives are specially formulated to be compatible with individual heat-shrink tubing compounds. These adhesives include a balance of polymers and additives that allow the adhesive to melt, flow, seal and adhere to a range of substrates at the shrink temperature of the overall tubing.

## Cross-Linking

Radiation cross-linking was pioneered by TE Connectivity under the Raychem brand to enhance polymer properties and to provide heat-shrinkability or shape memory. Polymeric tubing is extruded and the chemical structure then modified in a separate process to provide improved properties such as reduced deformation under load (creep), improved chemical and solvent resistance, increased abrasion resistance, improved impact properties and shape memory characteristics.

Due to the three dimensional cross-links which are formed during the cross-linking process, the tubing does not melt and obtains its perfect shape memory.

## Manufacturing Technology

Based on many years of experience Raychem tubing by

TE Connectivity is produced using optimised manufacturing processes by the following steps: compounding, extrusion, radiation cross-linking and expansion.

Firstly, compounding processes are used to mix selected polymers and additives. The resulting compounds are then extruded using optimised screw and die designs to produce homogeneous and consistent tubing. The tubing is then cross-linked using electron beam radiation.

In the expansion process the diameter of the tubing is increased by forces at high temperature.

Immediately after the tubing reaches its required expanded size, the tubing is cooled down and retains its expanded dimensions. This stage is called the “expanded” state.



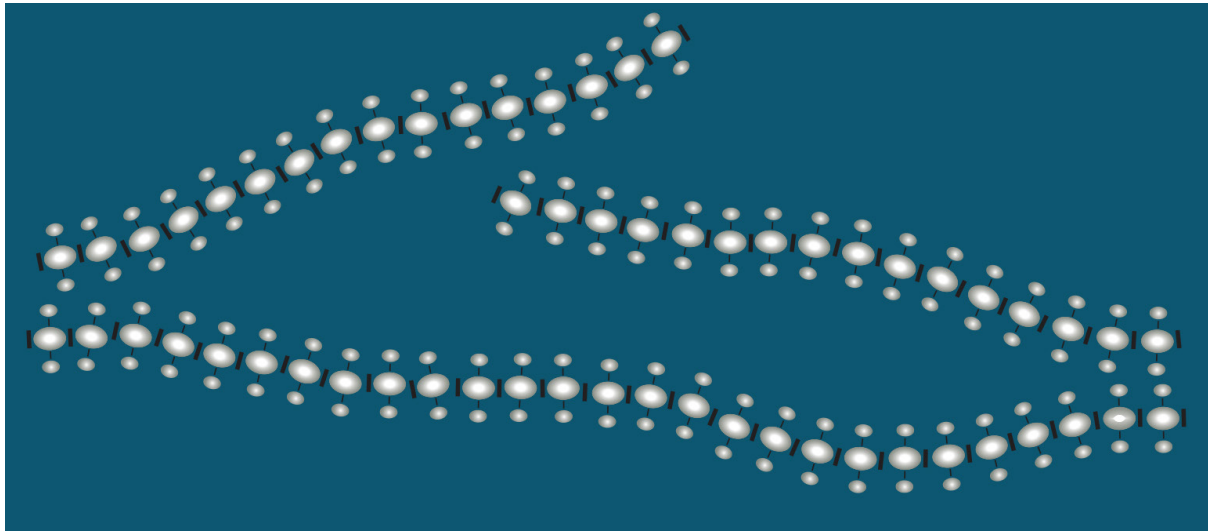
**Unmodified Polymer**



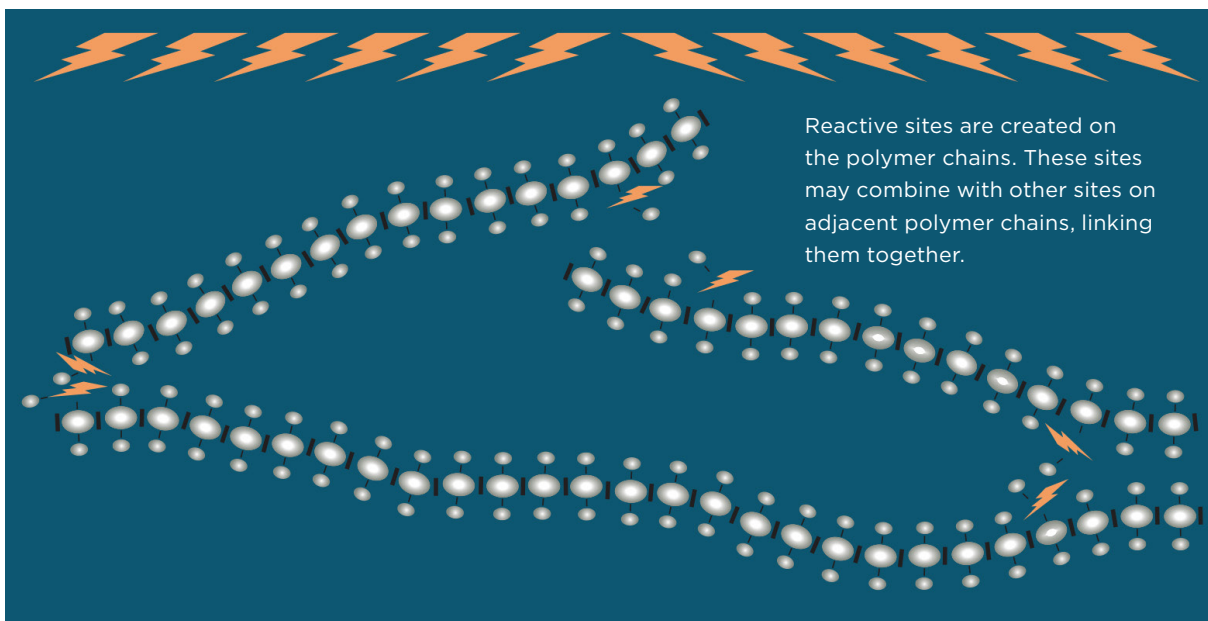
**Cross-Linked Polymer**

### What is Radiation Cross-Linking?

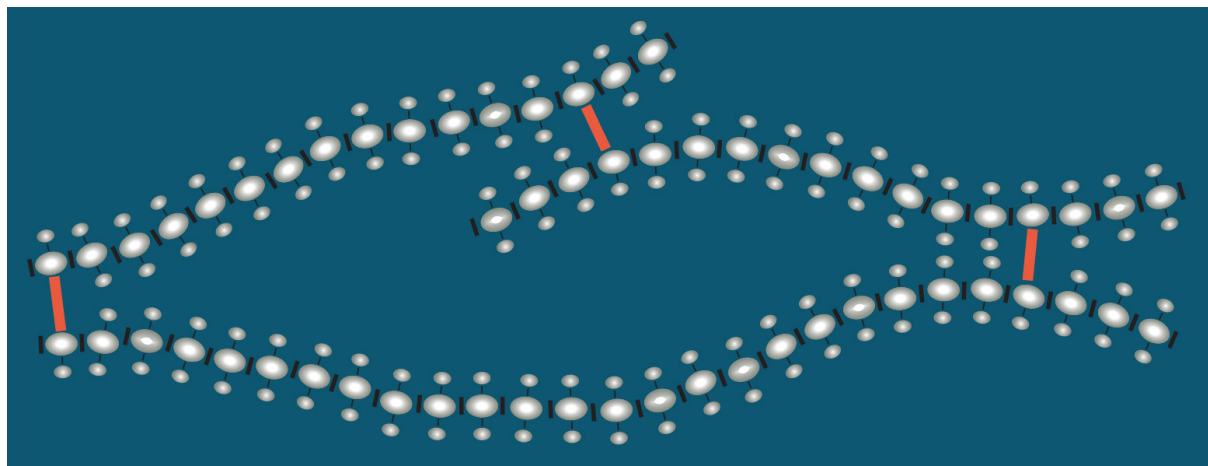
Uncross-linked polymer chains in insulation immediately after extrusion: Long chain molecules are free to slide over each other - polymer can be melted.



To cross-link the insulation, high energy electrons are fired at it in a special chamber:



The resulting structure is a network of linked molecules: This acts as a single giant molecule. Because the chains are no longer free to move over one another, the cross-linked molecules will not melt.



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Harness Design

- Sealing and Protection for Wire Bundles,
- Connectors, Terminals and Splices
- Splice Sealing
- Connector Sealing
- Wire Bundle Sealing
- Feed-Throughs

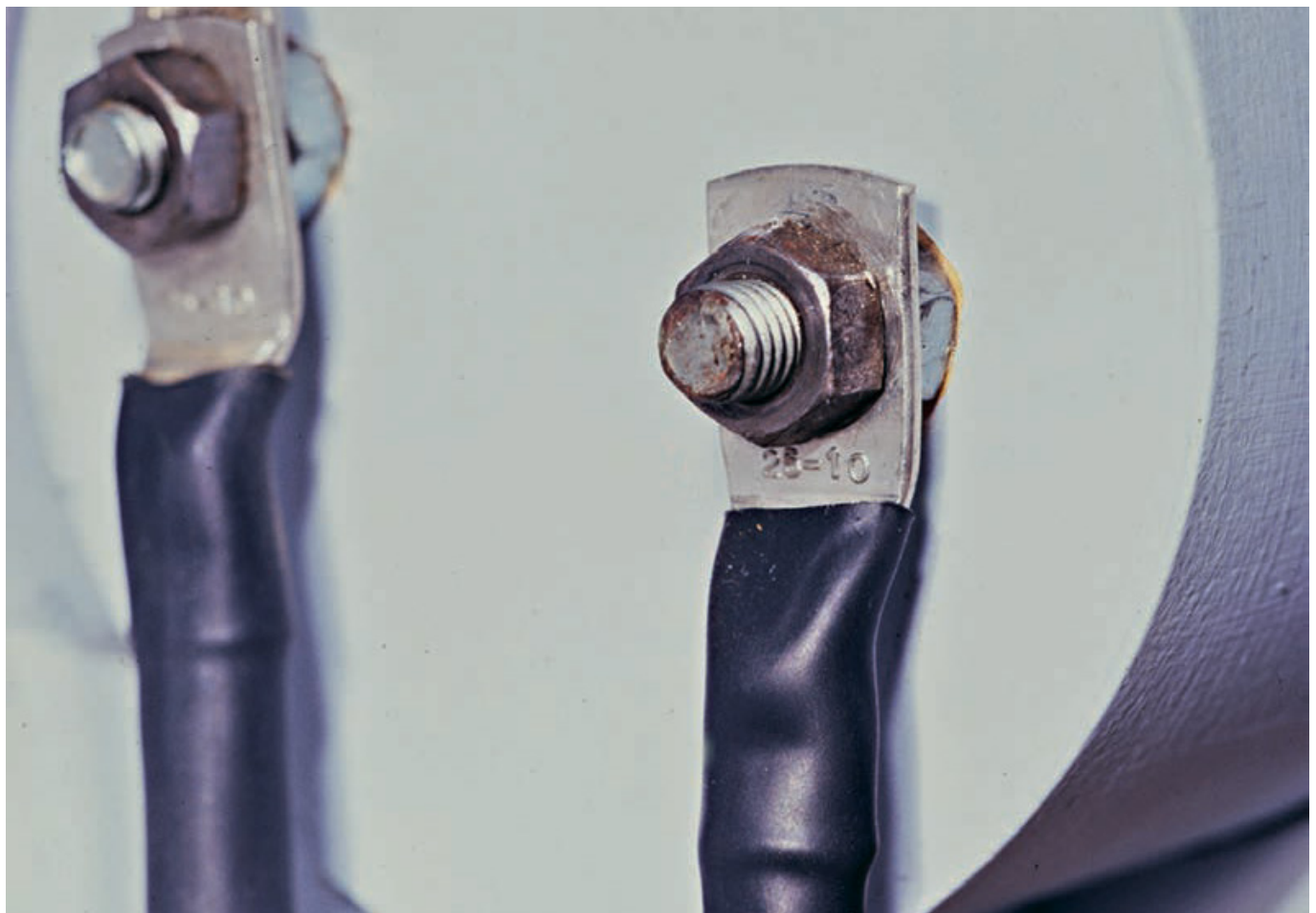
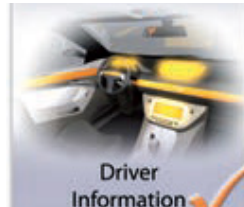


## Protection for Wire Bundles, Connectors, Terminals and Splices

### CRN Tubing

semi-rigid, flame retarded, polyolefin based heat-shrinkable tubing displays excellent resistance to a wide range of chemicals and solvents combined with excellent electrical properties.

The tubing is tough and semirigid which makes it ideally suitable for applications requiring strain relief or abrasion resistance. Widely used through-out industry for component protection and strain relief of sensitive areas such as solder and crimp joints.



### Low cost forming for power cables

#### Benefits

- Excellent abrasion resistance
- Good strain relief performance
- Outstanding physical and electrical performance
- Excellent chemical and solvent resistance
- Versatile process – can be carried out both on and off-board
- RoHS/ELV compliant

## A Semi-Rigid, Flame-Retarded Polyolefin Heat-Shrinkable Tubing

### Product Features - CRN Tubing

- Continuous operating temperature from -55°C up to +135°C (3000 hrs)
- Minimum shrink temperature: 110°C
- Minimum full recovery temperature: 135°C
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness	
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm	Ordering Description
3/64	1.2	0.6	0.51	CRN-3/64-colour code
1/16	1.6	0.8	0.51	CRN-1/1e-colour code
3/32	2.4	1.2	0.51	CRN-3/32-colour code
1/8	3.2	1.6	0.51	CRN-1/s-colour code
3/16	4.8	2.4	0.64	CRN-3/1e-colour code
1/4	6.4	3.2	0.64	CRN-1/4-colour code
3/8	9.5	4.8	0.76	CRN-3/c-colour code
1/2	12.7	6.4	0.76	CRN-1/2-colour code
3/4	19.1	9.5	0.89	CRN-3/4-colour code

Other lengths, colours and sizes are available subject to special order.

### Ordering Information

<b>Standard Colour</b>	Black (0)			
<b>Size Selection</b>	Always order the Special order size largest size that will shrink are available upon request. snugly over the component to be covered.			
<b>Ordering Description</b>	Specify product name, size and colour (for example CRN-1/8-0)			
<b>Specifications/ Approvals</b>	Series	UL	CSA	TE
	CRN-black	E35586 600V, 125°C	LR31929 600 V, 125°C	RT-360 Type 1 RK-6003

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Canadian Standards Association



Underwriters Laboratories



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### ES Caps

Heat-shrinkable one-piece caps with a thick adhesive liner which provide complete environmental and moisture sealing for stub splices.

The cap, with a pre-crimped end, is placed over the splice and heated to the arena and between the crimped or welded wires by the shrinking action of the tube.

The tough high density jackets also provide electrical insulation, excellent mechanical cut-through and abrasion protection as well as effective strain relief for the splice.



**ES Caps are specially designed to provide mechanical and environmental protection of stub splices in electrical harnesses. Clear caps allow see-through inspection; black caps are flame-retarded**

### Benefits

- 4:1 shrink ratio allows a few sizes to cover a wide range of splice and component diameters.
- Mechanically tough jacket provides strain relief and abrasion protection.
- Thick adhesive liner forms an effective barrier against fluids and moisture and performs well at an extended temperature range.
- ROHS/ELV compliant

## High-Shrink-Ratio, Adhesive-Lined Semirigid Polyolefin Caps

### Product Features - ES Caps

- Continuous operating temperatures from -40°C up to +125°C\* (3000 hrs) (\*with tape to help secure cap)
- Minimum shrink temperature: 100°C
- Minimum full recovery temperature: 135°C
- Flame retarded (black only)
- Black and clear cap options
- 2:1 shrink ratio

### Product Dimensions

	(including	Core)		Recovered Wall	Thickness**	
Standard Length* as Supplied mm	Maximum Expanded as Supplied mm	Maximum Recovered after Heating mm	Total Wall after Heating mm	Total Jacket Wall after Heating mm	Total Adhesive Wall after Heating mm	Ordering Description
30.35	5.72	1.27	1.20	0.64	0.56	ES-Cap-NO. 1
30,35	7.44	1.65	1,52	0.76	0.76	ES-Cap-NO. 2
40.50	10.85	2.41	1,91	0.89	1,37	ES-Cap-NO. 3

\* Other cap lengths available upon request.

\*\* The wall thickness of the tubing will be less than specified if recovery is restricted during

### Ordering Information

<b>Standard Colours</b>	Black (0)	Clear (X)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered.		
<b>Standard Packaging</b>	Cut pieces		
<b>Marking</b>	Caps will be marked with the number sizes (for example ES-1, ES-2, or ES-3).		
<b>Ordering Description</b>	Specify product name, size and colour (for example ES-CAP-NO. 1)		
<b>Specifications/ Approvals</b>	Series	UL	TE
	ES-CAP	E85381, 600 V, 125°C	RW-3006

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded (black only)



Fluid Resistant



Underwriters Laboratories



## Protection for Wire Bundles, Connectors, Terminals

### FRAG Tubing

Specially formulated for optimum high-temperature fluid resistance, and long term heat resistance. Resistant to diesel fuels, hydraulic fluids and lubricating oils. It is also well suited for the demands of motorsport cable harnesses.



### Flexible, chemical and abrasion resistant tubing

#### Benefits

- FRAG is a heat-shrinkable, thick-wall tubing designed for harsh environments. It has excellent resistance to fluids at elevated temperatures and good long term heat resistance.
- FRAG is flexible as well as abrasion resistant. These properties make it ideal for the protection of electrical cables or similar components.
- ROHS/ELV compliant

## Heat-Shrinkable, Flexible, Thick-Wall Tubing

### Product Features - FRAG Tubing

- Continuous operating temperature from -75°C up to +150°C
- Minimum shrink temperature: 150°C
- Minimum full recovery temperature: 175°C
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness		
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm		Ordering Description
3.2/1.6	3.2	1.6	0.80		FRAG-3.2/1.6-0
4.8/2.4	4.8	2.4	0.80		FRAG-4.8/2.4-0
6.0/3.5	6.0	3.5	0.90		FRAG-6.0/3.5-0
9.0/5.0	9.0	5.0	1.00		FRAG-9.0/5.0-0
12.0/7.0	12.0	7.0	1.25		FRAG-12.0/7.0-0
18.0/10.0	18.0	10.0	1.45		FRAG-18.0/10.0-0
25.0/13.0	25.0	13.0	1.80		FRAG-25.0/13.0-0
38.0/19.0	38.0	19.0	2.40		FRAG-38.0/19.0-0
51.0/25.0	51.0	25.0	2.80		FRAG-51.0/25.0-0
76.0/38.0	76.0	38.0	3.20		FRAG-76/38-0

The largest size that will recover snugly over the component to be covered should be ordered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. Other lengths and sizes are available subject to special order.

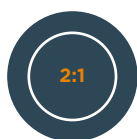
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example FRAG-3.2/1.6-0)	
<b>Specifications/ Approvals</b>	Series	TE
	FRAG	RK-6176

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



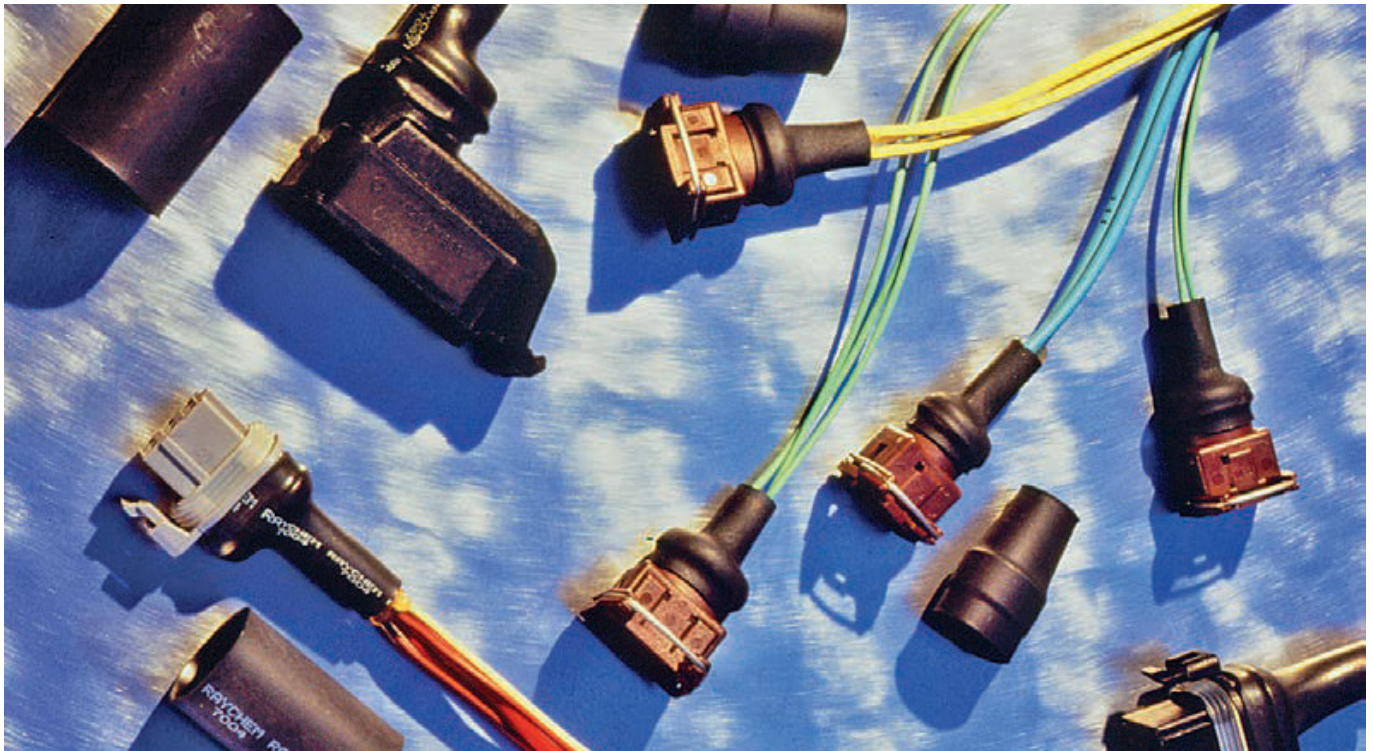
## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### HTAT Tubing

Semi-flexible, heat-shrinkable tubing with an integrally bonded meltable adhesive inner lining designed to provide moisture proof encapsulation for a range of substrates at elevated temperatures.

Manufactured from radiation cross-linked polyolefins, the inner wall melts when heated and is forced into interstices by the shrinking of the outer wall so that when cooled, the substrate is encapsulated by a tough, protective, moisture proof barrier.

An operating temperature range from -55 °C up to +125°C and a high shrink ratio as standard, means that the tubing offers superior environmental protection to a wide range of irregular shapes with varying dimensions. The jacket is flame retarded to reduce flame propagation.



### Flexible, chemical and abrasion resistant tubing

#### Benefits

- Low profile mechanical protection, strain relief and sealing
- Seals a wide range of different number/gauge sizes of wires
- Into the same connector housing
- Easy installation - using simple heat shrink process equipment
- Semi-flexible, dual-wall moisture proof, heat-shrink-able tubing
- Environmental sealing
- High strength bonding
- Ideal for connector sealing covering large diameter differences
- Shrink ratio 4:1
- Can be used in conjunction with adhesive profiles
- RoHS/ELV compliant

## Semi-Flexible, Dual-Wall Moisture Proof, Heat-Shrinkable Tubing

### Product Features - HTAT Tubing

- Continuous operating temperature from -55°C up to +125°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- Flame retarded
- 4:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness		
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm	W1 (nom) Melttable Wall Recovered after Heating mm	Ordering Description
4/1	4.0	1.0	1.00	0.40	HTAT-4/1-0
8/2	8.0	2.0	1.00	0.50	HTAT-8/2-0
12/3	12.0	3.0	1.40	0.60	HTAT-12/3-0
16/4	16.0	4.0	1.75	0.75	HTAT-16/4-0
24/6	24.0	6.0	2.25	0.80	HTAT-24/6-0
32/8	32.0	8.0	2,50	1.00	HTAT-32/8-0
48/13	48.0	13.0	2,54	1.00	HTAT-48/13-0

The largest size that will recover snugly over the component to be covered should be ordered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. Other lengths, colours (colour codes by size) and sizes are available subject to special order.

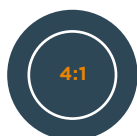
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example HTAT-12/3-colour)	
<b>Specifications/ Approvals</b>	Series	TE
	HTAT Tubing	RW-2052

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



## Protection for Wire Bundles, Connectors, Terminals and Splices

### LSTT Tubing

Highly flexible, low shrink temperature heat-shrinkable tubing: Easy to handle and install, its low shrink temperature offers exceptionally fast recovery for maximum efficiency in high volume commercial applications and makes it suitable for use on or near delicate temperature sensitive materials e. g. PVC (80 °C) jacketed wire and cable.

The material contains no added halogens. Although not flame retarded, LSTT meets the automotive flame propagation standard MVSS 302. LSTT gives good physical and electrical performance. Typical applications are electrical termination insulation, colour coding, covering of heat sensitive devices, cosmetic coverings and mechanical protection.



### Low shrink temperature polyolefin heat-shrinkable tubing

#### Benefits

- Rapid recovery at low temperatures
- Can be used with temperature sensitive materials
- Excellent physical and electrical performance
- Flexible
- RoHS/ELV compliant

## Semi-Flexible, Dual-Wall Moisture Proof, Heat-Shrinkable Tubing

### Product Features - LSTT Tubing

- Continuous operating temperature from 40°C up to +125°C
- Minimum shrink temperature: 65°C
- Minimum full recovery temperature: 110°C
- 2:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness	
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm	Ordering Description
1.6	1.6	0.8	0.50	LSTT-1.6-colour code
2.4	2.4	1.2	0.55	LSTT-2.4-colour code
3.2	3.2	1.6	0.55	LSTT-3.2-colour code
4.8	4.8	2.4	0.55	LSTT-4.8-colour code
6.4	6.4	3.2	0.65	LSTT-6.4-colour code
9.5	9.5	4.8	0.65	LSTT-9.5-colour code
12.7	12.7	6.4	0.65	LSTT-12.7-colour code
19.0	19.0	9.5	0.80	LSTT-19-colour code
25.4	25.4	12.7	0.95	LSTT-25.4-colour code
32.0	32.0	16.0	1.05	LSTT-32-colour code
38.0	38.0	19.0	1.05	LSTT-38-colour code
52.0	52.0	26.0	1.14	LSTT-52-available in black only

### Ordering Information

Standard Colours	Black (0)	Red (2)	Yellow (4)	Blue (6)
Size Selection	Always order the largest Special order sizes are size that available will shrink upon request. snugly over the component to be covered.			
Ordering Description	Specify product name, size and colour (for example LSTT-32-colour)			
Specifications/ Approvals	Series		TE	
	LSTT Tubing		RW-2051	

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### QSZH-125 Tubing

Zero halogen, dual wall heat-shrinkable tubing designed to provide environmental sealing, mechanical and electrical protection of in-line splices in an automotive environment

The tubing is centred over the splice area and on heating the adhesive melts and is squeezed around where the wires are crimped or welded and between wire cores by the shrinking action of the sleeve. The installed QSZH-125 tube provides low profile mechanical protection against flexing, abrasion and cut-through as well as electrical insulation.

There are five QSZH-125 sizes to cover a wide range of typical automotive splice configurations having a maximum of seven wires on either side. The sleeves are marked 1, 2, 3, 3A and 4 to denote the size.



### Sealing and protection of inline wire splices and grounding ring terminals

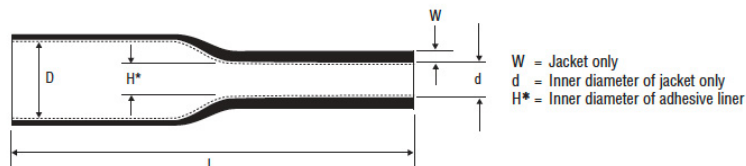
#### Benefits

- Excellent Environmental
- Sealing (2 x 10<sup>8</sup> Ohms minimum after 24 hrs immersion in 5% NaCl)
- Quick installation
- Zero Halogen
- Inspectable after installation
- Mechanical Protection against flexing, abrasion and cut-through
- Applications versatility - one tubing size covers a broad range of ground wire sizes and wire combinations
- Small cross-sectional profile
- Temperature rated to 125°C
- RoHS/ELV compliant

## Dual-Wall, Moisture Proof, Heat-Shrinkable Tubing to Protect Electrical Splices

### Product Features - QSZH-125 Tubing

- Continuous operating temperatures from -40°C up to+ 125°C (3000 hrs)
- 4:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness		(mm)		
Size	D (min) Expanded as Supplied	H (max) <sup>2</sup> Recovered after Heating	d (max) Recovered Jacket after Heating	W (min) Recovered Jacket after Heating	W + Adhesive Liner (min)	Length** L (nom)	Ordering Description
NR1	5.75	1,25	2.65	0.6	1.15	50	QSZH-125-NR1
NR2	7.50	1.65	3,45	0.7	1.4	50	QSZH-125-NR2
NR3	11.00	2.40	4.65	0.8	1.8	65	QSZH-125-NR3
NR3A	14.00	3.00	5.90	0.9	2.15	65	QSZH-125-NR3A
NR4	18.30	4.35	7.40	0.9	2.2	75	QSZH-125-NR4

Refer to the Installation Guidelines document before selecting size (PIP-101). The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage.

\* Nominal values for reference only.

\*\* Other lengths are available subject to special order.

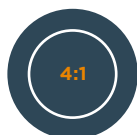
### Ordering Information

Standard Colour	Jacket	Adhesive
	Clear	Black
Installation	The product may be installed recommended application Consult your local TE Automotive using a TE Automotive RBK-ILS Processor or other equipment. office for more information.	
Size Selection	Refer to PIP-101	
Ordering Description	Specify product name, size and colour (for example QSZH-125-NR)	
Specifications/ Approvals	Series	TE
	QSZH-125 Tubing	RK-6771

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant

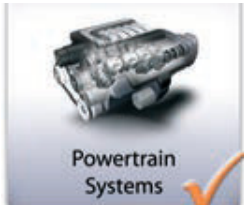


## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Ray Block 85 Sealing Kit

Designed to provide consistent sealing for cable bundles and the back of connectors. The wires in the bundle are placed within the channels of a specially formulated hot-melt adhesive profile, and then covered by dual wall, heat-shrinkable tubing with a flame-retardant radiation-crosslinked outer wall and hot-melt-adhesive inner wall.

When the tubing is heated the hot-melt adhesive melts and the tubing shrinks, forcing the molten adhesive to fill all the voids within the wire bundle and tubing. The result is a solid plug of adhesive molded around each wire in the bundle, creating a moisture-resistant seal.



### Easy-to-install grommet and wire bundle sealing for up to 20 wires

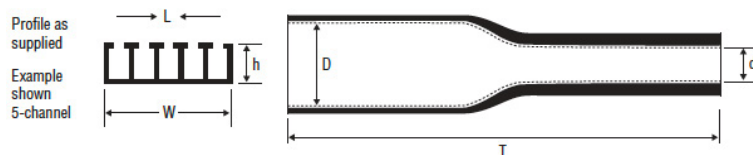
#### Benefits

- Excellent resistance to all common solvents and acids
- Outstanding vibration resistance
- Excellent electrical insulation
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - Ray Block 85 Sealing Kit

- Continuous operating temperature from 40°C up to +85°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- Flame retarded (ATUM tubing only)
- 4:1 shrink ratio



### Product Dimensions

Profile				Tubing			
Number of Channels	h Outside height (nom) mm	L Length (nom) mm	W Width (nom) mm	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	T (nom) mm	Ordering Description
2	8.5	2.75	8.50	12.00	3.00	34.00	RBK-85 Kit 0102-AX
3	8.5	2.75	12.25	16.00	4.00	33.00	RBK-85 Kit 0103-AX
4	8.5	2.75	16.00	16.00	4.00	44.00	RBK-85 Kit 0104-AX
5	8.5	2.75	21.00	24.00	6.00	34.00	RBK-85 Kit 0105-AX
5	8.5	2.75	21.00	24.00	6.00	23.00	RBK-85 Kit 0305-AX
7	8.5	2.75	27.25	24.00	6.00	65.00	RBK-85 Kit 0107-AO
7	8.5	2.75	27.25	24.00	6.00	23.00	RBK-85 Kit 0607-AX
8	8.5	2.75	31.00	24.00	6.00	47.00	RBK-85 Kit 0208-AX
10	8.5	2.75	38.50	32.00	8.00	55.00	RBK-85 Kit 0510-AO

The selection table is intended for guidance only and individual bundles may well differ in requirement. Special designs may be possible on request to cater for large wires or larger cable bundles. Please contact TE Automotive for further information. TE Automotive offers a variety of heating tools for the installation of RayBlock 85. The range includes hot air blowers, infra-red heaters and special automatic heating devices.

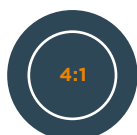
### Ordering Information

<b>Standard Colour</b>	Black (0)	Clear (X)
<b>Size Selection</b>	Maximum two wires per channel, For wires with an outside Standard Packaging: 1000 pcs for wires with maximum outside diameter 2,8 mm. diameter greater than 2,8 mm, please consult TE Automotive. of profile plus 1000 pcs of tubing per box.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RBK-85-Kit-0102-AX)	
<b>Specifications/ Approvals</b>	Series	TE
	QSZH-125 Tubing	RK-6771

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant

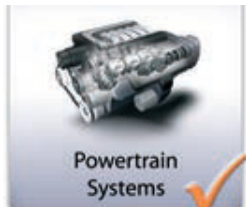


## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Ray Block 105 Sealing Kit

Designed to provide consistent sealing for cable bundles and the back of connectors. The wires in the bundle are placed within the channels of a specially formulated hot-melt adhesive profile, and then covered by dual wall, heat-shrinkable tubing with a flame-retardant radiation-crosslinked outer wall and hot-melt-adhesive inner wall.

When the tubing is heated the hot-melt adhesive melts and the tubing shrinks, forcing the molten adhesive to fill all the voids within the wire bundle and tubing. The result is a solid plug of adhesive molded around each wire in the bundle, creating a moisture-resistant seal.



### Easy-to-install grommet and wire bundle sealing for up to 20 wires

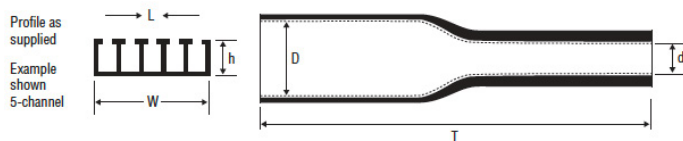
#### Benefits

- Excellent resistance to all common solvents and acids
- Outstanding vibration resistance
- Excellent electrical insulation
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - Ray Block 105 Sealing Kit

- Continuous operating temperature from 40°C up to + 105°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- Flame retarded
- 4:1 shrink ratio



### Product Dimensions

Profile				Tubing				
Number of Channels	h Outside height (nom) mm	L Length (nom) mm	W Width (nom) mm	O (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	T (nom) mm	Ordering Description	
2	8.5	2.75	8.50	12.00	3.00	55.00	RBK 106 Kit 0702-AO	
2	85	2.75	8.50	19.00	4.00	50.00	REK 106 1102-AC	
3	8.5	2.75	12.25	16.00	4.00	40.00	REK 106 Kit 0103-AC	
3	8.5	2.75	12.25	16.00	4.00	50.00	REK 106 Kit 1003-AO	
4	8.5	2.75	16.00	16.00	4.00	33.00	RBK 106 0204-AO	
5	8.5	2.75	19.75	24.00	6.00	45.00	RBK 100 0105-AC	
7	8.5	2.75	27.25	24.00	6.00	65.00	REK 100 Kit 0107-AO	
R	8.5	2.75	31.00	24.00	6.00	47.00	RBK 106 010508-AC	
10	8.5	2.75	38.50	32.00	8.00	65.00	RBK 105 Kit 0110-AO	
10/7	8.5	2.75	38.50/28.60	32.00	8.00	60.00	RBK 106 Kit 0510-AO	

The selection table is intended for guidance only and individual bundles may well differ in requirement. Special designs may be possible on request to cater for large wires or larger cable bundles. Please contact TE Automotive for further information. TE Automotive offers a variety of heating tools for the installation of RayBlock 105 Sealing Kit. The range includes hot-air blowers, infra-red heaters and special automatic heating devices.

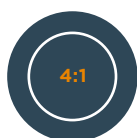
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Maximum two wires per channel for wires with maximum outside diameter 2.8 mm. For wires with an outside diameter greater than 28 mm, please consult TE Automotive. Standard Packaging 1000 pcs of profile plus 1000 pcs of tubing per box	
<b>Ordering Description</b>	Specify product name size and colour (for example RBK 105-Kit-0103 AD)	
<b>Specifications/ Approvals</b>	Series	TE
	RayBook 105 Sealing Kit	RW 2102

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### RBK-ILS-125 Tubing

Dual-wall, heat-shrinkable tubing designed to provide moisture proof encapsulation of an electrical splice in an automotive environment. Moisture may enter a splice area directly or indirectly via a capillary action between individual wires, thus causing corrosion.

The tubing is centered over the splice area and on heating the adhesive melts and is squeezed around where the wires are crimped or welded and between the conductors, by the shrinking action of the sleeve. The installed product provides low profile mechanical protection against flexing, abrasion and cut-through as well as electrical insulation. The jacket is flame-retarded.

There are five sizes to cover the range of splice profiles found, and up to seven wires may enter either end of the product. The sleeves are marked with size, eg. RBK-1 to aid selection. The compact size of RBK-ILS-125 suits process line harness assembly.

### RBK-ILS-125-NR500 Tubing

Highly over-expanded product which allows the product to be positioned and installed after the ring terminal has been crimped or ultrasonically welded to the ground wires.



### Sealing and protection of inline wire splices and grounding ring terminals

#### Benefits

- Excellent environmental seal
- Mechanical protection
- against flexing, abrasion and cut-through
- Small cross-sectional profile
- Simultaneous sealing, protection and insulation - In one process pass
- Rapid, simple installation - over-expanded sizes allow placement of tubing over ring terminal after ground wires have been terminated
- Applications versatility - one tubing size covers a broad range of ground wire sizes and wire combinations
- Superior strain relief and mechanical protection - provided by tough outer jacket, plus tubing and adhesive combination
- Established application and installation procedures - meeting most harness production processes
- RoHS/ELV compliant

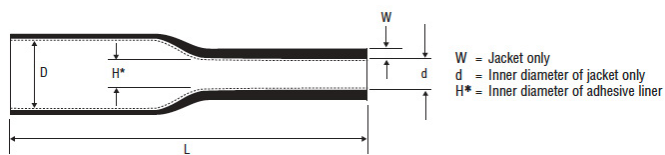
## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RBK-ILS-125 Tubing

- Continuous operating temperature from -40°C up to + 125°C (3000 hrs)
- Flame retarded
- 4:1 shrink ratio

### RBK-ILS-125-NR500 Tubing

- 5:1 expansion ratio, allowing installation over terminal



### Product Dimensions

	Inside Diameter			Wall Thickness (mm)			
Size	D (min) Expanded as Supplied	H (max) Recovered after Heating	d (max) Recovered Jacket after Heating	W (min) Recovered Jacket after Heating	W + Adhesive Liner (min)	Length** L (nom)	Ordering Description
NR1	5.75	1,25	2.65	0.6	1.15	50	RBK-ILS-125-NR1
NR2	7.50	1.65	3,45	0.7	1.4	50	RBK-ILS-125-NR2
NR3	11.00	2.40	4,65	0.8	1.8	65	RBK-ILS-125-NR3
NR3A	14.00	3.00	5.90	0.9	2.15	65	RBK-ILS-125-NR3A
NR4	18.30	4.35	7.40	0.9	2.2	75	RBK-ILS-125-NR4

The wal the hes oin tanges does than speleti sey iS side during shrinkage.

\* Nominal values for reference only.

\*\* Other lengths are available subject to special order.

### Ordering Information

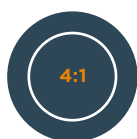
Standard Colour	Black (0)	
Installation	The product may be installed using a TE Automotive RBK-ILS Processor or other recommended application equipment. Consult your local TE Automotive office for more information.	
Size Selection	Refer to PIP-019	
Ordering Description	Specify product name, size and colour (for example RBK-ILS-125-NR)	
Specifications/ Approvals	Series	TE
	RBK-ILS-125 RK-6638	RK-6771

**Note:** This is a non-preferred product. Please refer to QSZH datasheet on page 17 Contact TE Automotive Sales representative.

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant

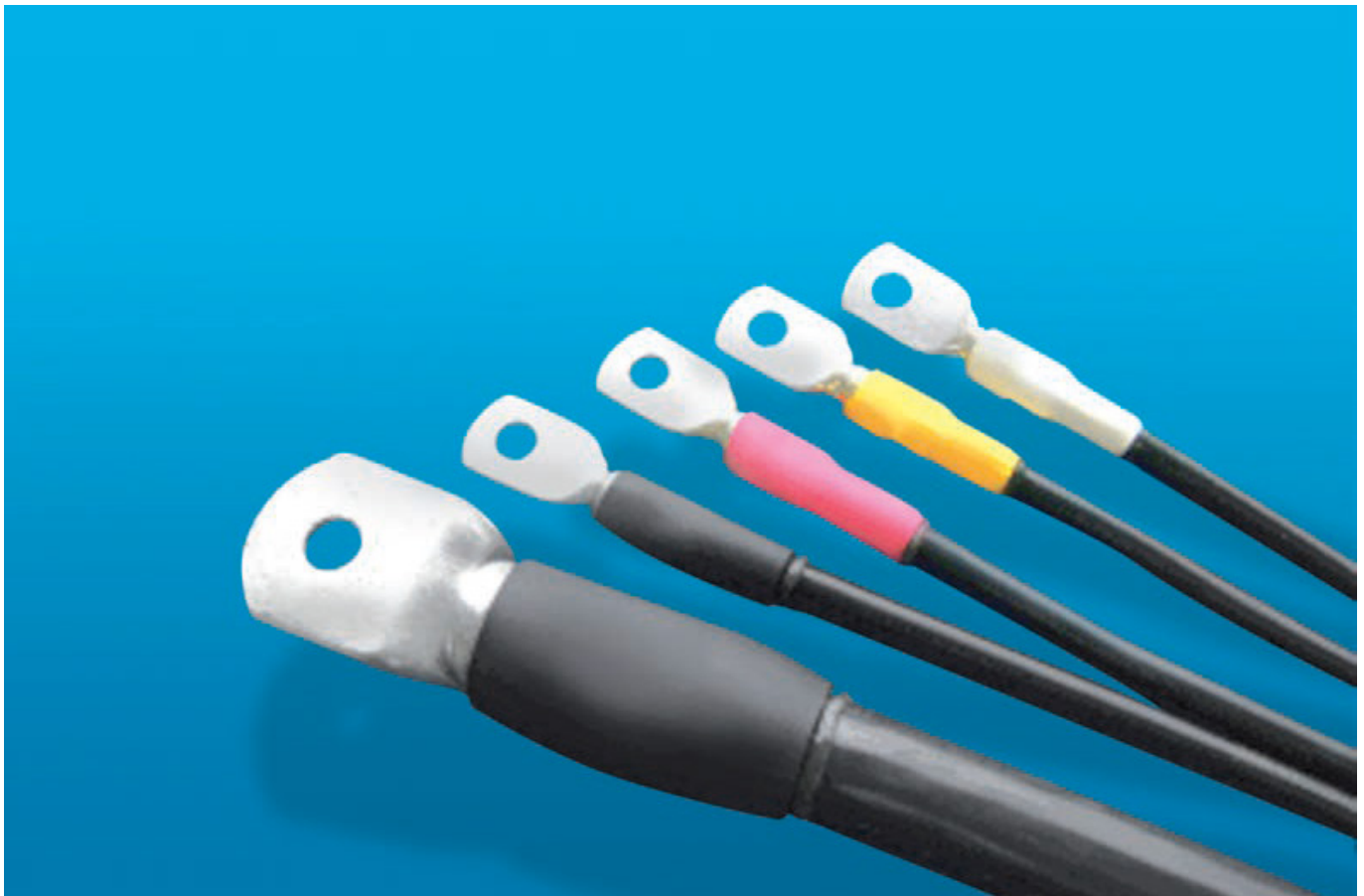


## Protection for Wire Bundles, Connectors, Terminals

### RBK-RTP-125 Tubing

RBK-RTP-125 is a dual wall, heat-shrinkable tubing designed to provide environmental protection for ring terminal assemblies in an automotive environment.

The installed product provides low profile mechanical protection against flexing, abrasion and cut-through as well as electrical insulation.



### Dual wall, moisture resistant, heat shrinkable tubing for ring terminal applications

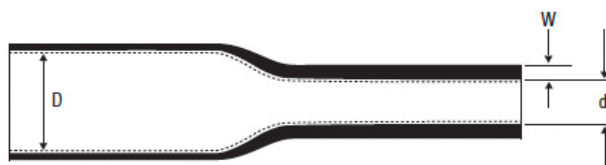
#### Benefits

- Environmental Protection 1
  - Mechanical Protection against flexing, abrasion and cut-through
  - Small cross-sectional profile
  - Temperature rated to 125°C 2
  - RoHS/ELV compliant
- 
- Due to the variation in size and design of ring terminals no claim is made with respect to sealing performance.
  - Depending on terminal shape. If surfaces are smooth or tapered there may be a tendency for the tube to move at elevated temperatures. Users should evaluate the suitability of this product at their required operating temperatures

## Protection for Wire Bundles, Connectors, Terminals

### Product Features - RBK-RTP-125 Tubing

- Continuous operating temperature from 55°C up to + 125°C
- Minimum shrink temperature: 155°C
- Minimum full recovery temperature: 175°C
- Flame retarded



### Product Dimensions

Inside Diameter		Wall Thickness		
D (min) Expanded as Supplied mm	d (max) Recovered Jacket after Heating mm	W (min) Recovered Jacket after Heating mm	W Adhesive Liner (min)* mm	Ordering Description
11.00	3,45	0.70	1.40	RBK-RTP-125-NR500-CoI
11.00	4.65	0,80	1.80	RBK-RTP-125-NR3-CoI
20.20	11.40	1,25	2.31	RBK-RTP-125-NR5-CoI

Supplied tube lengths will be per customer order. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage.

\* Nominal values for reference only.

### Ordering Information

<b>Standard Colour</b>	Check with Product Management on colour availability	
<b>Size Selection</b>	Always order the largest size that Special order sizes are available will shrink snugly over the component to be covered. upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RBK-RTP-125-NR)	
<b>Specifications/ Approvals</b>	Series	TE
	RBK-RTP-125	RW-6764

Operating Temperature Range



Shrink Temperature



Flame Retarded



Fluid Resistant



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

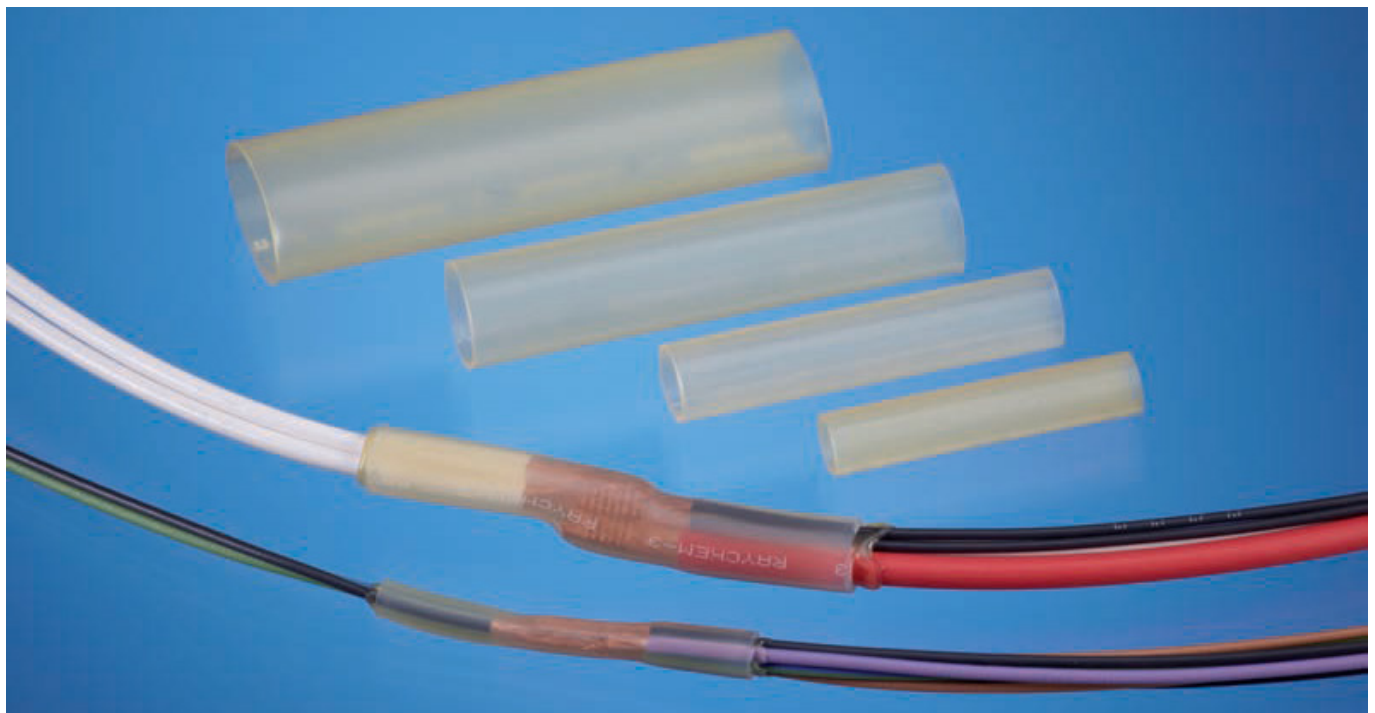
### RBK - VWS-125 Tubing

Dual-wall, heat-shrinkable tubing designed to provide environmental sealing of an electrical splice in an automotive environment.

Moisture may enter a splice directly or indirectly via capillary action between individual wires, thus causing corrosion. This effect is accelerated by variations in temperature.

The tubing is centred over the splice area and during heating the adhesive melts and is squeezed' around where the wires are crimped or welded and between the conductors by the shrinking action of the sleeve.

The installed product provides low profile mechanical protection against flexing, abrasion and cut-through as well as electrical insulation. There are four sizes to cover the range of splice profiles.



### Clear product for sealing and protection of inline wire splices

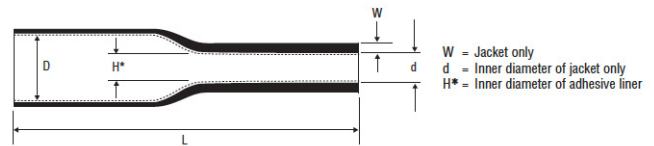
#### Benefits

- Excellent environmental seal
- Mechanical protection
- against flexing, abrasion and cut-through
- Small cross-sectional profile
- Single component solution - to seal, protect and insulate most in-line and stub splices
- Complete environmental and moisture sealing - for up to seven wires per side
- Tubing and adhesive combination - for superior strain relief
- Clear tubing allowing inspection of wire splices
- Application equipment and Installation procedures - to meet most harness production processes
- Meets most applicable worldwide automotive OEM splice sealing specifications
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RBK- VWS-125 Tubing

- Continuous operating temperature from -40°C up to +125°C (3000 hrs)
- 4:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded as Supplied	H (max) *1 Recovered after Heating	d (max) Recovered Jacket after Heating	Wall Thickness W (min) Recovered Jacket after Heating	(mm) W + Adhesive Liner (min)	Length*3 L (nom)	Ordering Description
NR1	5.70	1,27	2,52	0.80	1.42	50	RBK-VWS-125-NR1-X
NR2	8.00	1.65	3.01	1.06	1.78	50	RBK-VWS-125-NR2-X
NR3	10.80	2.40	4.55	1.16	2.14	65	RBK-VWS-125-NR3-X
NR4	17.78	4.45	7.40*2	1.04	2.41	75	RBK-VWS-125-NR4-X

Refer to the Installation Guidelines document before selecting size (PIP-004). The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage.

\*1 Nominal values for reference only.

\*2 Estimate.

\*3 Other lengths are available subject to special order.

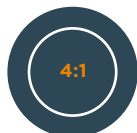
### Ordering Information

<b>Standard Colour</b>	Check with Product Management on colour availability	
<b>Size Selection</b>	Always order the largest size that Special order sizes are available will shrink snugly over the component to be covered. upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RBK-RTP-125-NR)	
<b>Specifications/ Approvals</b>	Series	TE
	RBK-RTP-125	RW-6764

Operating  
Temperature  
Range



Shrinking  
Ratio



Shrink  
Temperature



Fluid  
Resistant



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

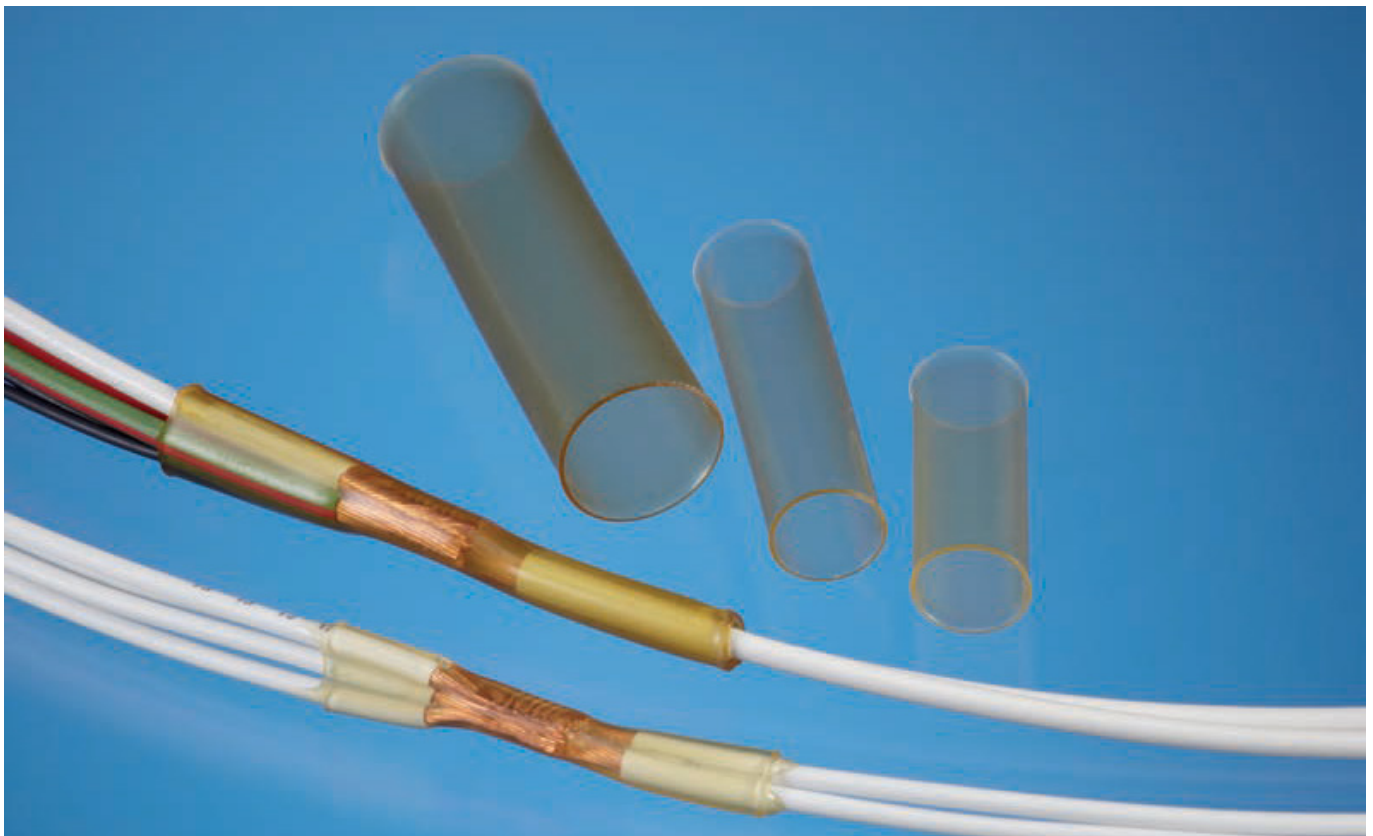
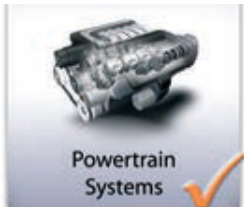
### RPPM Tubing

RPPM Tubing is a flexible, heat-shrinkable, dual-wall tubing with an integrally bonded meltable adhesive liner.

Available in clear and black, the tough outer jacket with both vpes offers excellent mechanical strength.

RPPM is used for moisture proof encapsulation of a wide variety of components. In particular, it adheres well to PVC. The high shrink ratio allows RPPM to be used with a range of dimensions.

Clear RPPM offers excellent clarity for protection of substrates that may need to be inspected during service. Black RPPM has a high gloss finish suitable for cosmetic applications.



### Effective strain relief, protection and insulation for dry area splices

#### Benefits

- Single component solution - to insulate and protect almost all dry area splices
- Repeatable process - not subject to operator variability
- Low cost, high throughput process equipment available - cost competitive with PVC tape
- Rapid installation - up to 2000+ splices per hour
- Low profile protection - reducing the diameter of conduit required
- Reduced total installed cost - less handling than PVC over-taping more than off-sets higher material cost
- Tubing and adhesive combination - for superior strain relief
- High shrink ratios - allow one size to cover a wide range of splice combinations
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RPPM Tubing

- Continuous operating temperature from -40°C up to +85°C (3000 hrs)
- Minimum shrink temperature: 60°C
- Minimum full recovery temperature: 80°C
- 4:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Wall Thickness W (nom) Total Wall Recovered after Heating mm	Ordering Description
4/1	4.0	1.0	0.8	RPPM-4/1-colour code
8/2	8.0	2.0	0.9	RPPM-8/2-colour code
12/3	12.0	3.0	1.2	RPPM-12/3-colour code
16/4	16.0	4.0	1.5	RPPM-16/4-colour code
NR510	9.0	1.5	1.6	RPPM-NR510-X
NR801	6.4	1.0	0,8	RPPM-NR801-colour code

Order the largest size that will recover snugly over the component to be covered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. Other lengths and sizes are available subject to special order.

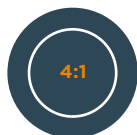
### Ordering Information

<b>Standard Colours</b>	Clear (X)	Black (O)
<b>Size Selection</b>	Always order the largest size Special order sizes are available that will shrink snugly over the component to be covered. upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RPPM-8/2-X)	
<b>Specifications/ Approvals</b>	Series	TE
	RPPM	RK-6214

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



## Protection for Wire Bundles, Connectors, Terminals and Splices

### RW-175 Tubing

An extremely tough, high temperature, thin-wall insulation tubing. This transparent, non-burning, semi-rigid tubing has superior resistance to most industrial fuels, solvents and chemicals.

Designed for applications requiring strain relief at temperatures up to 175°C, this product is unusually tough in its resistance to abrasion and cut through.

Typical applications include high temperature applications, protection, strain relief, chemical resistance, mechanical and abrasion protection.

The natural rigidity of this material makes it suitable for automated installation via pick and place station.



**High temperature tubing with excellent chemical and abrasion resistance. All round general protection and insulation.**

### Benefits

- Tough, semi-rigid very thin-wall insulation
- High flame-resistance meeting the requirements of UL and
- CSA VW-1 rating
- High temperature performance
- Protection from most
- Industrial solvents
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RW-175 Tubing

- Continuous operating temperature from -55°C up to +175°C
- Minimum shrink temperature: 155°C
- Minimum full recovery temperature: 175°C
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness	
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm	Ordering Description
3/64	1.2	0.6	0.25	RW-175-3/64-X
1/16	1.6	0.8	0.25	RW-175-1/16-X
3/32	2.4	1.2	0.27	RW-175-3/32-X
1/8	3.2	1.6	0.27	RW-175-1/8-X
3/16	4.8	2.4	0.27	RW-175-3/16-X
1/4	6.4	3.2	0.33	RW-175-1/4-X
3/8	9.5	4.8	0.33	RW-175-3/8-X
1/2	12.7	6.4	0.33	RW-175-1/2-X
3/4	19.0	9.5	0.43	RW-175-3/4-X
1	25.4	12.7	0.48	RW-175-1-X
1 1/2	38.1	19.1	0.51	RW-175-1 1/2-X
2	50.8	25.4	0.51	RW-175-2-X

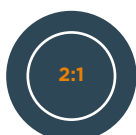
### Ordering Information

Colour	Standard Colour	Clear (X)		
	Non-Standard Colour	Black (0)		
Size Selection	Always order the largest Special order sizes are size that will shrink available upon request. snugly over the component to be covered.			
Ordering Description	Specify product name, size and colour (for example RW-175-1/4-colour)			
Specifications/ Approvals	Series	UL	CSA	TE
	RW-175	E35586VW-1 600 V, 150°C	LR31929VW-1 600 V, 150°C	RW-3029/1 RW-3029/2

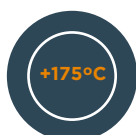
Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Canadian Standards Association



Underwriters Laboratories



## Protection for Wire Bundles, Connectors, Terminals and Splices

### RW-200/RW-200-E Tubing

Premium heat-shrinkable tubing fabricated from fluoro-elastomers - a crosslinked material designed for a wide range of applications.

It is available in two configurations. RW-200-E is the thickest wall version: RW-200 has the thinnest wall for lighter weight applications.

Offering fluid resistance, RW-200 tubing can be used in applications up to 200 °C [392 °F].



### Heat-shrinkable, chemical-resistant, high-temperature tubing

#### Benefits

- High resistance to impact and abrasion
- Resistance to a wide variety of fuels, lubricants, acids, and solvents at elevated temperatures
- Flexibility at low temperatures without cracking
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RW-200/RW-200-E Tubing

- Operating Temperature Range  
RW-200: -40°C to +200°C (-40°F to 392°F), RW-200-E: -55°C to +200°C (-67°F to 392°F)
- Minimum shrink temperature: 100°C (212°F)
- Minimum full recovery temperature: 175°C (347°F)
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded	d (max) Recovered after Heating	Wall Thickness* W (nom) after	Recovered Heating
	as Supplied	after Heating	RW-200-E	RW-200
1/8	3.2 (0.125)	1.6 (0.062)	0.76 (0.030)	0.76 (0.030)
3/16	4.8 (0.187)	2.4 (0.093)	0.84 (0.033)	0.89 (0.035)
1/4	6.4 (0.250)	3.2 (0.125)	0.89 (0.035)	0.89 (0.035)
3/8	9.5 (0.375)	4.8 (0.187)	1.02 (0.040)	0.89 (0.035)
1/2	12.7 (0.500)	6.4 (0.250)	1.22 (0.048)	0.89 (0.035)
5/8	15.9 (0.625)	7.9 (0.312)	-	1.07 (0.042)
3/4	19.1 (0.750)	9.5 (0.375)	1.45 (0.057)	1.07 (0.042)
7/8	22.2 (0.875)	11.1 (0.437)	-	1.25 (0.049)
1	25.4 (1.000)	12.7 (0.500)	1.78 (0.070)	1.25 (0.049)
1 1/4	31.8 (1.250)	15.9 (0.625)	-	1.40 (0.055)
1 1/2	38.1 (1.500)	19.1 (0.750)	2.41 (0.095)	1.40 (0.055)
2	50.8 (2.000)	25.4 (1.000)	2.79 (0.110)	1.65 (0.065)

\* Wall thickness will be less if tubing recovery is restricted during shrinkage.

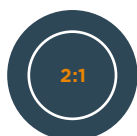
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size Special order sizes are available that will shrink snugly over the component to be covered. upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RW-200-E-1/4-0, RW-200-1/2-0)	
<b>Specifications/ Approvals</b>	Series	TE
	RW-200 RW-200-E	RW-3037 RW-3037

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



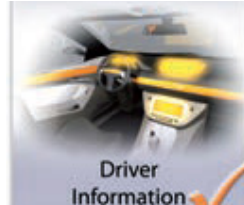
Fluid Resistant



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### SCL Tubing

Encapsulates components, splices, and terminations where moisture resistance and mechanical protection are required. Encapsulant melts and flows to fill surface irregularities of the substrate. While still hot, the tubing can be blocked to form a wire breakout.



### Semi-rigid cross-linked heat-shrinkable encapsulation tubing

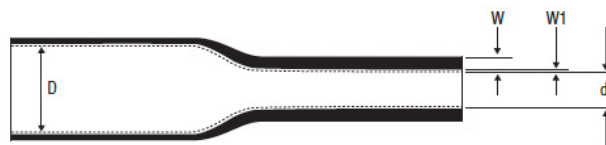
#### Benefits

- UL approved construction is available
- One-step moisture proof encapsulation
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - SCL Tubing

- Continuous operating temperature from 55°C up to + 110°C
- Minimum shrink temperature: 125°C
- Minimum full recovery temperature: 135°C
- Flame retarded
- 2.5:1 and 3:1 shrink ratio



### Product Dimensions

Inside Diameter		Wall Thickness			Ordering Description
D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Total Wall Recovered after Heating mm	W1 (nom) Meltable Wall Recovered after Heating mm		
3.2	0.6	0.96	0.51	SCL-1/8-0	
4.8	1.5	1.09	0.64	SCL-3/16-0	
6.4	2.0	1.19	0.69	SCL-1/4-0	
9.5	3.4	1.27	0.76	SCL-3/8-0	
12.7	5.0	1.39	0.89	SCL-1/2-0	
19.1	8.0	1.65	1.02	SCL-3/4-0	
25.4	10.2	1.90	1.02	SCL-1-0	

The largest size that will recover snugly over the component to be covered should be ordered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. SC apatacin speal uil appovel corstructons, afe avalale suljje 1o speal oitet

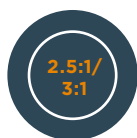
### Ordering Information

<b>Standard Colour</b>	Black (0)		
<b>Size Selection</b>	Always order the Special order sizes largest size that will shrink snugly over the are available upon request. component to be covered.		
<b>Ordering Description</b>	Specify product name, size and colour (for example SCL-1/8-0)		
<b>Specifications/ Approvals</b>	Series	UL	TE
	SCL	E85381, 600 V, 125°C	RT-1301

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Underwriters Laboratories



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### SCT (150°C) Tubing

Dual-wall, heat-shrinkable tubing designed to provide environmental sealing of an electrical splice in an automotive environment.

Moisture may enter a splice directly or indirectly via capillary action between individual wires, thus causing corrosion. This effect is accelerated by variations in temperature.

The tubing is centred over the splice area and during heating the adhesive melts and is squeezed' around where the Wires are crimped or welded and between the conductors by the shrinking action of the sleeve.

The installed product provides low profile mechanical protection against flexing, abrasion and cut-through as well as electrical insulation. There are four sizes to cover the range of splice profiles.



**SCT Tubing is specially designed to insulate and seal automotive wire splices and components in an under-the-hood automotive environment**

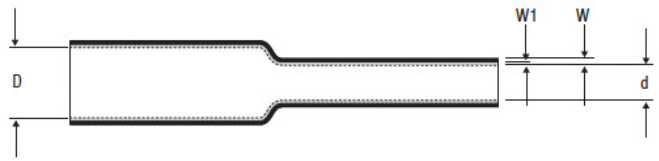
#### Benefits

- Excellent environmental seal
- Mechanical protection against flexing, abrasion and cut-through
- Small cross-sectional profile
- 4:1 shrink ratio allows a few sizes to cover a wide range of splice and component diameters
- Flame-retardant and mechanically tough, the tubing provides strain relief and abrasion protection of wire splices, terminals, and other components
- Thick adhesive liner forms an effective barrier against fluids and moisture and performs well at an extended temperature range
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - SCT (150°C) Tubing

- Continuous operating temperatures from -40°C up to +150°C (3000 hrs)
- Minimum shrink temperature: 110°C
- Minimum full recovery temperature: 135°C
- Flame retarded
- 4:1 shrink ratio



### Product Dimensions

	Inside Diameter		Recovered Wall	Thickness*
Size	D (min) Expanded as Supplied mm (Inch)	d (max) Recovered after Heating mm (Inch)	W (nom) Total Wall after Heating mm (Inch)	W1 Meltable Wall after Heating mm (Inch)
SCT-NO. 1	7.6 (.300)	1.7 (.065)	1.52 +.30 (.060 .012)	.76 (.030)
SCT-NO. 2	9.0 (.355)	2.3 (.090)	1.52 .30 (.060 .012)	.76 (.030)
SCT-NO. 3	11.6 (.455)	2.5 (.100)	2.29 .30 (.090 .012)	1.40 (.055)
SCT-NO. 4	17.8 (.700)	4.4 (.175)	2.54 .30 (.100 .012)	1.52 (.060)

\* Wall thickness will be less if tubing recovery is restricted during shrinkage.

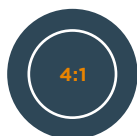
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component being covered Special order sizes are available upon request.	
<b>Standard Packaging</b>	Cut pieces	
<b>Marking</b>	Tubing will be printed with its numbered size (such as SCT-1, SCT-2, SCT-3, SCT-4).	
<b>Ordering Description</b>	Specify product name, numbered size, colour and cut length (e.g. SCT-NO.3-0-1220mm).	
<b>Specifications/ Approvals</b>	Series	TE
	SCT Tubing	SCT SCD

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



## Protection for Wire Bundles, Connectors, Terminals and Splices

### VERSAFIT Tubing

VERSAFIT highly flame-retarded, very flexible polyolefin heat-shrinkable tubing has been designed to meet the stringent requirements of UL 224 VW-1 and CSA and is, therefore, recommended for use in applications requiring the highest level of flame retardance.

VERSAFIT tubing will electrically insulate and protect in-line components terminals and splices, bundle wires for very flexible, light duty harnesses and provide electrical insulation, mechanical protection, cable bundling and strain relief.



### Highly flame-retarded, low shrink temperature polyolefin heatshrinkable tubing

#### Benefits

- Good chemical and solvent resistance
- Excellent physical and electrical properties
- Excellent flammability performance
- Low shrink temperature reduces installation time and the risk of damage to temperature-sensitive components
- Very flexible; doesn't easily wrinkle when bent
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - VERSAFIT Tubing

- Continuous operating temperature from 55°C up to + 135°C
- Minimum shrink temperature: 70°C
- Minimum full recovery temperature: 90°C
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

	Inside Diameter		Wall Thickness	
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Recovered after Heating mm	Ordering Description
3/64	1,63	0.58	0.40	VERSAFIT-3/e4-colour code
1/16	1,85	0.79	0.43	VERSAFIT-1/1e-colour code
3/32	2.79	1.17	0.51	VERSAFIT-2/22-colour code
1/8	3,43	1.57	0.51	VERSAFIT-1/6-colour code
3/16	5.21	2.36	0.51	VERSAFIT-2/ie-colour code
1/4	7.11	3.17	0,64	VERSAFIT-1/4-colour code
3/8	10.16	4.74	0,64	VERSAFIT-3/--colour code-FSP
1/2	13.72	6.35	0.64	VERSAFIT-1/2-colour code-FSP
5/8	16.90	8.0	0.76	VERSAFIT-5/-colour code-FSP
3/4	20.45	9.52	0.76	VERSAFIT-3/4-colour code-FSP
1	25.53	12.7	0.89	VERSAFIT-1-colour code-FSP
1 1/4	33.40	15,88	1.02	VERSAFIT-1-14-colour code
1 1/2	39.88	19.05	1.02	VERSAFIT-1-12-colour code
2	52.83	25.4	1.14	VERSAFIT-2-colour code
3	78.49	38.1	1,27	VERSAFIT-3-colour code
4	104.14	50,8	1.40	VERSAFIT-4-colour code

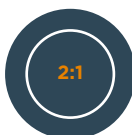
### Ordering Information

<b>Standard Colour</b>	Black (0)	Red (2)	White (9)	Blue (6)	Yellow (4)	Green (5)
<b>Size Selection</b>	Always order the Special order sizes largest size that will shrink are available upon request. snugly over the component to be covered.					
<b>Ordering Description</b>	Specify product name, size and colour (for example Versafit-1/2-colour)					
<b>Specifications/ Approvals</b>	Series	UL	CS	TE		
	VERSAFIT	E35586VW1 600 V, 125°C	LR31929VW1 600 V, 125°C	RW-3009		

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



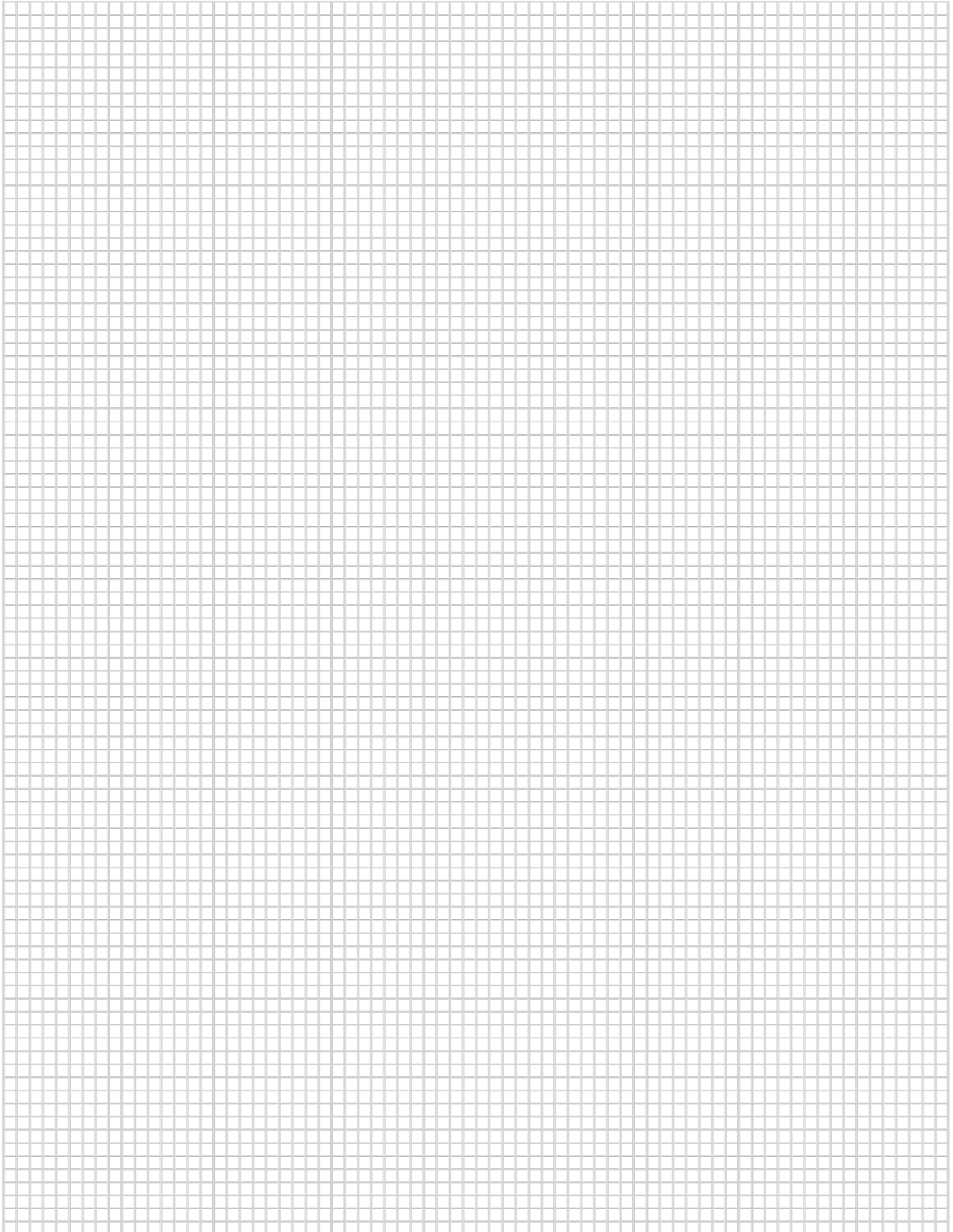
Canadian Standards Association



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## Engineering Notes



## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Mechanical Protection

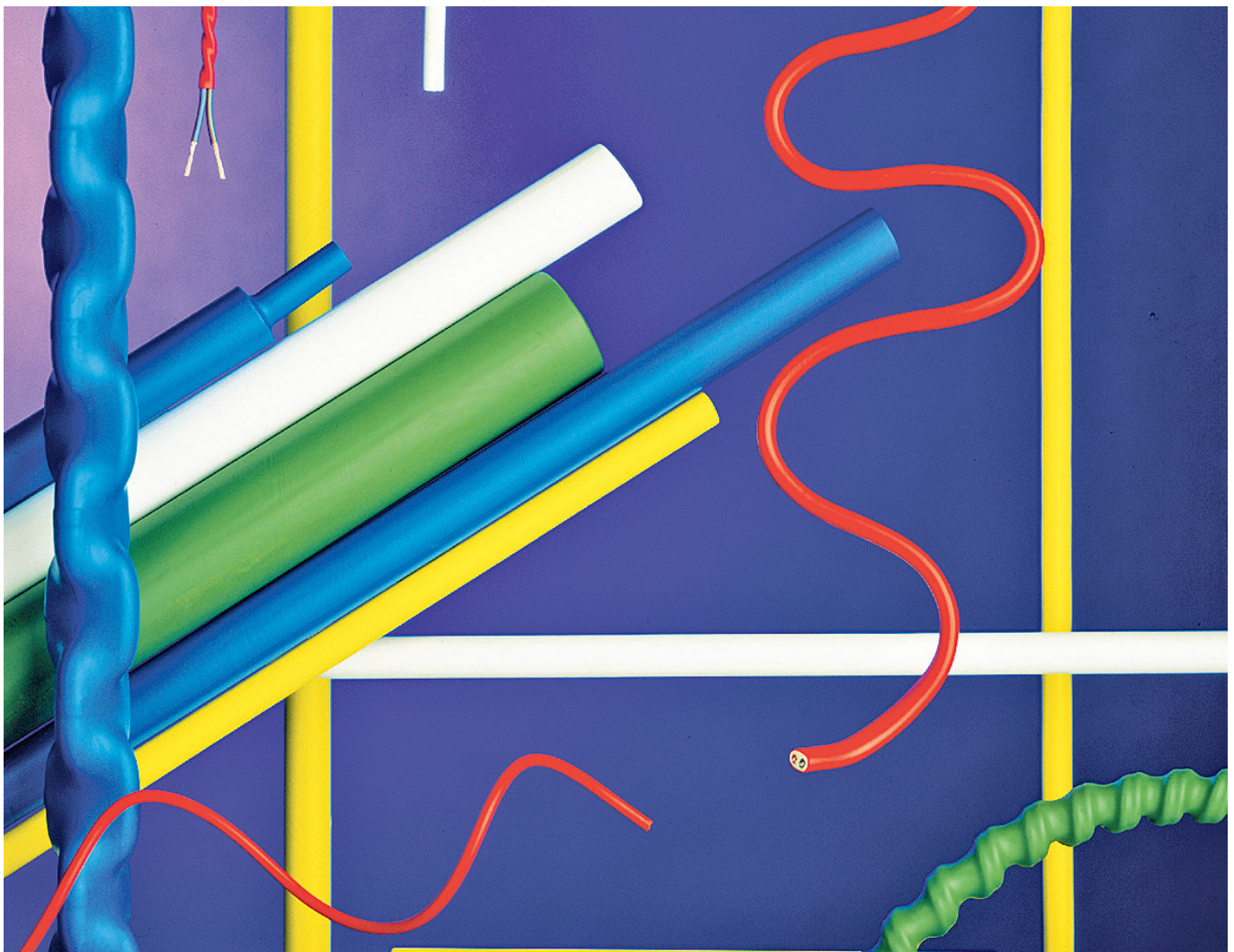
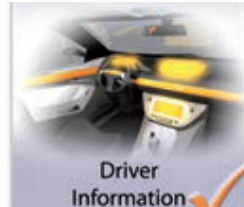
- Versatile Protective Coverings for Automotive Components
- Electric Motor Protection
- Wire Harness Protection
- Electronic Component Protection



## Versatile Protective Coverings for Automotive Components

### CGPT Tubing

A tough, flexible, general purpose polyolefin tubing with good resistance to common deler steng, is ungue blend of chemical, electrical, and physical properties makes it suitable for a wide range of applications, including electrical insulation, strain relief, cable bundling, colour-coding and lent and on of viran aleronic components, and mechanical protection.



### General purpose, flame-retardant\* polyolefin tubing

\* Clear product (X) is not flame-retardant.

#### Benefits

- Very good chemical and solvent resistance
- Flexible
- Excellent physical and electrical performance
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - CGPT Tubing

- Continuous operating temperature from 40°C up to +135°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 120°C
- Flame retarded
- 2:1 and 3:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Wall Thickness W (nom) Recovered after Heating mm	Ordering Description
2:1 Shrink Ratio				
1.2/0.6	1.2	0.6	0.45	CGPT-1.2/0.6-colour code
1.6/0.8	1.6	0.8	0.45	CGPT-1.6/0.8-colour code
2.4/1.2	2.4	1.2	0.50	CGPT-2.4/1.2-colour code
3.2/1.6	3.2	1.6	0.50	CGPT-3.2/1.6-colour code*
4.8/2.4	4.8	2.4	0.50	CGPT-4.8/2.4-colour code*
6.4/3.2	6.4	3.2	0.65	CGPT-6.4/3.2-colour code*
9.5/4.8	9.5	4.8	0.65	CGPT-9.5/4.8-colour code-FSP*
12.7/6.4	12.7	6.4	0.65	CGPT-12.7/6.4-colour code-FSP*
19/9.5	19.0	9.5	0.75	CGPT-19/9.5-colour code-FSP*
25.4/12.7	25.4	12.7	0.90	CGPT-25.4/12.7-colour code-FSP*
32/16	32.0	16.0	0.95	CGPT-32/16-colour code*
38/19	38.0	19.0	1.00	CGPT-38/19-colour code*
51/25.4	51.0	25.4	1.15	CGPT-51/25.4-colour code
76/38	76.0	38.0	1.25	CGPT-76/38-colour code
102/51	102.0	51.0	1.40	CGPT-102/51-colour code
3:1 Shrink Ratio				
1.5/0.5	1.5	0.5	0.45	CGPT-1.5/0.5-colour code
3/1	3.0	1.0	0.55	CGPT-3/1-colour code
6/2	6.0	2.0	0.65	CGPT-6/2-colour code
9/3	9.0	3.0	0.75	CGPT-9/3-colour code
12/4	12.0	4.0	0.75	CGPT-12/4-colour code
18/6	18.0	6.0	0.85	CGPT-18/6-colour code
24/8	24.0	8.0	1.00	CGPT-24/8-colour code
39/13	39.0	13.0	1.15	CGPT-39/13-colour code

### Ordering Information

<b>Standard Colour</b>	Black (0)	Red (2)	Yellow (4)	Green (5)	Blue (6)	White (9)
	Clear (X)	Brown (1)	Green/Yellow stripes			
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.					
<b>Ordering Description</b>	Specify product name, size and colour (for example CGPT-3.2/1.6-colour)					
<b>Specifications/ Approvals</b>	Series	UL	CSA	TE		
	CGPT*	E35586 600 V, 125°C	LR31929 600 V, 125°C	RW-2059		

\* clear product (x) is not flame retarded

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Canadian Standards Association



Underwriters Laboratories



## Versatile Protective Coverings for Automotive Components

### HCTE Tubing

Flexible convoluted conduit manufactured from radiation crosslinked, modified Ethylene Tetrafluoroethylene (ETFE). Its helical construction combines a high degree of flexibility with excellent crush resistance.

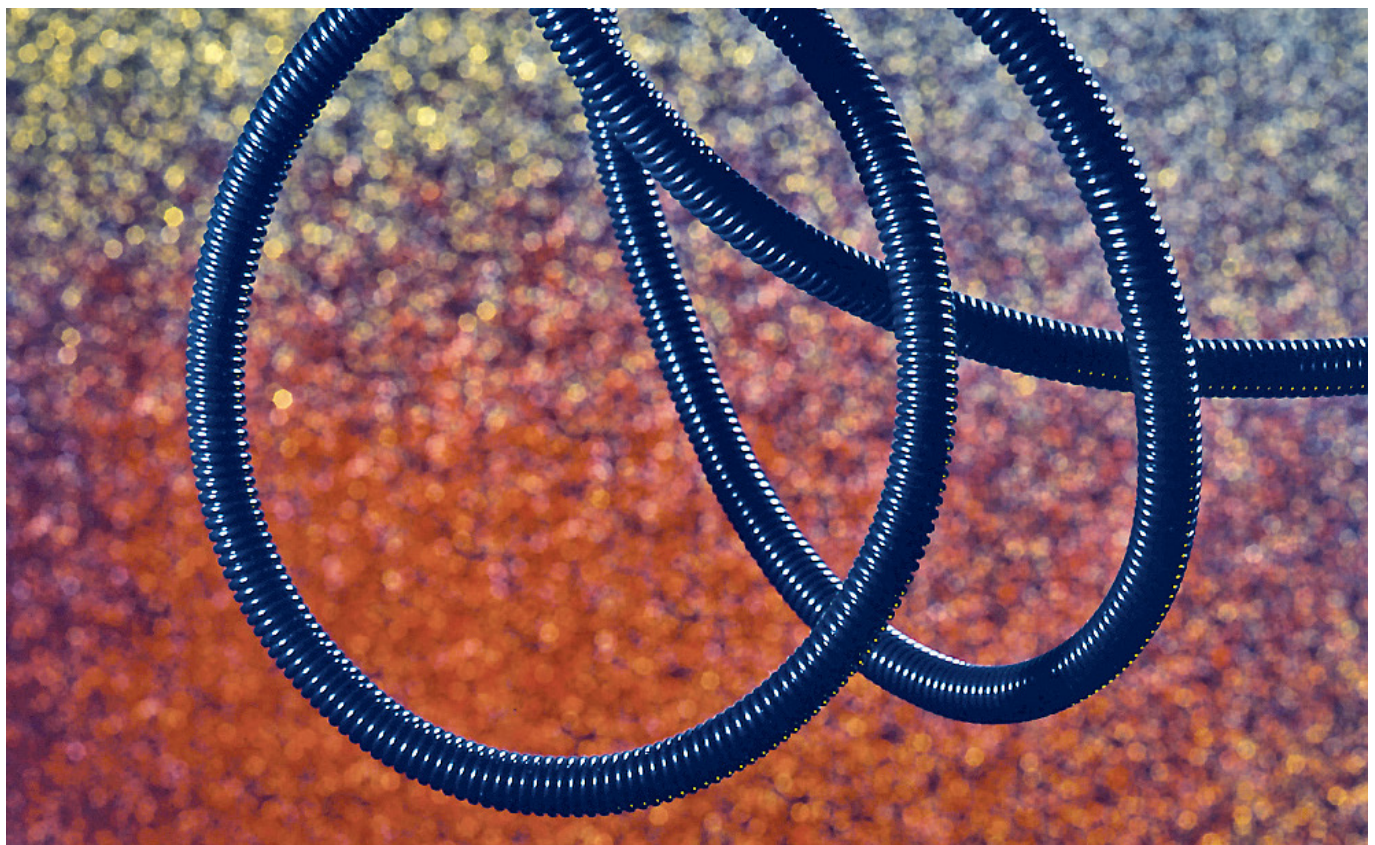
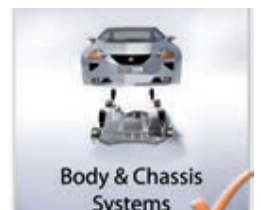
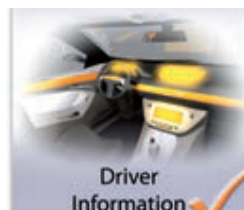
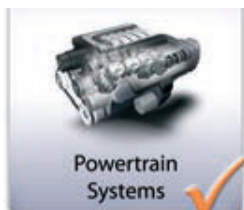
HCTE will operate continuously at temperatures up to 200°C and up to 300°C for limited periods.

Used as a conduit to provide mechanical protection for electrical wiring systems in applications requiring flexibility, high-temperature performance and good resistance to a variety of fluids. Widely used in the military and commercial aerospace industries.

Can be used in conjunction with other TE Connectivity's Raychem components to form an integrated harnessing system.

### Installation

It is recommended that no more than 70 % of the internal area ("fill factor") of the HCTE conduit be occupied by wires in any application.



### Highly flame-retarded, low shrink temperature polyolefin heatshrinkable tubing

#### Benefits

- Highly flame-retardant
- Highly flexible and fluid resistant
- Not heat-shrinkable
- High crush resistance
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - HCTE Tubing

- Operating temperature Range -55°C up to +200°C
- Flame retarded
- 2:1 shrink ratio

### Product Dimensions

Size	Inside Diameter Minimum mm	Outside Diameter Maximum mm	Maximum Wall Thickness mm
0187	4.60	8.10	0,46
0281	6,90	10.50	0.46
0312	7.70	11.80	0.46
0375	9.20	12.90	0.46
0437	10.80	14.50	0.46
0500	12.30	16.50	0.58
0625	15.40	19.50	0.58
0750	17.90	23.60	0.58
0875	21.80	27.20	0.58
1000	24.70	31.10	0.58
1250	30.70	35.30	0.58
1500	36.50	46.50	0.58
1625	39.60	50.17	0.58
1750	42.67	52.88	0.58
2000	49.20	59.23	0.58

### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order a conduit size that will ensure that a "fill factor" of 70% is not exceeded.	
<b>Ordering Description</b>	Specify product name, size and colour (for example HCTE-0187-0)	
<b>Specifications/ Approvals</b>	Series	TE
	HCTE	RT-1162

Operating Temperature Range



Shrinking Ratio



Flame Retarded



## Versatile Protective Coverings for Automotive Components

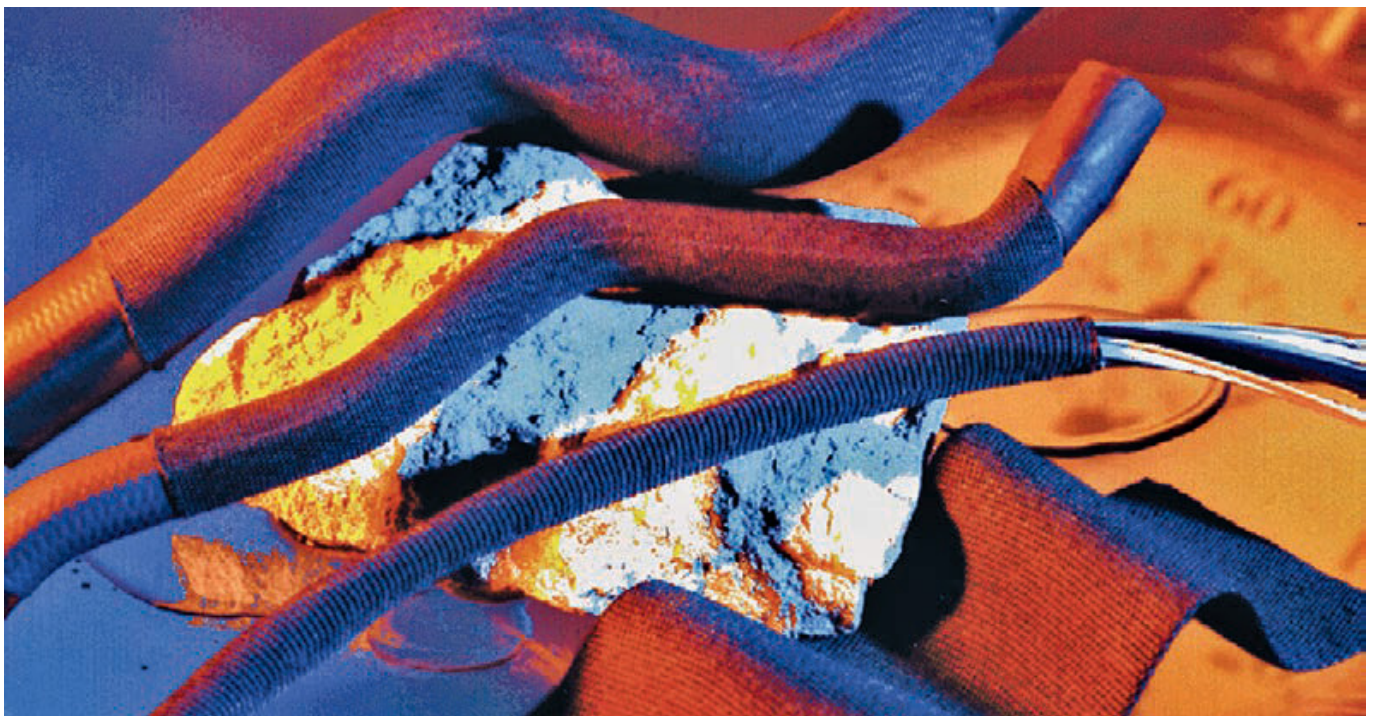
### HFT 5000 Tubing

HFT 5000 tubing products are made of very flexible heat-shrink-able fabric material, they shrink and fit snugly and securely around the underlying substrate.

Designed primarily to provide mechanical abrasion protection for components such as rubber hoses, plastic pipes, and harness wiring bundles, they are also suitable for other applications, such as noise and rattle suppression.

The woven construction makes

HET 5000 extremely flexible and resistant to trapping water, heat and humidity. It provides outstanding abrasion, chafing and cutting protection, even at high temperatures HFT-5000 product is easy to install and can be cut with standard industrial cutting equipment.



### Heat shrinkable abrasion resistant woven fabric tube

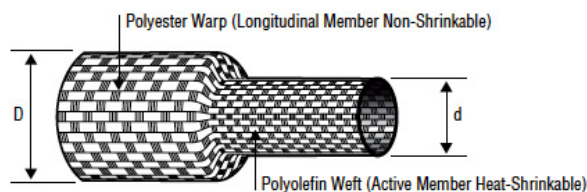
#### Benefits

- Extremely tough - meeting even demanding automotive abrasion specifications
- Protect only where protection is needed - minimising cost
- Safe installation with no hot knife cutting equipment required - reduces investment
- Soft to handle so operators do not need to wear gloves - increases productivity
- Can be cut with conventional guillotines or even scissors
- Resists hose pulsing effects
- Halogen free
- Resistant to harsh environments such as engine compartments
- Grips substrates tightly without additional fixing
- Highly flexible woven fabric construction for easy installation onto awkward substrates such as tightly angled hoses
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - HFT 5000 Tubing

- Continuous operating temperature from 40°C up to + 125°C (3000 hrs)  
40°C up to + 150°C (1000 hrs)
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- Low shrink temperature
- 2:1 shrink ratio



### Product Dimensions

Standard Sizes		
Inside Diameter		
D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Ordering Description
12	6	HFT-5000-12/6-0
20	10	HFT-5000-20/10-0
25	12	HFT-5000-25/12-0
30	15	HFT-5000-30/15-0
34	17	HFT-5000-34/17-0
40	20	HFT-5000-40/20-0
50	25	HFT-5000-50/25-0
60	30	HFT-5000-60/30-0
70	35	HFT-5000-70/35-0
80	40	HFT-5000-80/40-0
100	50	HFT-5000-100/50-0
11/4	33.40	15,88

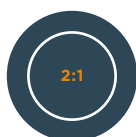
### Ordering Information

Standard Colour	Black (0)	
	Note: Fully recoverable fabric wall thickness: Approximately 1 mm. Longitudinal change on full recovery is -10% to -20%; 0 = Black	
	For full product performance details consult TE Automotive Specifications RW-2060.	
Specifications/ Approvals	Series	TE
	HFT 5000 Tubing	RW-2060
	Material Safety Data Sheet available on request.	
	Installation instructions available on request.	

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



## Versatile Protective Coverings for Automotive Components

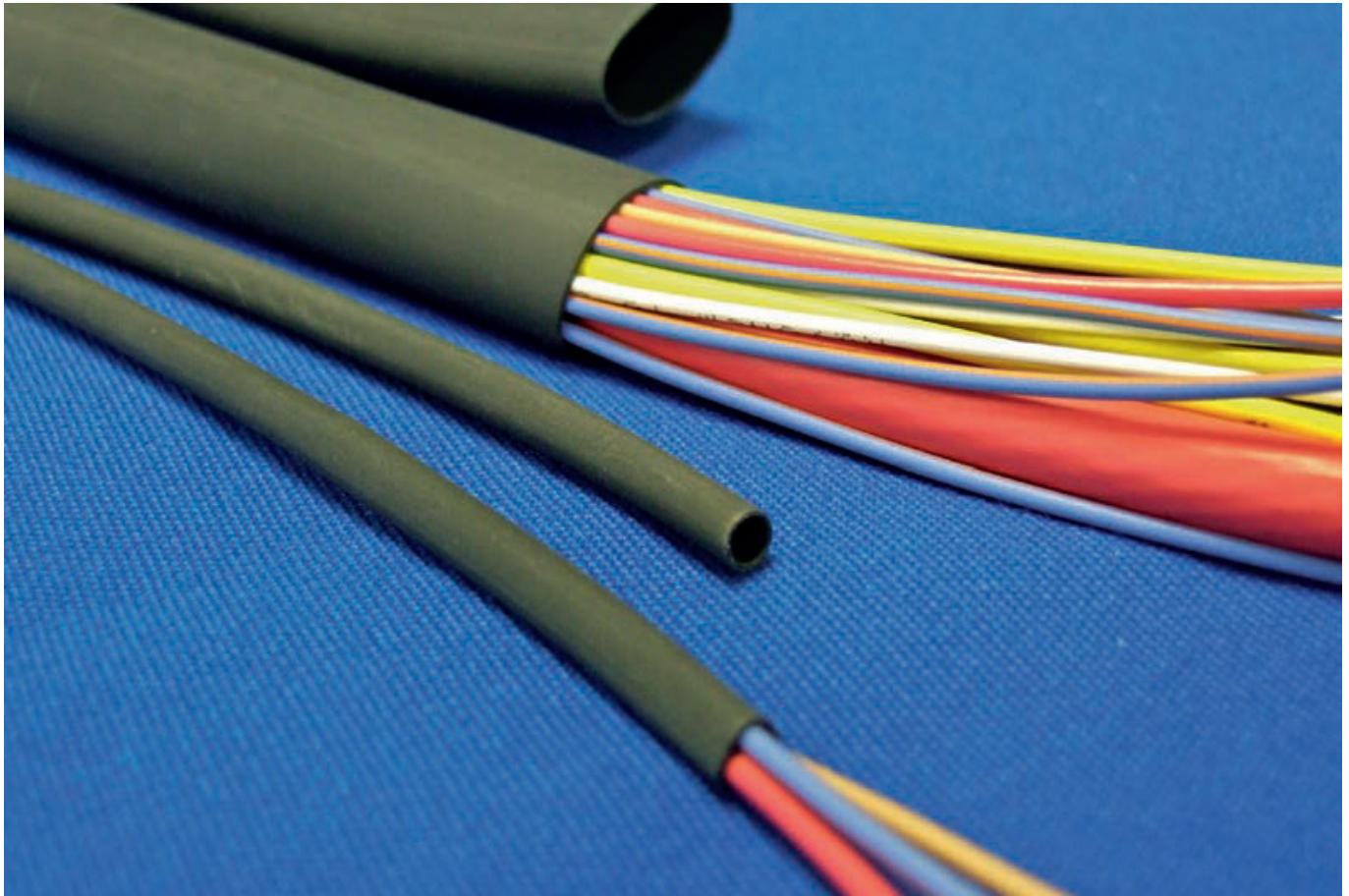
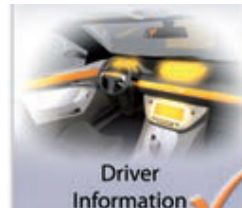
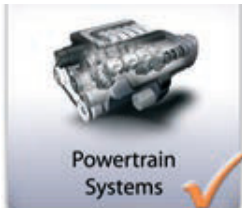
### NETM Tubing

Non heat-shrink tubing designed for electrical harnessing needs. Particularly suitable for the aggressive environment of car engines NETM can withstand higher temperatures than traditional PVC materials whilst retaining its high level of performance.

NETM1000 is the more flexible product, enabling it to be easily routed through engine spaces. NETM2000 offers greater mechanical strength and excellent abrasion resistance.

NETM products are durable non-shrinking polyolefin tubings which remain heat resistant up to at least 130°C. Specifically designed for use in electrical harnesses, NETM tubings are flame retarded and offer excellent abrasion resistance.

NETM1000 is a more flexible 125 °C product allowing it to follow wiring bundles routed in tight bends around underbonnet components. NETM2000 is designed for higher temperature applications rated up to 150 °C



### Specially designed for use in electrical harnesses

#### Benefits

- Excellent heat resistance
- Flexible
- Good mechanical strength
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - NETM Tubing

- Operating temperature from -55°C up to +135°C (NETM-1000) from -40°C up to +150°C (NETM-2000)



### Product Dimensions

	Inside Diameter D (nom) Supplied mm	Wall Thickness W (nom) mm	Product Description
NETM1000	3	0.5	NETM1000-3-0-SP
	4	0.5	NETM1000-4-0-SP
	5	0.5	NETM1000-5-0-SP
	6	0.5	NETM1000-6-0-SP
	8	0.5	NETM1000-8-0-SP
	10	0.5	NETM1000-10-0-SP
	12	0.5	NETM1000-12-0-SP
	14	0.5	NETM1000-14-0-SP
NETM2000	6	0.5	NETM2000-6-0-SP
	8	0.5	NETM2000-8-0-SP
	10	0.5	NETM2000-10-0-SP
	12	0.5	NETM2000-12-0-SP

### Ordering Information

<b>Standard Colour</b>	Black (0)
------------------------	-----------

Operating Temperature Range



Operating Temperature Range



## Versatile Protective Coverings for Automotive Components

### RNF-100

Premium grade polyolefin based heat-shrinkable tubing with an outstanding overall balance of properties

The product has a wide range of industrial approvals. RNF-100 tubing possesses a unique blend of physical, chemical and electrical properties and is suitable for a wide range of applications.

Used extensively for lightweight harness jackets, insulation, colour coding identification, protection against fluids and provides mechanical strength.



**Cost-effective localized protection for wires and cables in high temperature environments**

### Benefits

- Outstanding all round performance
- Excellent physical and electrical performance
- Good chemical and solvent resistance
- Flexible
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RNF-100

- Continuous operating temperature from 55°C up to + 135°C
- Minimum shrink temperature: 95°C
- Minimum full recovery temperature: 121°C
- Flame retarded (colours only)
- 2:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Wall Thickness W (nom) Recovered after Heating mm	Ordering Description
3/64	1.2	0.6	0.45	RNF-100-3/e4-colour code
1/16	1.6	0.8	0.45	RNF-100-1/16-colour code
3/32	2.4	1.2	0.50	RNF-100-3/32-colour code
1/8	3.2	1.6	0.50	RNF-100-1/--colour code
3/16	4.8	2.4	0.50	RNF-100-3/1e-colour code
1/4	6.4	3.2	0.65	RNF-100-1/4-colour code
3/8	9.5	4.8	0.65	RNF-100-3/8-colour code-FSP*
1/2	12.7	6.4	0.65	RNF-100-1/2-colour code-FSP*
3/4	19.0	9.5	0.75	RNF-100-3/4-colour code-FSP*
1	25.4	12.7	0.90	RNF-100-1-colour code-FSP*
1 1/4	31.0	16.0	0.95	RNF-100-1-1/4-colour code
1 1/2	38.0	19.0	1.00	RNF-100-1-1/2-colour code
2	51.0	25.4	1.15	RNF-100-2-colour code
3	76.0	38.0	1.25	RNF-100-3-colour code
4	102.0	51.0	1.40	RNF-100-4-colour code
5	127.0	63.5	1.52	RNF-100-5-colour code
9/3	9.0	3.0	0.75	CGPT-9/3-colour code
12/4	12.0	4.0	0.75	CGPT-12/4-colour code
18/6	18.0	6.0	0.85	CGPT-18/6-colour code
24/8	24.0	8.0	1.00	CGPT-24/8-colour code
39/13	39.0	13.0	1.15	CGPT-39/13-colour code

\* Material supplied on Flat Spooled Packaging (FSP) as standard

### Ordering Information

Standard Colours	Clear (X)   Black (0)   Red (2)   Yellow (4)   Green (5)   Blue (6)   White (9)												
Size Selection	Always order the Special order sizes largest size that will be available upon shrink snugly over the request. component to be covered.												
Ordering Description	Specify product name, size and colour (for example RNF-100-1/8-0)												
Specifications/ Approvals	<table border="1"> <thead> <tr> <th>Series</th> <th>UL</th> <th>CSA</th> <th>TE</th> </tr> </thead> <tbody> <tr> <td>RNF-100 Type 1 (colours)</td> <td>E35586 600 V, 125°C</td> <td>LR31929 600 V, 125°C</td> <td>RT-350 Type 1 RK-6001</td> </tr> <tr> <td>RNF-100 Type 2 (clear)</td> <td>E35586 600 V, 125°C</td> <td>LR31929 600 V, 125°C</td> <td>RT-350 Type 2 RK-6001</td> </tr> </tbody> </table>	Series	UL	CSA	TE	RNF-100 Type 1 (colours)	E35586 600 V, 125°C	LR31929 600 V, 125°C	RT-350 Type 1 RK-6001	RNF-100 Type 2 (clear)	E35586 600 V, 125°C	LR31929 600 V, 125°C	RT-350 Type 2 RK-6001
	Series	UL	CSA	TE									
RNF-100 Type 1 (colours)	E35586 600 V, 125°C	LR31929 600 V, 125°C	RT-350 Type 1 RK-6001										
RNF-100 Type 2 (clear)	E35586 600 V, 125°C	LR31929 600 V, 125°C	RT-350 Type 2 RK-6001										

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Canadian Standards Association



Underwriters Laboratories

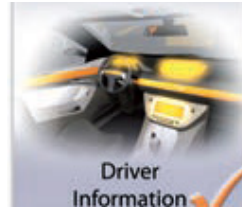


## Versatile Protective Coverings for Automotive Components

### RNF-150 Tubing

Can be used for jacketing and bundling of wires to form light-duty harnesses, especially where a low profile, abrasion resistance, and flexibility are needed.

Can also be used to provide insulation and strain relief of electrical connections and wire terminations, identification of wires, and packaging of components.



### High-performance, flame-resistant, flexible, fluoropolymer tubing

#### Benefits

- Approximately 40% thinner walls than most general purpose polyolefin tubings
- High flame-resistance
- Excellent physical and electrical properties after exposure to many chemicals and solvents at 50 °C (but not recommended for use in direct contact with ketones)
- Recommended maximum temperature for use as a primary insulator: 135 °C
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RNF-150 Tubing

- Continuous operating temperature from 55°C up to + 150°C
- Minimum shrink temperature: 110°C (230°F)
- Minimum full recovery temperature: 150°C (302°F)
- Flame retarded
- 2:1 shrink ratio



### Product Dimensions

Size	Inside Diameter		Wall Thickness*		Ordering Description
	D (min) Expanded as Supplied mm/inch	d (max) Recovered after Heating mm/inch	W Recovered after Heating mm/inch		
3/64	1.2 (0.046)	0.6 (0.023)	0.25 +0.05 (0.010 +0.002)		RNF-150-3/64-colour code
1/16	1.6 (0.063)	0.8 (0.031)	0.25 +0.05 (0.010 +0.002)		RNF-150-1/16-colour code
3/32	2.4 (0.093)	1.2 (0.046)	0.25 +0.05 (0.010 +0.002)		RNF-150-3/22-colour code
1/8	3.2 (0.125)	1.6 (0.062)	0,25 +0.05 (0.010 +0.002)		RNF-150-1/-s-colour code
3/16	4,8 (0.187)	2.4 (0.093)	0.25 +0.05 (0.010 +0.002)		RNF-150-3/ie-colour code
1/4	6.4 (0.250)	3.2 (0.125)	0.30 +0.08 (0.012 2 +0.003)		RNF-150-1/4-colour code
3/8	9.5 (0.375)	4.8 (0.187)	0.30 +0.08 (0.012 +0.003)		RNF-150-/--colour code
1/2	12.7 (0.500)	6.4 (0.250)	0.30 +0.08 (0.012 +0.003)		RNF-150-1/2-colour code
3/4	19.0 (0.750)	9.5 (0.375)	0,43 +0.08 (0.017 +0.003)		RNF-150-3/--colour code
1	25.4 (1.000)	12,7 (0.500)	0,48 +0.08 (0.019 +0.003)		RNF-150-1-colour code

\* Wall thickness will be less if tubing recovery is restricted during shrinkage

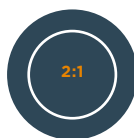
### Ordering Information

<b>Standard Colour</b>	Black (0)		
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.		
<b>Ordering Description</b>	Specify product name, size and colour (for example RNF-150-1/4-0)		
	**) Europe only		
<b>Specifications/ Approvals</b>	Series	UL	TE
	RNF-150	E35586 VW-1, 600 V, 150°C	RT-370

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



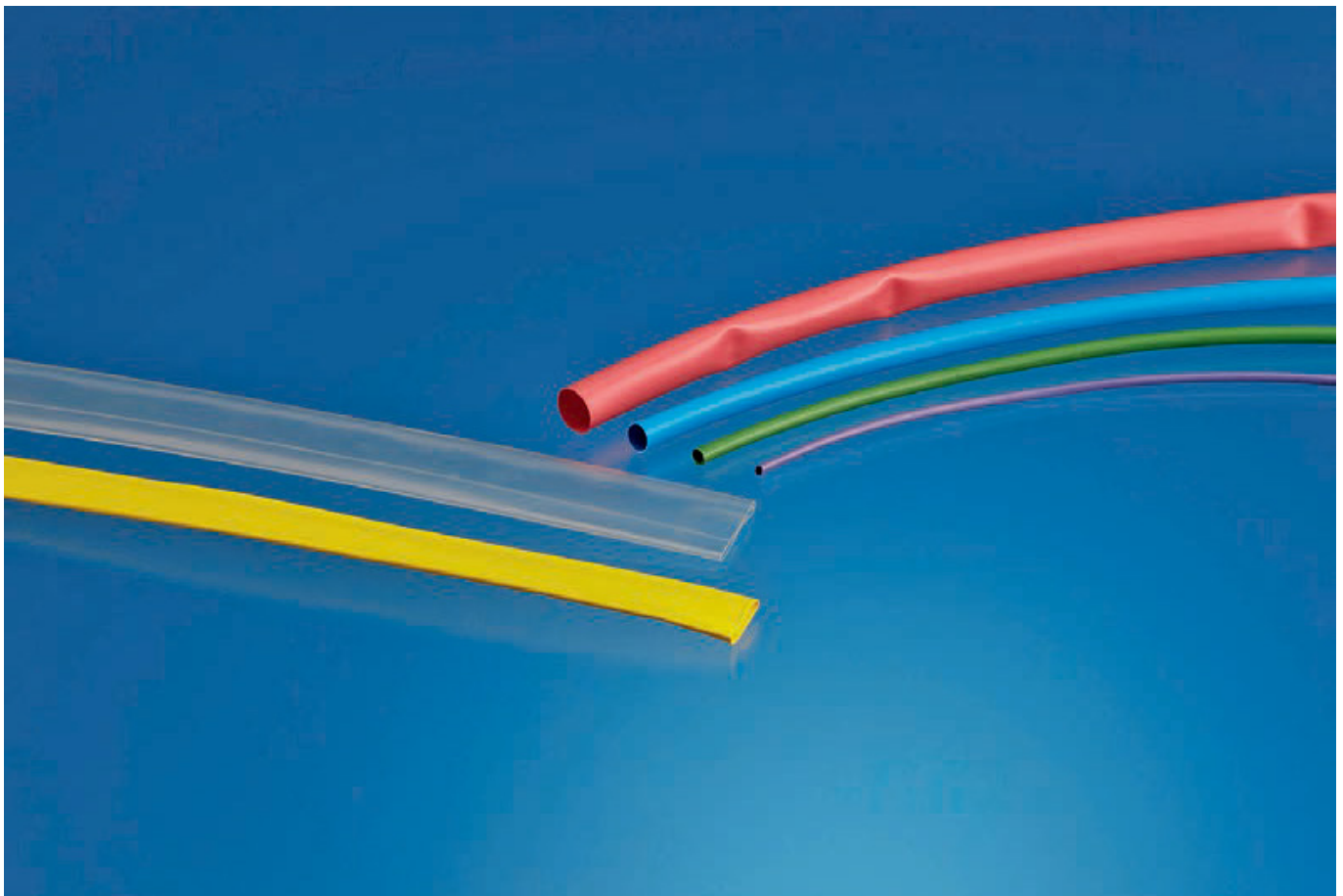
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## Versatile Protective Coverings for Automotive Components

### RNF-3000 Tubing

Used for insulation and strain relief of wire terminations and electrical connections. Also suitable for light-duty harnessing, jacketing, and identification of wires, cables, and electrical and electronic components.



### Flexible, high-shrink-ratio, flame-retardant, general purpose, polyolefin tubing

#### Benefits

- 13:1 shrink ratio easily accommodates awkward, irregular shapes
- Few sizes cover a wide range of diameters, allowing reduced inventory
- Excellent physical, chemical, and electrical properties meet industry standards for highly reliable, general purpose tubing
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RNF-3000 Tubing

- Continuous operating temperature from 55°C up to + 135°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 120°C
- Flame retarded
- 3:1 shrink ratio



### Product Dimensions

Size	Inside Diameter D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Wall Thickness* W Recovered after Heating mm	Ordering Description
1.5/0.5	1.5	0.5	0.45	RNF-3000-1.5/0.5-colour code
3/1	3.0	1.0	0.55	RNF-3000-3/1-colour code
4.5/1.5	4.5	1.5	0,55	RNF-3000-4.5/1.5-colour code
6/2	6.0	2.0	0,65	RNF-3000-6/2-colour code
9/3	9.0	3.0	0.75	RNF-3000-9/3-colour code
12/4	12.0	4.0	0.75	RNF-3000-12/4-colour code
18/6	18.0	6.0	0,85	RNF-3000-18/6-colour code
24/8	24.0	8.0	1.00	RNF-3000-24/8-colour code
39/13	39.0	13.0	1.15	RNF-3000-39/13-colour code

\* Wall thickness will be less if tubing recovery is restricted during shrinkage

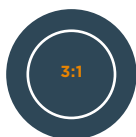
### Ordering Information

<b>Standard Colours</b>	Black (0)	White (9)	Red (2)	Blue (6)	Yellow (4)	Clear (X)
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.					
<b>Ordering Description</b>	Specify product name, size and colour (for example RNF-3000-6/2-0)					
<b>Specifications/ Approvals</b>	Series	UL	CSA	TE		
	RNF-3000	E35586 600 V, 125°C	LR31929 600 V, 125°C	RW-2053		

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Canadian Standards Association



Underwriters Laboratories



## Versatile Protective Coverings for Automotive Components

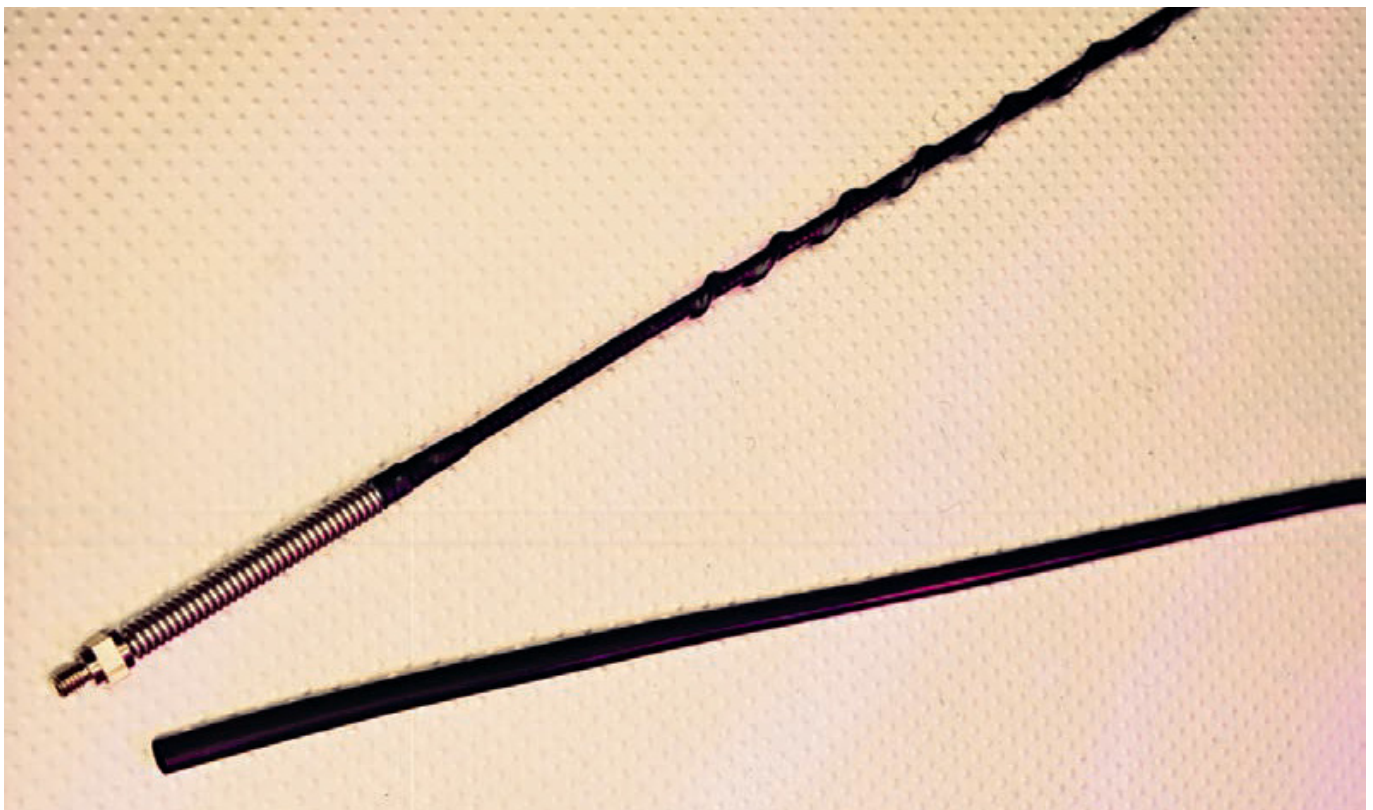
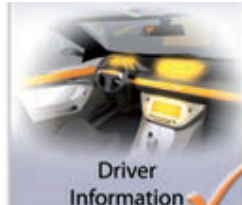
### RPPM Tubing

Flexible, heat-shrinkable dual-wall tubing with an integrally bonded meltable adhesive liner. The tough outer jacket offers excellent mechanical strength, yet is flexible enough to cater for a high degree of movement.

Available in clear and black, the tough outer jacket with both types offers excellent mechanical strength.

RPPM is used for moisture proof encapsulation of a wide variety of components. In particular, it adheres well to PVC. The high shrink ratio allows RPPM to be used with a range of dimensions.

Clear RPPM offers excellent clarity for protection of substrates that may need to be inspected during service. Black RPPM has a high gloss finish suitable for cosmetic applications.



### Flexible dual wall, moisture proof heatshrinkable tubing

#### Benefits

- Protects antenna and locates and protects antenna windings, in one simple process
- Adhesive lined - to fix winding and tubing permanently in position
- High shrink ratio (6:1) - providing a snug fit on both winding and bare antenna diameters
- Low wind noise - ultra thinwall tubing provides minimal wind shear
- Shiny black finish
- Minimal tooling and handling costs - simply cut what you need
- Versatile product - one tubing size shrinks to fit a range of antenna diameters
- Easy, low-cost installation process - using high volume hot air, convection or infrared equipment
- ROHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RPPM Tubing

- Continuous operating temperature from
- 40°C up to +85°C (3000 hrs)
- Minimum shrink temperature: 60°C
- Minimum full recovery temperature: 80°C
- 4:1 shrink ratio



### Product Dimensions

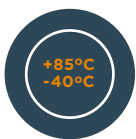
Size	Inside Diameter		Wall Thickness		Ordering Description
	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Total Wall Recovered after Heating mm		
4/1	4.0	1.0	0.8		RPPM-4/1-colour code
8/2	8.0	2.0	0.9		RPPM-8/2-colour code
12/3	12.0	3.0	1.2		RPPM-12/3-colour code
16/4	16.0	4.0	1.5		RPPM-16/4-colour code
NR510	9.0	1.5	1.6		RPPM-NR510-X
NR801	6.4	1.0	0.8		RPPM-NR801-colour code

Order the largest size that will recover snugly over the component to be covered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. Other lengths and sizes are available subject to special order.

### Ordering Information

<b>Standard Colours</b>	Black (0)	Clear (X)
<b>Size Selection</b>	Always order the largest size Special order sizes are available that will shrink snugly over the component to be covered. upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RPPM-8/2-X)	
<b>Specifications/ Approvals</b>	Series	TE
	RPPM	RK-6214

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



## Versatile Protective Coverings for Automotive Components

### RPT-120 Tubing

This resilient tubing offers an alternative to paint, particularly suitable for round substrates. It provides excellent mechanical and corrosion protection compared to paint and the high quality surface creates a quality image for the component being protected.

#### Product Features

- Provides a tough resilient layer to protect the component beneath
- Easy to install with conventional heating equipment
- Low cost of set up



**Thin-wall tubing, conforms and protects substrates as a cost-effective alternative solution to paint**

#### Benefits

- Provides a resilient layer protecting the component beneath from damage and corrosion
- Good surface finish giving a professional look to the final product
- Less taxing Health and Safety considerations reducing the cost of process set up
- Low shrink temperature for fast installation
- Can be printed before installation to give component details
- RoHS/ELV compliant

## Sealing and Protection for Wire Bundles, Connectors, Terminals and Splices

### Product Features - RPT-120 Tubing

- Operating temperature from
- 40°C up to + 120°C
- Minimum full recovery temperature: 115°C
- 2:1 shrink ratio



### Product Dimensions

Size	Inside Diameter		Wall Thickness		Ordering Description
	O (min) Expanded as Supplied mm	d (max) Recovered after Heating -	W (nom) Wall Thickness mm		
19/6	19.0	6.0	1.0		RPT-120-19/6-0
27/12.7	27.0	12.7	0.86		RPT-120-27/12.7-0

### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest Special order sizes are size that will shrink snugly over the component to be covered available upon request	
<b>Ordering Description</b>	Specify product name size and colour (for example RPT-120-19/6-0)	
<b>Specifications/ Approvals</b>	Series	TE
	RPT-120	RK-6765

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



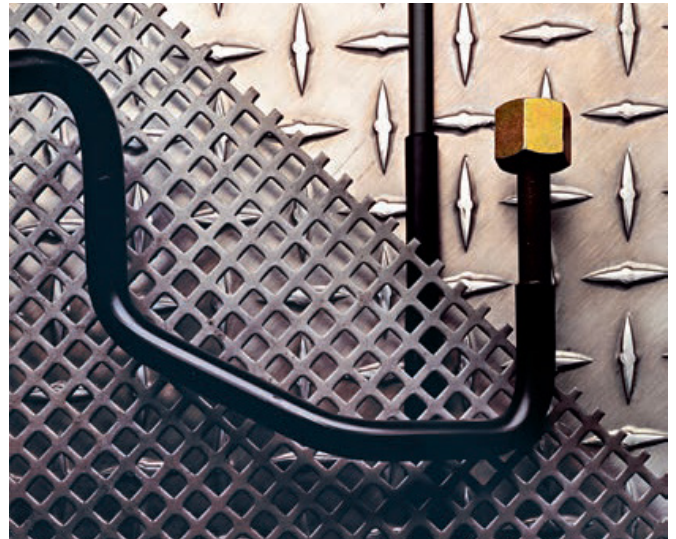
## Engineering Notes



## Automotive Hose and Pipe Protection

### Fluid Management

- Automotive Hose and Pipe Protection
- Fluid Line Protection
- Hose Coupling
- Cooling Hose Protection

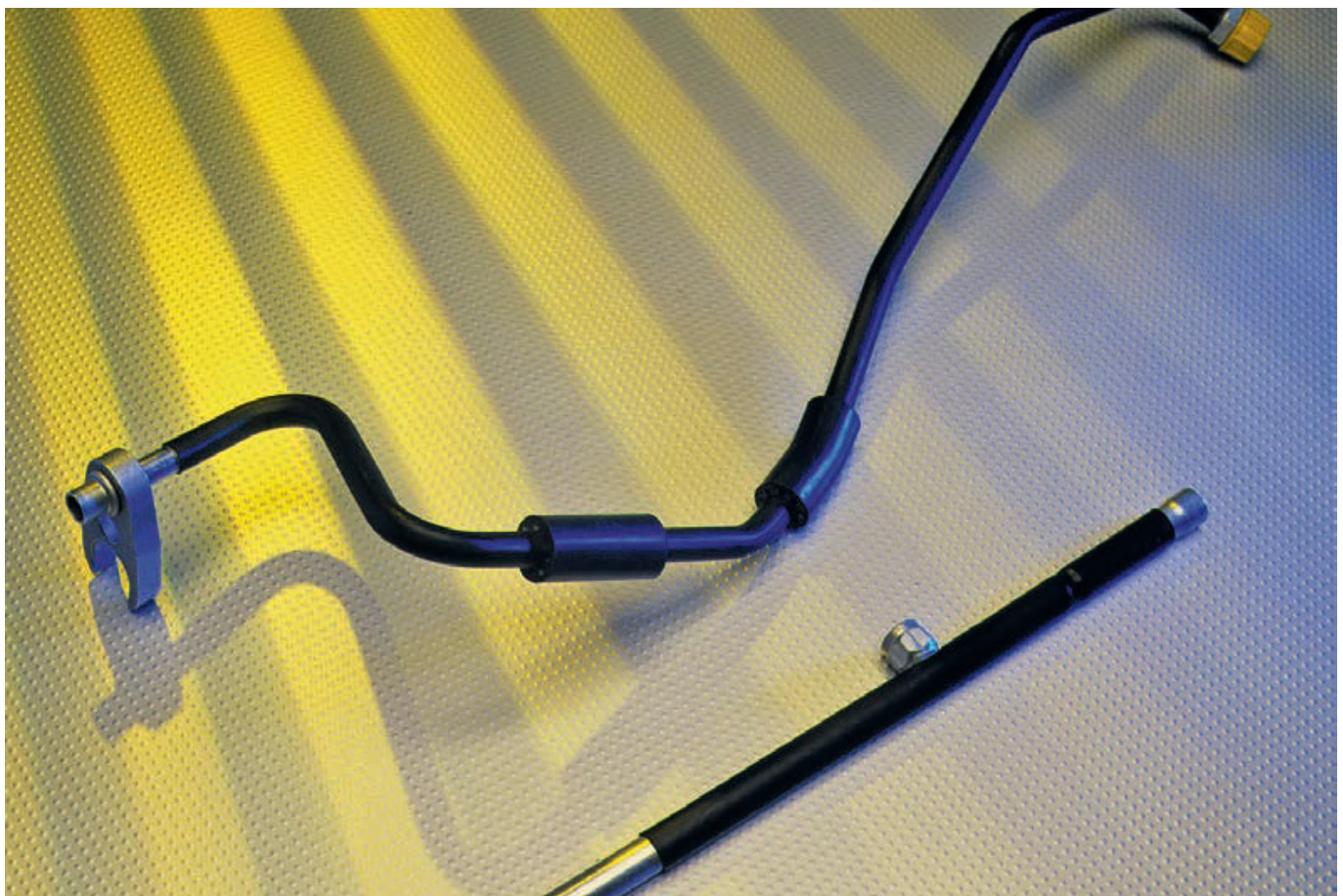
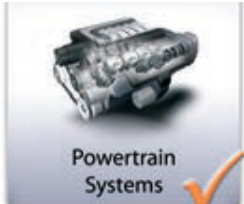


## Automotive Hose and Pipe Protection

### AP-2000 Tubing

AP-2000 is designed for use on industry standard metal pipes to provide protection on automotive brake and fuel lines in areas exposed to mechanical abuse and moisture. The product is positioned on straight pipe lengths prior to the second end-nut fitting.

Each size of AP-2000 tubing has been designed for use on specific standard size of metal pipe. The product rapidly shrinks on application of heat above 115°C and the adhesive melts and flows around the substrate, eliminating air gaps. Once installed, the pipes are bent and formed.



**Cost-effective anti-noise, abrasion and corrosion protection for automotive brake and air-conditioning lines.**

### Benefits

- Adds protection only where it is needed - minimising costs compared to whole pipe dip-coats
- One size fits a range of pipes minimising inventory costs
- Easier, lower cost installation compared to dip-coat processes - simple heat-shrink process using not air, convection or infrared equipment
- Reduced production times - as pipes can be formed after heat-shrink tubing is installed
- Moistureproof sealing - hot-melt adhesive flows between tubing and pipe, preventing any moisture from coming into contact with the pipe
- ROHS/ELV compliant

## Automotive Hose and Pipe Protection

### Product Features - AP-2000 Tubing

- Continuous operating temperature from 40°C up to +80°C
- Minimum shrink temperature: 110°C
- Minimum full recovery temperature: 115°C



### Product Dimensions

Size	Standard Pipe Diameter mm	Inside Diameter D (min) Expanded as Supplied mm	Wall Thickness W (nom) Recovered after Heating mm	Ordering Description
6	4.76	6.0	1.0	AP2000-6
8	6.35	8.0	1.0	AP2000-8
10	8.00	10.0	1.0	AP2000-10
15	10.00	15.0	1.0	AP2000-15
NR101	4.85	14.0	1.0	AP2000-NR101
NR102	3.50	5.0	1.0	AP2000-NR102

The size that corresponds to the pipe diameter shown in the table above should be ordered. Contact TE Automotive for non-standard pipe diameters.

The product may be supplied in cut pieces and spools for long continuous lengths or high volumes.

### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example AP-2000-6-0)	
<b>Specifications/ Approvals</b>	Series	TE
	AP-2000 Tubing	RW-1001

Operating Temperature Range



Shrink Temperature



Fluid Resistant

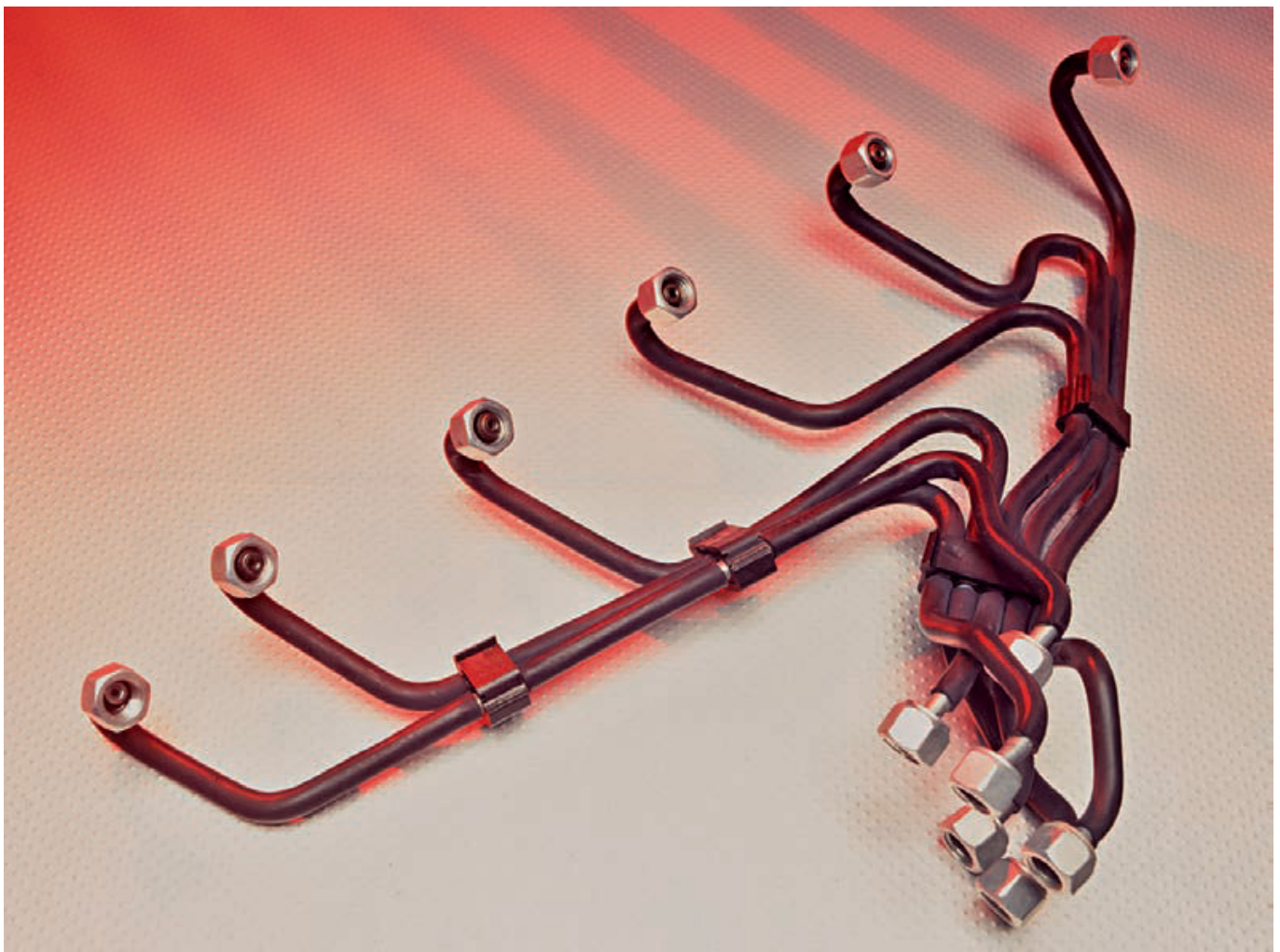


## Automotive Hose and Pipe Protection

### ATUM Tubing

Semi-flexible, heat-shrinkable tubing with a meltable adhesive inner lining designed to provide moisture proof sealing to a wide range of substrates such as electrical wire splices, cable jack-ets, wire breakouts and electrical components.

The high shrink ratios mean that only seven sizes are required to cover a wide range of substrate diameters. Typical applications are environmental sealing of electrical components including wire splices and harness breakouts as well as sealing cable ends against moisture ingress.



### High shrink ratio adhesive lined polyolefin tubing

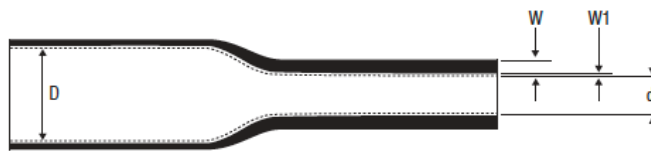
#### Benefits

- Easier, lower cost installation compared to dip-coat
- processes - simply slide over substrate and shrink using hot air, convection or infrared equipment.
- Reduced production times - tubes can be bent or formed on the pipe.
- Moisture proof sealing - hot-melt adhesive flows between tubing and substrate to provide a permanent waterproof bond.
- Application versatility - one size of tubing fits a range of substrate diameters minimizing inventory costs.
- RoHS/ELV compliant

## Automotive Hose and Pipe Protection

### Product Features - ATUM Tubing

- Continuous operating temperature from 55°C up to + 110°C
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- 3:1 and 4:1 shrink ratio



### Product Dimensions

Inside Diameter		Wall Thickness				Ordering Description			
D (min) Expanded as Supplied		d (max) Recovered after Heating		W (nom) Total Wall Recovered after Heating		W1 (nom) Meltable Wall Recovered after Heating			
mm	mm	mm	mm	mm	mm	mm	mm		
3:1	4:1	3:1	4:1	3:1	4:1	3:1	4:1	3:1	4:1
3	4	1	1	1.00	1.00	0.5	0.5	Atum-3/1-colour code	Atum-4/1-colour code
6	8	2	2	1.00	1.00	0.5	0.5	Atum-6/2-colour code	Atum-8/2-colour code
9	12	3	3	1.40	1.40	0.6	0.6	Atum-9/3-colour code	Atum-12/3-colour code
12	16	4	4	1.78	1,78	0.7	0.7	Atum-12/4-colour code	Atum-16/4-colour code
19	24	6	6	2.25	2.25	0,8	0,8	Atum-19/6-colour code	Atum-24/6-colour code
24	32	8	8	2.54	2.54	1.0	1.0	Atum-24/8-colour code	Atum-32/8-colour code
40	52	13	13	2.54	2,54	1.0	1.0	Atum-40/13-colour code	Atum-52/13-colour code

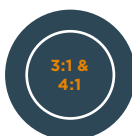
### Ordering Information

<b>Standard Colours</b>	Black (0)	Clear (X)
<b>Size Selection</b>	Always order the Special order sizes largest size that will shrink snugly are available upon request. over the component to be covered.	
<b>Ordering Description</b>	Specify product name, size and colour (for example ATUM-12/3-colour)	
<b>Specifications/ Approvals</b>	Series	UL
	ATUM	E85381 600 V, 110°C
		TE
		RW-2063 (black) RK-6024 (colours and clear)

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Flame Retarded



Fluid Resistant



Underwriters Laboratories



## Automotive Hose and Pipe Protection

### DWTC Tubing

Flexible, heat-shrinkable, dual-wall tubing with an integrally bonded meltable adhesive inner liner designed to offer moisture proof encapsulation to a wide variety of substrates. Available in black and clear, clear version of DWTC offers excellent clarity for protection of substrates that may need to be inspected during service.

The tough outer jacket gives excellent mechanical strength with a high resistance to splitting. The high shrinkage ratio means that only four sizes are needed to give protection to a full range of irregular shapes with widely varying dimensions.



### Flexible, dual wall moisture proof heat shrinkable tubing

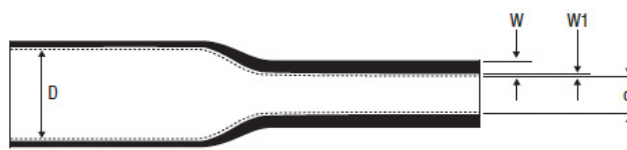
#### Benefits

- Adds protection only where it is needed - minimizing costs compared to whole pipe coating
- Greater versatility - can be over-expanded to allow over end fitting
- Easier, lower cost installation compared to dip-coat processes - simple heat-shrink process using hot air, convection infrared equipment
- Reduced production times - heat-shrink tubing can be installed on a straight pipe before it is formed to make a cluster.
- Moisture proof sealing - hotmelt adhesive flows between tubing and pipe, preventing any moisture from coming into contact with the pipe.
- RoHS/ELV compliant

## Automotive Hose and Pipe Protection

### Product Features - DWTC Tubing

- Continuous operating temperature from 55°C up to +75°C
- Minimum shrink temperature: 60°C
- Minimum full recovery temperature: 100°C
- 4:1 shrink ratio3:1 and 4:1 shrink ratio



### Product Dimensions

Size	Inside Diameter		Wall Thickness		Ordering Description
	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Total Wall Recovered after Heating mm	W1 (nom) Meltable Wall Recovered after Heating mm	
4/1	4.0	1.0	0,8	0.25	DWTC-4/1-X
8/2	8.0	2.0	0.9	0.25	DWTC-8/2-X
12/3	12.0	3.0	1.2	0.40	DWTC-12/3-X
16/4	16.0	4.0	1.5	0,50	DWTC-16/4-X

The largest size that will recover snugly over the component to be covered should be ordered. The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage.

Other lengths and sizes are available subject to special order.

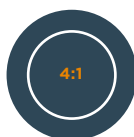
### Ordering Information

<b>Standard Colour</b>	Clear (X)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example DWTC-4/1-X)	
<b>Specifications/ Approvals</b>	Series	TE
	DWTC	RK-6204

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



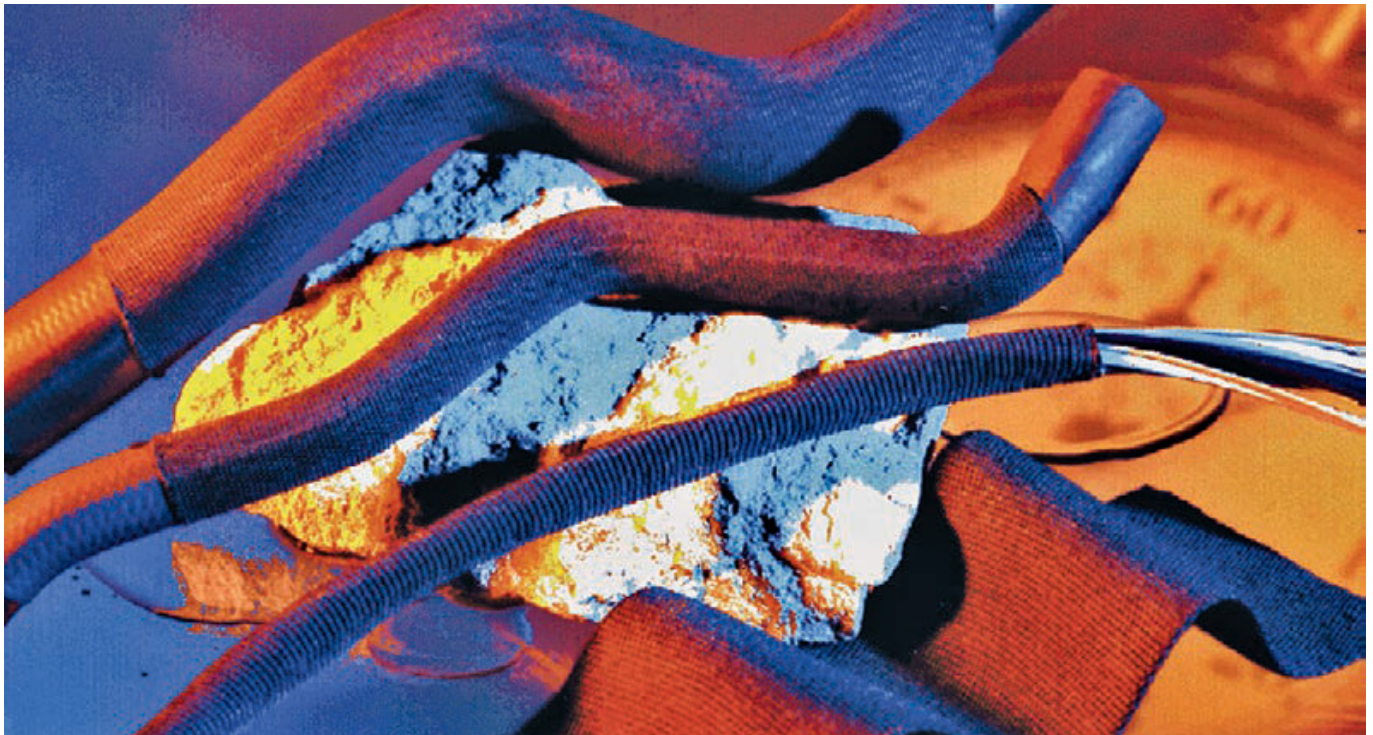
## Veratile Protection Coverings for Automotive Components

### HFT 5000 Tubing

HFT 5000 tubing products are made of very flexible heat-shrink-able fabric material, they shrink and fit snugly and securely around the underlying substrate.

Designed primarily to provide mechanical abrasion protection for components such as rubber hoses, plastic pipes, and harness wiring bundles, they are also suitable for other applications, such as noise and rattle suppression.

The woven construction makes HET 5000 extremely flexible and resistant to trapping water, heat and humidity. It provides outstanding abrasion, chafing and cutting protection, even at high temperatures HFT-5000 product is easy to install and can be cut with standard industrial cutting equipment.



### Heat shrinkable abrasion resistant woven fabric tube

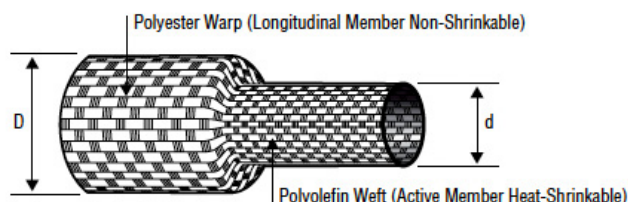
#### Benefits

- Extremely tough - meeting even demanding automotive abrasion specifications
- Protect only where protection is needed - minimising cost
- Safe installation with no hot knife cutting equipment required - reduces investment
- Soft to handle so operators do not need to wear gloves - Increases productivity
- Can be cut with conventional guillotines or even scissors
- Resists hose pulsing effects
- Halogen free
- Resistent to harsh environments such as engine compartments
- Grips substrates tightly without additional fixing
- Highly flexible woven fabric construction for easy installation onto awkward substrates such as tightly angled hoses
- ROHS/ELV compliant

## Veratile Protection Coverings for Automotive Components

### Product Features - HFT 5000 Tubing

- Continuous operating temperature from 40°C up to + 125°C (3000 hrs)  
40°C up to + 150°C (1000 hrs)
- Minimum shrink temperature: 80°C
- Minimum full recovery temperature: 110°C
- Low shrink temperature
- 2:1 shrink ratio



### Product Dimensions

Standard Sizes		
Inside Diameter		
D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	Ordering Description
12	6	HFT-5000-12/6-0
20	10	HFT-5000-20/10-0
25	12	HFT-5000-25/12-0
30	15	HFT-5000-30/15-0
34	17	HFT-5000-34/17-0
40	20	HFT-5000-40/20-0
50	25	HFT-5000-50/25-0
60	30	HFT-5000-60/30-0
70	35	HFT-5000-70/35-0
80	40	HFT-5000-80/40-0
100	50	HFT-5000-100/50-0

### Ordering Information

Standard Colour	Black (0)	
	Note: Fully recoverable fabric wall thickness: Approximately 1 mm. Longitudinal change on full recovery is -10% to -20%; 0 = Black	
	For full product performance details consult TE Automotive Specifications RW-2060.	
Specifications/ Approvals	Series	TE
	HFT 5000 Tubing	RW-2060
	Material Safety Data Sheet available on request	
	Installation instructions available on request	

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



## Automotive Hose and Pipe Protection

### RPT-120 Tubing

This resilient tubing offers an alternative to paint, particularly suitable for round substrates. It provides excellent mechanical and corrosion protection compared to paint and the high quality surface creates a quality image for the component being protected.

#### Product Features

- Provides a tough resilient layer to protect the component beneath
- Easy to install with conventional heating equipment
- Low cost of set up



Thin-wall tubing, conforms and protects substrates as a cost-effective alternative solution to paint

#### Benefits

- Provides a resilient layer protecting the component beneath from damage and corrosion
- Good surface finish giving a professional look to the final product
- Less taxing Health and Safety considerations reducing the cost of process set up
- Low shrink temperature for fast installation
- Can be printed before installation to give component details

## Automotive Hose and Pipe Protection

### Product Features - RPT-120 Tubing

- Operating temperature from 40°C up to + 120°C
- Minimum full recovery temperature: 115°C
- 2:1 shrink ratio



### Product Dimensions

Inside Diameter		Wall Thickness		
Size	D (min) Expanded as Supplied mm	d (max) Recovered after Heating mm	W (nom) Wall Thickness mm	Ordering Description
19/6	19.0	6.0	1.00	RPT-120-19/6-0
27/12.7	27.0	12.7	0.86	RPT-120-27/12.7-0

### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example RPT-120-19/6-0)	
<b>Specifications/ Approvals</b>	Series	TE
	RPT-120	RK-6765

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



Fluid Resistant



## Protection for Wire Bundles, Connectors, Terminals

### TECT Tubing

TECT is a dual wall semi-conductive heat shrinkable tubing designed to allow electrical grounding of coated fuel lines. A portion of the protective coating on the fuel line is removed exposing the bare metal core. The TECT is recovered down over the exposed metal giving an electrical grounding point whilst resealing the coated fuel line from the environment.



### Semi-conductive, dual wall, moisture proof heat shrinkable tubing

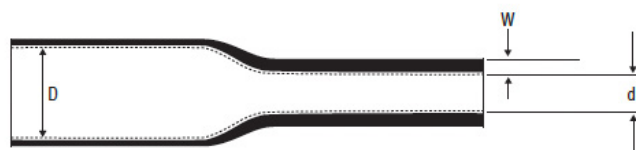
#### Benefits

- Semi-conductive
- Environmentally sealed
- Simple to install
- RoHS/ELV compliant

## Protection for Wire Bundles, Connectors, Terminals

### Product Features - TECT Tubing

- Operating temperature from 40°C up to + 120°C
- Minimum full recovery temperature: 120°C
- 2:1 shrink ratio (minimum)



### Product Dimensions

Inside Diameter		Wall Thickness		Cut Length (nom) mm	Ordering Description
D Diameter (min) mm	d Jacket Diameter (max) mm	W Jacket Wall (min) mm	Jacket and Liner L (min) mm		
13.5	5.0	1.0	1.25	30	TECT-13.5/4.5-0-XX
16.0	8.0	1.0	1.25	30	TECT-16/8-0-XX

The wall thickness of the tubing will be less than specified if recovery is restricted during shrinkage. Dimension L (Jacket and Liner) value is for reference only.

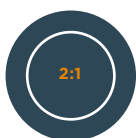
### Ordering Information

<b>Standard Colour</b>	Black (0)	
<b>Size Selection</b>	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
<b>Ordering Description</b>	Specify product name, size and colour (for example TECT-13.5/4.5-0)	
<b>Specifications/ Approvals</b>	Series	TE
	TECT	RW-2080

Operating Temperature Range



Shrinking Ratio



Shrink Temperature



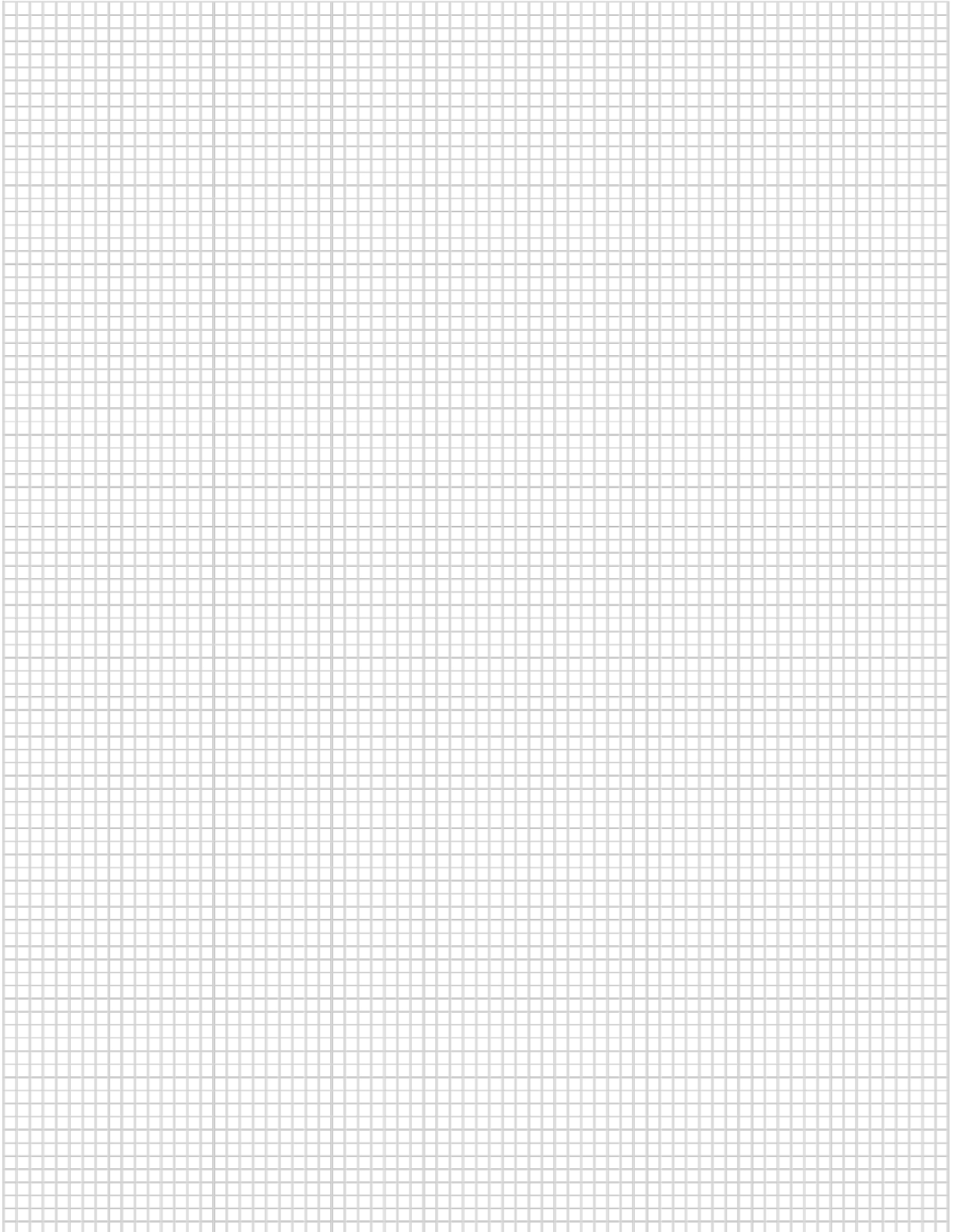
Flame Retarded



Fluid Resistant

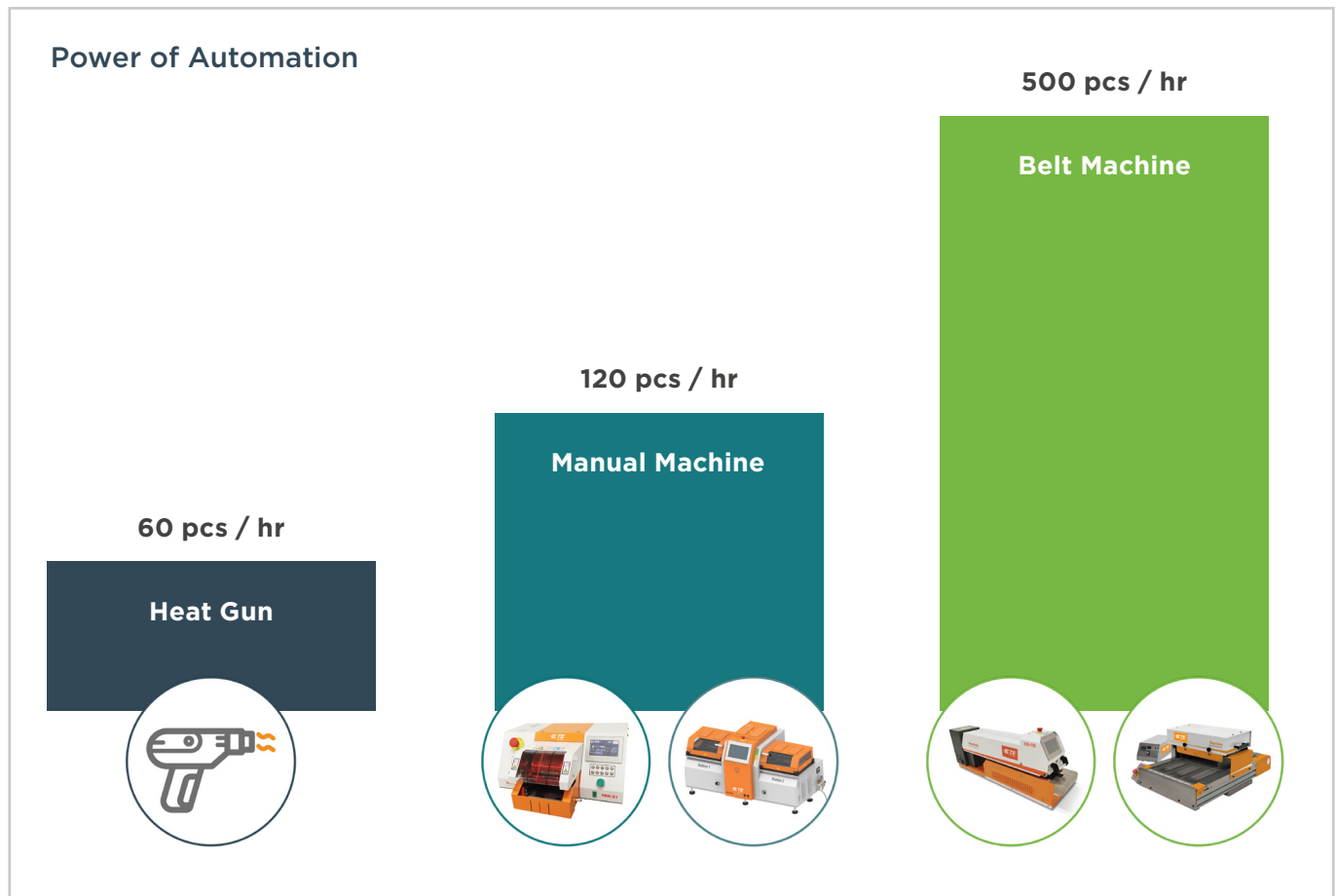


## Engineering Notes



# APPLICATION EQUIPMENT

## Machines:



		 RBK X1 & X1C	 XS-D1	 XB17 & XB-19	 Model 105
 In-Line Splice		✓	✓	✓	✓
 End (Stub) Splice		Fixture needed	✓	Fixture needed	Customized fixture needed
 Ring Terminal		Fixture needed	✓	Fixture needed	Customized fixture needed
 Wire Bundle		✗	✓	Limited to size	✓

## RBK X1 PROCESSOR

### Technical Data

- Electrical supply: 220 – 240V, 50/60 Hz
- Power consumption: 3A (max.)
- Maximum temperature setting: 500° C (possible to reach 600° C)
- Machine cycle time: 1 to 99 secs. (usual working time is 6 to 20 sec.)
- Total system noise: <80 dB
- Dimensions: 419 x 500 x 218 mm
- Weight: 24 kg

### Product Range/Sizes

- Tubing diameter: Up to 19 mm (max)
- Tubing length: Up to 65 mm (max)



### MACHINE ORDERING INFORMATION

Description	PN
RBK X1	2234800-1
RBK X1 CE	2234800-2
RBK X1 Air Cooled	1-2234800-3
RBK X1 CE Air Cooled	1-2234800-4

### ACCESSORIES ORDERING INFORMATION

Description	PN
Handheld Barcode Scanner	2234781-1
110V-220V AC transformer with US AC cord	2234986-1
Handheld Barcode Scanner (wireless)	9-2375314-9
Communication Cable	2234787-1

MES (custom only)

### CALIBRATION SOLUTIONS ORDERING INFORMATION

Description	PN
Calibration Kit (includes probe & cable)	1-2389761-2
Standard UHI Temperature Calibration Probe	288869-000
Connection Cable (applied with probe)	9-2375314-6

### Product Features

The RBK X1 processor is a semi-automatic unit designed specifically for sealing wire bundles, splice terminals and ring terminals. The RBK X1 features long life heating elements, operator key lock/password protection levels and individual selections for Installation times, temperature and product size information.

### THE RBK X1 CAN OPERATE IN SEVERAL MODES:

- Stand-alone – operator sets time and temperature
- Sequenced – preset times and temperatures can be sequenced automatically and can also be randomly selected from sequence stored
- Communication with upstream ultrasonic welder can allow time and temperature to be automatically set without operator intervention

**RBK X1 Operation:**

The operator is able to efficiently load both machines and minimize dead time. Installing splice sealing products immediately after welding gives reduced installation time and early possible mechanical protection for the welded joint.

The operator positions the splice sealing product centrally over the splice joint and then locates the assembly into the gripper mechanism. Pushing the two start buttons initiates the machine cycle, bringing the heating chamber into place over the joint area. The heating chamber remains in place for the set period and then returns to the rest position. The wire assembly is automatically ejected, with the splice sealing product installed and the joint area sealed, insulated and strain relieved.

**FIXTURE SOLUTIONS**

Description	PN
Stub Splice Fixture	981721-000 <sup>†</sup>
Air Cool Connection Box (applied with stub splice fixture 981721-000)	1-529533-7

<sup>†</sup> Custom tooling will be quoted separately

**MULTI-PURPOSE FIXTURE SOLUTIONS**

Description	PN
Cable Clamping Fixture (without AC)	2234786-1
Cable Clamping Fixture (with AC)	2234786-2

Both multi-purpose fixtures accept customized tooling

**RBK X1C PROCESSOR**

**Technical Data**

- Electrical supply: 220 - 240V, 50/60 Hz
- Power consumption: 3A (max.)
- Maximum temperature setting: 500° C (possible to reach 600° C)
- Machine cycle time: 1 to 99 secs. (usual working time is 6 to 20 sec.)
- Total system noise: <80 dB
- Dimensions: 555 x 500 x 232 mm
- Weight: 32 Kg



**Product Range/Sizes**

- Tubing diameter: Up to 19 mm (max)
- Tubing length: Up to 60 mm (max)

**MACHINE ORDERING INFORMATION**

Description	PN
Centering Device Unit Only (for upgrades)	2369600-1
RBK X1C	2376800-1
RBK X1C CE	2376800-2
RBK X1C Air Cooled	1-2376800-3
RBK X1C CE Air Cooled	1-2376800-4

**RBX X1C FIXTURE**

Description	PN
RBK X1C fixture	2369606-1

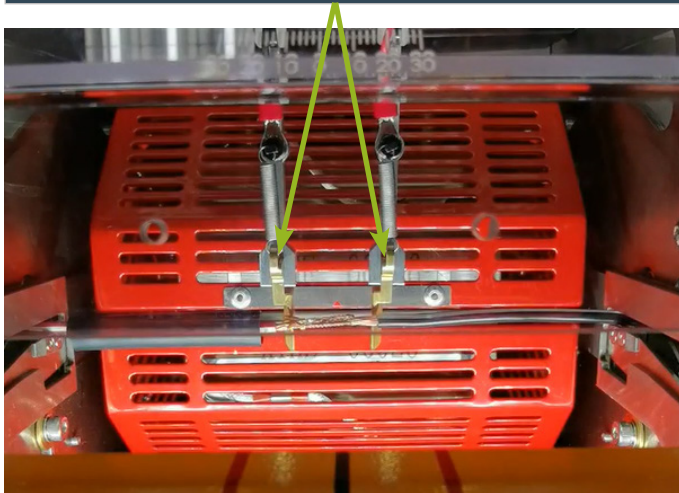
**Product Features**

Based on the RBK X1 platform, the RBK X1C machine includes an automatic centering device that help to maintain accurate wire and tubing placement.

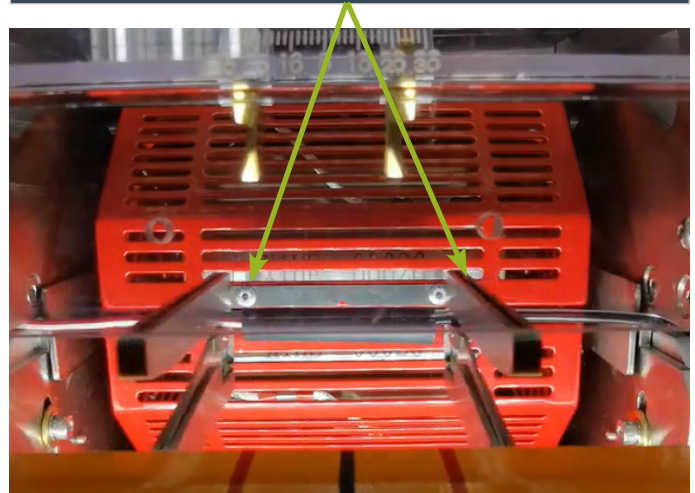
Programmable splice sensors electronically verify that wires are accurately positioned to begin the centering process. Upon validation of wire placement, the system will activate automated guide arms to properly position the tubing product into place for the heat shrink cycle to begin.

**A CLOSER LOOK AT HOW THE CENTERING DEVICE WORKS**

**Programmable sensors locate splice location for proper wire alignment**



**Automated guide arms position tubing into place for the heat cycle to begin**



**XB-17 BELT HEATER**

**Technical Data**

- Electrical supply: [PN 2375310-2] 110 VAC, 1Ø; [PN 2375310-1] 220 VAC, 1Ø
- Heating elements: 2 ea. 1000 Watts stamped foil infrared with quartz face
- Maximum temperature setting: 600° C
- Air flow (cooling): 2 - 100 CFM fans in the upper heater housing
- Conveyor belt system: Double sided timing belts; two on each side of the processor - pitch 9.5 mm [0.375 in]
- Belt speed: 2.5 - 35 mm/s
- Processor dimensions in mm (LxWxH): 1210 x 258 x 510
- Shipping dimensions in mm (LxWxH): 1570 x 540 x 770
- Processor weight: 88 Kg [194 lbs]

**Product Range/Sizes**

- Tubing diameter (max): 19 mm [0.75 in]
- Tubing length (max): Up to 90 mm [3.5 in]



**Product Features**

- Closed-loop time and temperature control
- Continuous controlled process
- Adaptable for different applications
- Emergency stop-switch
- Slim-profile benchtop design

**Easy Operation**

The XB-17 belt heater is a more reliable, safer and faster alternative to heat guns for heat shrink wire processing applications. This compact, conveyor-style machine provides a controlled process for a wide variety of heat-shrinkable tubing products. Double-sided timing belts on the top and bottom of the processing chamber draw the assemblies through a thermally controlled infrared heat zone and through a fan-cooled zone before depositing them safely into an unloading bin.

Labor costs are reduced significantly because once an assembly is loaded, the operator can begin preparing another assembly. The throughput rate is usually limited by the rate at which the operator can load assemblies into the processor.

**Controlled Heating Zone**

The XB-17 processor has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures (maximum working temperature setting is 600° C) are controlled by a thermocouple embedded into the upper heating element connected to a closed-loop temperature controller. Plus, conveyor belts reverse direction to prevent product from entering the heating chamber if the system is outside the desired temperature settings.

**Advanced Connectivity**

An integrated multi-language touchscreen interface with programmable logic system can adjust belt speed, temperature settings, and offers users the ability to create hundreds of unique profiles.

Connection ports on the XB-17 support several options such as a barcode scanner, automatic temperature calibration, and remote access to an upstream welder.

**Versatile Design**

The processor is designed to process a broad range of heat-shrinkable products up to 19 mm [0.75 in] in diameter and 90 mm [3.5 in] in length. The infrared energy source is well-suited to efficient processing of either single-wall or adhesive-lined tubing. Heat output can be controlled to accommodate a wide variety of products and substrates.

**MACHINE ORDERING INFORMATION**

Description	PN
XB-17, 220V	2375310-1
XB-17, 110V	2375310-2

## XB-19 BELT HEATER

### Technical Data

- Electrical supply: [PN 2375320-X] 220 VAC, 1Ø
- Heating elements: 2 ea; standard length (100 mm) [PN 2375320-1]; wide length (160 mm) [PN 2375320-2]
- Maximum temperature setting: 600° C
- Belt speed: 2.5 - 35 mm/s
- Processor dimensions in mm (LxWxH): 1340 x 260 x 550
- Weight: 92 kg [203 lbs]

### Product Range/Sizes

- Tubing diameter (max): 25 mm
- Tubing length 100 mm [PN 2375320-1]; 160 mm [PN 2375320-2]

### Product Features

- Adjustable belt distance to accommodate larger tubing lengths
- Closed-loop time and temperature control
- Continuous controlled process
- Adaptable for different applications
- Emergency stop-switch
- Slim-profile bench-top design

### Easy Capacity

The XB-19 machine is a continuous-running process belt heater suitable for handling a wide range of workpieces and substrates including RAYCHEM tubing products for ring and FASTON terminals.

An adjustable belt distance feature allows operators to extend the processing range of tubing products from 100 mm up to 160 mm.

### Excellent Process Control

The system provides superior heat shrink management with both the motor speed and heating elements having closed-loop control.

Two pairs of timing belts grip the individual workpieces and carry them through an infrared heating zone. The workpieces then pass through a cooling zone before finally being deposited into a collection bin.

For added safety, conveyor belts reverse direction to prevent product from entering the heating chamber if the system is outside the desired temperature settings.

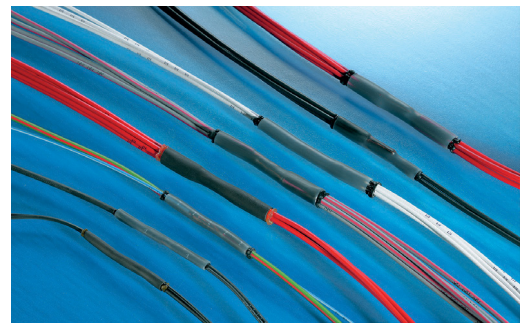
### Advanced Connectivity

An integrated multi-language touchscreen interface with programmable logic system can adjust belt speed, temperature settings, and offers users the ability to create hundreds of unique profiles.

Connection ports on the XB-19 support several options such as a bar-code scanner, automatic temperature calibration, and remote access to an upstream welder.

### Versatile Design

The processor is designed to process a broad range of heat-shrinkable products up to 25 mm in diameter and 160 mm in length. It's infrared energy source is well-suited to efficient processing of either single-wall or adhesive-lined tubing. Heat output can be controlled to accommodate a wide variety of products and substrates.



**MACHINE ORDERING INFORMATION**

Description	PN
XB-19, Standard (100 mm)	2375320-1
XB-19, Wide (160 mm)	2375320-2

**PRODUCT HOLDERS**

Please consult TE sales for the correct part numbers for your application.

**Extra Accessories for the XB-17 & XB-19 Line**

XB-17 and XB-19 belt heaters include a host of options to increase accuracy, performance and flexibility. Both models can be sold with field-installed, or factory-mounted automatic centering devices. Additional options include custom Manufacturing Execution Systems (MES), wheeled carts, and custom product holders for ring terminal and stub splice applications.



**PLUG-AND-PLAY CENTERING DEVICE**

**XB-17 & XB-19 Automatic Centering Device**

For improved accuracy, XB-17 & XB-19 model belt heaters can be equipped with an easy-to-install automatic centering device.



**XB BELT HEATER OPTIONS & ACCESSORIES**

Description	PN
XB-17 & XB-19 Automatic Centering Device	2375330-1
XB-17 / XB-19 Machine Stand	2375329-1
XB-17 Upper Heating Element (220V)	2375317-3
XB-17 Lower Heating Element (220V)	2375317-4
XB-17 Upper Heating Element (110V)	2375317-5
XB-17 Lower Heating Element (110V)	2375317-6
XB-19 Upper Heating Element (100 mm width)	2375327-3
XB-19 Lower Heating Element (100 mm width)	2375327-4
XB-19 Upper Heating Element (160 mm width)	2375327-5
XB-19 Lower Heating Element (160 mm width)	2375327-6

## XS-D1 SHUTTLE MACHINE

### Technical Data

- Electrical supply: 230 V single phase
- Power consumption: Max. 3520 W
- Maximum temperature setting: 550° C (recommended 500° C)
- Process rate: 120/hour maximum depending on application and operator
- Heating times: 3 to 99 sec. depending on application
- Weight: 170Kg
- Dimensions – (L x H x D): 1350 x 700 x 650 mm
- Product range: Wide range of RAYCHEM tubing products such as all dual wall tubes, single wall tubes and ES-Caps (maximum diameter 70 mm [2.76 in], and maximum length 100 mm [3.94 in] in-line / 250 mm [9.84 in] end)



### Product Features

- Automatic cycle start once heater is automatically positioned over product, which gives improved process control (recommended for adhesive lined heat shrinkable tubing e.g. sealing applications)
- Automatic heating head retraction at end of heating & cooling cycle helps prevent damage to components
- Multiple product fixture assemblies give increased process rates
- Automatic movement of the heaters and door opening once process is finished
- Optional quick fixture replacement
- Fixture recognition for correct product processing

### Applications

The XS-D1 is suitable for the installation of a range of RAYCHEM, heat shrinkable tubing products onto a variety of small components, e.g. ring terminals, FASTON terminals and small connectors as well as in-line products. The machine is provided with two workstations and a movable heating head.

Each workstation provides fixtures for common products, but these can be replaced by customized ones which can be specified and ordered separately. These support the workpieces and locate the tubing products. The operator loads the workpieces into the fixtures at one of the workstations, confirms that the tubing product is correctly positioned and then closes the cover, then the heat head automatically positions to start the heating cycle. The operator then continues with loading/unloading the other workstation while the heating/cooling cycle is taking place.

The XS-D1 shuttle is provided with closed loop temperature control, ensuring repeatability during production, and a calibration is also possible ensuring temperature is consistent.

Once the other workstation has been loaded and the first installation is complete, the heat head is moved into position over the product and the next heating cycle initiated. Heating times vary typically from 3 to 30 seconds depending on the size and type of tubing product. Process rates up to 120 pieces/hour can be achieved depending on the heating time and the time taken by the operator to load/unload the workpieces. Cooling time can also be programmed to handle safely products once process is finished.

The installation temperature/power can be varied according to product type/size and required cycle times.

The heating elements, which are continuously energized, are infrared medium wavelength and consists of a coiled resistance wire contained in quartz glass plates. The closed loop temperature control uses similar elements but has integral thermocouple sensor.

### ORDERING INFORMATION

Description	PN
XS-D1 Standard	2410400-1
XS-D1 Plus	2410400-2

The XS-D1 shuttle machine is also available with customized fixtures. Ordering information is available upon request.

## MODEL 105 TUNNEL OVEN

### Technical Data

- Electrical supply: 210 – 240 VAC, 20 A, 50/60 Hz
- Heating elements: (2) 1500 W infrared stamped foil with black quartz face
- Drive system: DC gear motor with closed loop motor controller, 3-digit thumb-wheel
- Air flow (cooling): 4 – 100 CFM fans, 2 – for upper heater housing, 2 – for product cooling
- Maximum temperature setting: 600° C
- Conveyor belt system: Wire mesh 70% open
- Belt speed: 6.1 – 152 cm [0.2 – 5.0 ft] per minute
- Processor dimensions (L x W x H): 99 x 68.5 x 41.7 cm
- Control box dimensions (L x W x H): 51.5 x 21.0 x 17.8 cm
- Control box weight: 7.7 kg (17 lbs)
- Shipping dimensions (L x W x H): 134.6 x 116.8 x 63.5 cm
- Shipping weight: 146 kg [320 lbs]
- Tubing diameter (max): 98 mm [3.86 in]
- Tubing length (max): 356 mm [14 in] perpendicular to belt travel, unlimited length parallel to belt travel



### Product Features

- Closed-loop speed and temperature control
- Continuous controlled process
- Adaptable for different applications
- Heater operation and over-temperature alarm lights
- CE approved

### Ordering Information

- Model 105 Tunnel Oven CLTEQ-M105-TUNNEL-OVEN, [PN: 955018-000] (Custom variations available upon request)

### Applications

The Model 105 tunnel oven is a reliable and versatile process heater which provides a controlled process for a wide variety of heat shrinkable products.

It is designed as an integrated modular unit. Assemblies are placed on the entry section of a mesh conveyor belt, transported through the heating chamber, across a bank of cooling fans then discharged from the rear of the conveyor.

The upper chamber is cantilevered to permit processing of assemblies that require only a portion of the assembly to pass through the heat zone and is equipped with adjustable heat shields to maximize the oven heating efficiency for various applications.

### Controlled Heating Zone

Two stamped foil heating elements provide consistent temperatures (ambient to 600° C) and are controlled by a thermocouple embedded into the upper heating element connected to a closed-loop temperature controller. An alarm light illuminates whenever the actual heating element temperature varies from the set point temperature.

### Conveyor Speed Control

The conveyor speed is precisely set by a 3-digit drive controller. The DC drive motor provides constant conveyor speed at any potentiometer setting from 100 to 999 mm [0.2 to 5.0 ft] per minute, for precise heating of assemblies.

**Minimal Skill Requirements**

The open loading area of the entry section requires that the operator simply place an assembly on the mesh conveyor belt within the effective width of the heat zone and collect it at the opposite end.

**Versatility**

The processor is designed to process a broad range of heat shrinkable products up to 76.2 mm in diameter and infinite length. The infrared energy source is for efficient processing of either single-wall or adhesive-lined tubing. Heat output and drive speed can be controlled to accommodate a wide variety of products and substrates such as HFT 5000, AP-2000, QSZH 125 and other RAYCHEM tubing products.

**MACHINE ORDERING INFORMATION**

Description	PN
Model 105 Tunnel Oven, Standard	955018-000

**AD-3050 SEAL TEST EQUIPMENT**

**Ordering Information**

- AD-3050-SEAL-TEST-EQ-NC **PN: C82893-000**
- Version with integrated timer: AD-3050-SEAL-TEST-EQ-NC-TIMER **PN: 528024-1** (Timer retrofit kit available)

**Product Features**

- Fast determination of sealing integrity
- Multiple test fixtures
- Easy load and release of test samples
- Connector seal test port
- Timer adjustable from 8 - 120 seconds (only with integrated AD-3050 Seal Test Equipment timer version)



**Technical Data**

- Pneumatic supply: 600 kPa / 6 bar maximum, filtered supply 200 kPa / 2 bar test pressure maximum (Test pressure typically 50 kPa / 0.5 bar)
- Machine cycle times for seal testing: Typically 1 min.
- Total system noise: Negligible noise from air test
- Dimensions: 550 x 350 x 215 mm (21.7 x 13.8 x 8.5 in) (excludes packing case)
- Weight: 4 Kg (excludes packing case)

**MACHINE ORDERING INFORMATION**

Description	PN
AD3-3050 Seal Tester	C82893-000
AD3-3050 Seal Tester with Timer	528024-1

**ACCESSORIES ORDERING INFORMATION**

Description	PN
AD-3050 Seal Kit, 8 Positions	299155-000
Timer Retrofit Kit	4-529533-7

This kit converts C82893-000 seal tester to 528024-1

The AD-3050 is a manually operated pneumatic device, intended for use as a convenient “in process” sampling technique for checking sealed splices.

Different combinations of in-line, end-/stub-splices and various ring terminal applications can be pressure tested in any of the combination of fixtures (8 in total).

There is also a facility to allow leak testing of various connectors. The tool is also intended for use as a quick and easy sampling technique for the preliminary selection of installation conditions where RAYCHEM splice protection products are used.

TE has seen good correlation between results obtained with the AD-3050 seal test and those obtained through water immersion testing. However testing in accordance with the Original Equipment Manufacturer (OEM) specification is the only way of confirming that the OEM specification is being met.

The splice products are located in clamps which deliver the test pressure. The product is immersed in water and pressure is delivered through the wire(s) to the sealed area.

The test result is determined visually by looking for bubbles in the area of the sealing product. Connectors can also be pressure tested by adapting the separate supply fixture to any connector type. Use of this equipment is described in TE's customer manual. This equipment can also check for instances where individual wire strands poke through the installed heat shrinkable sleeve.

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## FIELD SERVICE SUPPORT

### SERVICES

#### Standard Service

Includes troubleshooting and making repairs

#### Equipment Installation

Providing installation, set-up and training at time of equipment delivery

#### Training

- Basic crimp theory
- Hand tool, applicator and equipment set-up, operation and maintenance

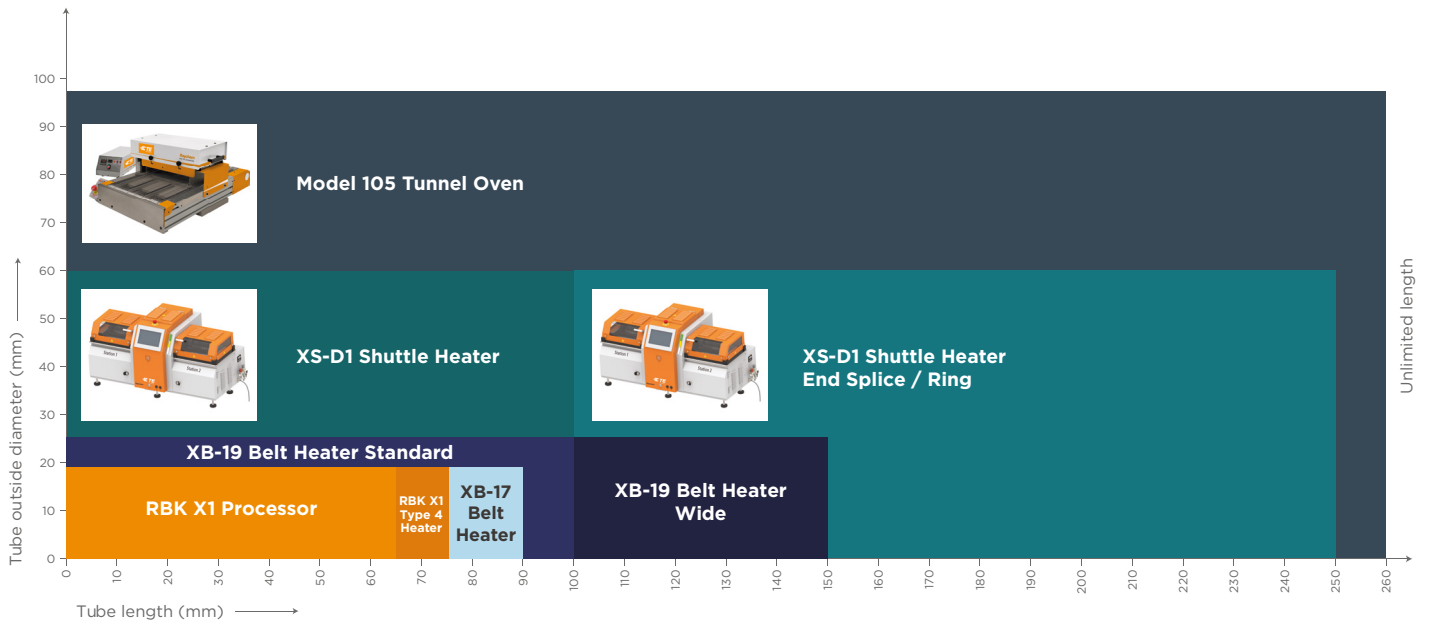
#### Preventive Maintenance and/or Inspection Certification

Provides service for periodic visits to perform preventive maintenance and/or inspection certification service on hand tools, applicators and bench equipment. Inspection of the finished product is made to confirm it meets TE application specifications. Documentation is available upon request for traceability to support your facilities' quality system requirements.



## Heat Shrink Machine Selection Guide Based on Tubing Dimensions

						
	RBK X1 Processor	XB-17 Belt Heater	XB-19 Belt Heater Standard	XB-19 Belt Heater Wide	XS-D1	Model 105
Tube length	0...65mm (Standard) 0...75mm (Type 4 heater)	0...90mm	0...100mm	0...160mm	0...100mm (In-line) 0...250mm (End & Ring)	Unlimited length (width: 356mm)
Tube diameter	0...19mm	0...19mm	0...25mm	0...25mm	0...60mm	0...96mm



## Sealing Matrix

Application	Products								
	QSZH	RBK-ILS	RBK-VWS	ES-CAP	SCT	RBK-RTP	HTAT	RBK-105-KIT	RBK-85-KIT
Splice Sealing - Inline	✓	✓	✓		✓				
Splice Sealing - Stub				✓					
Ring Terminal Sealing	✓	✓	✓		✓	✓			
Connector Sealing					✓		✓		
Bundle Wire Sealing								✓	✓

[Click here for more information about tubing](#)

## Engineering Notes



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