



# RAYCHEM TUBING PRODUCTS

SINGLE WALL, DUAL WALL, HEAVY DUTY,  
SPECIAL PURPOSE AND MEDICAL-GRADE

**Restriction on the use of  
Hazardous Substances  
(RoHS)**

At TE Connectivity (TE), we're ready to support your RoHS requirements. We've assessed more than 1.5 million end items/components for RoHS compliance, and issued new part numbers where any change was required to eliminate the restricted materials.

Part numbers in this catalog are RoHS Compliant, unless marked otherwise. These products comply with European Union Directive 2002/95/EC, as amended 1 January 2006, that restricts the use of lead, mercury, cadmium, hexavalent chromium, PBB, and PBDE in certain electrical and electronic products sold into the EU as of 1 July 2006.

Note: For purposes of this Catalog, included within the definition of RoHS Compliant are products that are clearly "Out of Scope" of the RoHS Directive such as hand tools and other nonelectrical accessories. Information regarding RoHS compliance is provided based on reasonable inquiry of our suppliers and represents our current actual knowledge based on the information provided by our suppliers. This information is subject to change.

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- Downloadable Technical Data
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| BSTS/BSTS-FR                               | General purpose, heat-shrinkable tubing . . . . . 1-5, 1-6                                                        |
| CGAT                                       | Adhesive-lined, flexible, polyolefin heat-shrinkable tubing . . . . . 1-7, 1-8                                    |
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| DCPT                                       | Flexible, flame-retardant, dual-color, polyolefin tubing . . . . . 1-15, 1-16                                     |
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| HFT5000                                    | Heat-shrinkable fabric tubing . . . . . 1-39, 1-40                                                                |
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| HRHT                                       | High-ratio, high-temperature, flexible,<br>thick wall polyolefin heat-shrinkable tubing . . . . . 1-43, 1-44      |
| HT-200                                     | High-clarity, highly flame-resistant, very flexible,<br>fluoropolymer heat-shrinkable tubing . . . . . 1-45, 1-46 |
| HTAT                                       | Semiflexible, dual wall, moisture-resistant,<br>heat-shrinkable tubing . . . . . 1-47, 1-48                       |
| LSTT                                       | Low-shrink-temperature, non-flame-retardant,<br>heat-shrinkable, polyolefin tubing . . . . . 1-49, 1-50           |
| MicroFit                                   | Small-diameter, high-shrink-ratio tubing . . . . . 1-51, 1-52                                                     |
| MT1000                                     | Altera medical-grade, USP Class VI, high-temperature,<br>semirigid, fluoropolymer tubing . . . . . 1-53, 1-54     |
| MT2000                                     | Altera medical-grade, USP Class VI, lubricious,<br>thin-wall, polyolefin tubing . . . . . 1-55, 1-56              |
| MT3000                                     | Altera medical-grade, USP Class VI, high-temperature<br>flexible, fluoropolymer tubing . . . . . 1-57, 1-58       |
| MT5000                                     | Altera medical-grade, USP Class VI, flexible,<br>polyolefin tubing . . . . . 1-59, 1-60                           |
| MT6000                                     | Altera medical-grade, USP Class VI, high-shrink-ratio,<br>polyolefin tubing . . . . . 1-61, 1-62                  |
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| NT                         | Flexible, general purpose modified elastomeric tubing . . . . .                                                     | 1-67, 1-68       |
| NT-MIL                     | Flexible, rugged, modified elastomeric tubing. . . . .                                                              | 1-69, 1-70       |
| NTFR                       | Very flexible, rugged neoprene elastomer tubing . . . . .                                                           | 1-71, 1-72       |
| PD Caps                    | Semirigid, encapsulant-lined, polyolefin caps . . . . .                                                             | 1-73, 1-74       |
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| Rayrim                     | Commercial protective, self-adhering, edging material . . . . .                                                     | 1-81, 1-82       |
| RaySpool                   | Convenient packaging and dispensing system for heat-shrinkable tubing. . . . .                                      | 1-83, 1-84, 1-85 |
| RHW                        | Rugged, heavy wall, adhesive-lined, polyolefin heat-shrinkable tubing . . . . .                                     | 1-87, 1-88       |
| RMW                        | Medium wall, polyolefin heat-shrinkable tubing. . . . .                                                             | 1-89, 1-90       |
| RNF-100                    | Flexible, flame-retardant, general purpose, polyolefin tubing. . . . .                                              | 1-91, 1-92       |
| RNF-150                    | High-performance, flame-resistant, flexible, fluoropolymer tubing . . . . .                                         | 1-93, 1-94       |
| RNF-3000                   | Flexible, high-shrink-ratio, flame-retardant, general purpose, polyolefin tubing . . . . .                          | 1-95, 1-96       |
| RP-4800                    | High-shrink-ratio, flame-retardant, polyolefin tubing . . . . .                                                     | 1-97, 1-98       |
| RPPM                       | Flexible, dual wall, moisture proof, heat-shrinkable tubing . . . . .                                               | 1-99, 1-100      |
| RT-3                       | Semirigid, flame-retardant, polyolefin tubing. . . . .                                                              | 1-101, 1-102     |
| RT-375                     | Clear, flame-resistant, flexible, fluoropolymer tubing. . . . .                                                     | 1-103, 1-104     |
| RT555                      | Fluid-resistant, chemical-resistant, crosslinked fluoropolymer tubing with extended temperature range . . . . .     | 1-105, 1-106     |
| RW-175/RW-175-E            | High-temperature, chemical-resistant, polyvinylidene fluoride tubing . . . . .                                      | 1-107, 1-108     |
| RW-200/RW-200-E            | Heat-shrinkable, chemical-resistant, high-temperature tubing. . . . .                                               | 1-109, 1-110     |
| SCL                        | Semirigid, encapsulant-lined, polyolefin tubing . . . . .                                                           | 1-111, 1-112     |
| SCT                        | Flame-retardant, adhesive-lined, semirigid polyolefin heat-shrinkable tubing (extended temperature range) . . . . . | 1-113, 1-114     |
| SFR                        | Very flexible, flame-retardant, silicone elastomer tubing . . . . .                                                 | 1-115, 1-116     |
| SRFR                       | Highly flexible, silicone rubber tubing . . . . .                                                                   | 1-117, 1-118     |
| SST/SST-FR                 | Self-sealing, heat-shrinkable tubing . . . . .                                                                      | 1-119, 1-120     |
| TAT-125                    | Adhesive-lined, flexible polyolefin tubing. . . . .                                                                 | 1-121, 1-122     |
| TC Caps                    | Semirigid, flame-retardant polyolefin caps . . . . .                                                                | 1-123, 1-124     |
| TFE and TFER               | High-temperature, chemically inert, modified tubing made of PTFE . . . . .                                          | 1-125, 1-126     |
| Tubing Kits and MiniSpools | Smaller packaging options for single wall and adhesive-lined tubing products . . . . .                              | 1-127, 1-128     |
| TUGA-GP                    | Shiny, non-flame-retardant, polyolefin tubing. . . . .                                                              | 1-129, 1-130     |
| URHT                       | Ultra high-ratio, flame-retardant, polyolefin heat-shrinkable tubing . . . . .                                      | 1-131, 1-132     |
| Versafit                   | Highly flame-retardant, very flexible, low-shrink-temperature, polyolefin tubing. . . . .                           | 1-133, 1-134     |
| Versafit-3X                | Very flexible, high-shrink-ratio, highly flame-retardant, low-shrink-temperature, polyolefin tubing. . . . .        | 1-135, 1-136     |



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| Versafit V4 | Very-thin-wall, very flexible, highly flame-retardant, polyolefin tubing . . . . .                                   | 1-139, 1-140 |
| Versaflex   | Expandable, braided, polyester sleeving . . . . .                                                                    | 1-141, 1-142 |
| XFFR        | Halogen-free, flame-retardant, heat-shrinkable tubing . . . . .                                                      | 1-143, 1-144 |
| ZH2         | Flexible, highly flame-retardant, low recovery temperature, ZEROHAL polyolefin tubing . . . . .                      | 1-145, 1-146 |
| ZH4         | Very-thin-wall, very flexible, highly flame-retardant, low recovery temperature, ZEROHAL polyolefin tubing . . . . . | 1-147, 1-148 |
| ZH-100      | Flexible, thin-wall, low-fire-hazard tubing . . . . .                                                                | 1-149, 1-150 |
| ZHTM        | Heat-shrinkable, flexible tubing with low toxicity for fire safety applications . . . . .                            | 1-151, 1-152 |

## Application Equipment

|                        |                                                                    |            |
|------------------------|--------------------------------------------------------------------|------------|
| HL1910E/HL2010E        | Light duty heating tool . . . . .                                  | 2-3, 2-4   |
| ThermoGun HG           | Medium duty heating tool . . . . .                                 | 2-5, 2-6   |
| CV-1981 and CV-1983    | Heavy duty hot-air heating tool . . . . .                          | 2-7, 2-8   |
| IR-1891                | Heating work station for short length tubing . . . . .             | 2-9, 2-10  |
| Model 81CE             | Discrete heater for heat-shrinkable tubing products . . . . .      | 2-11, 2-12 |
| RBK-ILS-Processor MkII | Installation of splice sealing products . . . . .                  | 2-13, 2-14 |
| Model 105              | Tabletop tunnel oven . . . . .                                     | 2-15, 2-16 |
| Model 16B              | Tabletop belt heater . . . . .                                     | 2-17, 2-18 |
| Model 19               | Belt heater for heat-shrinkable tubing products . . . . .          | 2-19, 2-20 |
| Model 20               | Belt heater for heat-shrinkable tubing products . . . . .          | 2-21, 2-22 |
| VBH-1                  | Versatile bed heater for large assemblies and substrates . . . . . | 2-23, 2-24 |

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## Overview

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TE Connectivity's (TE) Raychem brand of tubing was developed when our scientists pioneered the application of radiation crosslinking and the development of heat-shrinkable polymer products. Today TE is recognized worldwide for its expertise in these areas.

The Raychem brand of tubings are made of polyolefins, fluoropolymers, and elastomers enhanced by radiation crosslinking and heat-shrinkability. When

heated during installation, our tubings shrink to conform to virtually any shape. They provide dependable insulation, mechanical protection, and strain relief, as well as aesthetic appeal.

Single wall tubings are available in thin-wall, medium-wall, and thick-wall versions. With dual wall tubings, an inner wall — either an encapsulant or an adhesive — melts and flows during installation heating, to protect against

environmental damage. Encapsulants protect connections and components from splashes and corrosion. Adhesives go a step further, sealing to plastic, metal, rubber, or other substrates.

You can choose from tubings that are highly flexible or semirigid, 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 colors to meet commercial, military or medical specifications, our tubings can also be customized for special applications.

Installation is fast and easy with handheld heating tools or bench-mounted heaters. A range of automatic and semi-automatic installation equipment is available for high-volume applications.

## Tubing Categories

| Single Wall     | Type             | Product Name                  |                                         |                                 |                  |
|-----------------|------------------|-------------------------------|-----------------------------------------|---------------------------------|------------------|
|                 | Very Flexible    | LSTT<br>Versafit              | Versafit V2<br>Versafit V4              | Versafit 3X                     |                  |
|                 | Flexible         | BRST<br>CGPE-105<br>CGPT      | DCPT<br>RNF-100<br>RNF-3000             | RP-4800<br>TUGA                 |                  |
|                 | Semirigid        | CRN                           | RT-3                                    |                                 |                  |
| Dual Wall       | Semi-flexible    | ATUM<br>DWFR                  | DWP-125<br>HTAT                         |                                 |                  |
|                 | Flexible         | CGAT<br>DWTC                  | PTCM<br>RPPM                            | TAT-125                         |                  |
|                 | Semirigid        | DSPL<br>ES1000                | ES2000<br>FL2500                        | SCL<br>SCT                      |                  |
| Heavy Duty      |                  | BSTS/BSTS-FR<br>HF            | HRHT<br>HRHF/HRNF/HRSR<br>RMW           | RHW<br>SST/SST-FR<br>URHT       |                  |
| Special Purpose | Elastomers       | DR-25<br>NT<br>NT-MIL<br>NTFR | RW-200<br>RW-200-E<br>SFR<br>SRFR       |                                 |                  |
|                 | Fluoropolymers   | HT-200<br>RNF-150             | RT-375<br>RT555                         | RW-175/RW-175-E<br>TFE and TFER |                  |
|                 | MicroFit         | MFT-MT1000                    | MFT-MT2000                              |                                 |                  |
|                 | Caps             | ES Caps<br>PD Caps            | TC Caps                                 |                                 |                  |
|                 | Conduit          | HCTE                          |                                         |                                 |                  |
|                 | Kits             | RayBlock 85<br>RayBlock 105   | RaySpool<br>Tubing Kits and Mini-Spools |                                 |                  |
|                 | Low toxicity     | XFFR<br>ZH-100                | ZH2<br>ZH4                              | ZHTM                            |                  |
|                 | Edging material  | Rayrim                        |                                         |                                 |                  |
|                 | Fiber and fabric | HFT5000                       |                                         |                                 |                  |
|                 | Braid            | Versaflex                     |                                         |                                 |                  |
| Medical-grade   |                  | MFT-MT1000<br>MFT-MT2000      | MT1000<br>MT2000<br>MT3000              | MT5000<br>MT6000                | MT-FEP<br>MT-LWA |

## Tubing Selection Guide

| PRODUCT                                                 |                |                 | Polyolefin | Fluoropolymer | Elastomer | Operating Temperature °C / [°F] |               | Min. shrink temperature (°C) | Min. full recovery temperature (°C) | Shrink ratio    |
|---------------------------------------------------------|----------------|-----------------|------------|---------------|-----------|---------------------------------|---------------|------------------------------|-------------------------------------|-----------------|
| <b>Single Wall</b>                                      | Very flexible  | LSTT            | •          |               |           | -40 to 125                      | [-40 to 257]  | 65                           | 110                                 | 2:1             |
|                                                         |                | Versafit        | •          |               |           | -55 to 135                      | [-67 to 275]  | 70                           | 90                                  | 2:1             |
|                                                         |                | Versafit-3X     | •          |               |           | -55 to 135                      | [-67 to 275]  | 70                           | 90                                  | 3:1             |
|                                                         |                | Versafit V2     | •          |               |           | -30 to 125                      | [-22 to 257]  | 70                           | 90                                  | 2:1             |
|                                                         |                | Versafit V4     | •          |               |           | -30 to 125                      | [-22 to 257]  | 70                           | 90                                  | 2:1             |
|                                                         | Flexible       | BRST            | •          |               |           | -40 to 120                      | [-40 to 248]  | 95                           | 130                                 | 2:1             |
|                                                         |                | CGPE-105        | •          |               |           | -70 to 105                      | [-94 to 221]  | 85                           | 110                                 | 2:1             |
|                                                         |                | CGPT            | •          |               |           | -40 to 135                      | [-40 to 275]  | 80                           | 120                                 | 2:1             |
|                                                         |                | DCPT            | •          |               |           | -55 to 135                      | [-67 to 275]  | 95                           | 120                                 | 2:1             |
|                                                         |                | RNF-100         | •          |               |           | -55 to 135                      | [-67 to 275]  | 95                           | 121                                 | 2:1             |
|                                                         |                | RNF-3000        | •          |               |           | -55 to 135                      | [-67 to 275]  | 80                           | 120                                 | 3:1             |
|                                                         |                | RP-4800         | •          |               |           | -55 to 135                      | [-67 to 275]  | 95                           | 121                                 | 4:1             |
|                                                         |                | TUGA            | •          |               |           | -55 to 125                      | [-67 to 257]  | 85                           | 110                                 | 2:1             |
|                                                         |                | CRN             | •          |               |           | -55 to 135                      | [-67 to 275]  | 110                          | 135                                 | 2:1             |
|                                                         |                | RT-3            | •          |               |           | -55 to 135                      | [-67 to 275]  | 110                          | 135                                 | 2.5:1           |
| <b>Dual wall</b><br>[adhesive-and<br>encapsulant-lined] | Semiflexible   | ATUM            | •          |               |           | -55 to 110                      | [-67 to 230]  | 80                           | 110                                 | 3:1             |
|                                                         |                | DWFR            | •          |               |           | -40 to 110                      | [-40 to 230]  | 60                           | 110                                 | 3:1             |
|                                                         | Flexible       | DWP-125         | •          |               |           | -40 to 110                      | [-40 to 230]  | 80                           | 125                                 | 3:1             |
|                                                         |                | HTAT            | •          |               |           | -55 to 125                      | [-67 to 257]  | 80                           | 110                                 | 4:1             |
|                                                         |                | CGAT            | •          |               |           | -30 to 80                       | [-22 to 176]  | 80                           | 115                                 | 3:1             |
|                                                         |                | DWTC            | •          |               |           | -55 to 75                       | [-67 to 167]  | 60                           | 100                                 | 4:1             |
|                                                         |                | PTCM            | •          |               |           | -40 to 85                       | [-40 to 185]  | 60                           | 80                                  | 6:1             |
|                                                         |                | RPPM            | •          |               |           | -40 to 85                       | [-40 to 185]  | 60                           | 80                                  | 4:1             |
|                                                         |                | TAT-125         | •          |               |           | -55 to 110                      | [-67 to 230]  | 95                           | 121                                 | 2:1             |
|                                                         |                | DSPL            | •          |               |           | -40 to 125                      | [-40 to 257]  | 110                          | 135                                 | 4:1             |
|                                                         | Semirigid      | ES1000          | •          |               |           | -40 to 130                      | [-40 to 266]  | 110                          | 135                                 | 4:1             |
|                                                         |                | ES2000          | •          |               |           | -40 to 130                      | [-40 to 266]  | 110                          | 135                                 | 4:1             |
|                                                         |                | FL2500          | •          |               |           | -40 to 135                      | [-40 to 275]  | 110                          | 135                                 | 4:1             |
|                                                         |                | SCL             | •          |               |           | -55 to 110                      | [-67 to 230]  | 125                          | 135                                 | 3:1             |
|                                                         |                | SCT             | •          |               |           | -40 to 150                      | [-40 to 302]  | 110                          | 135                                 | 4:1             |
| <b>Heavy Duty</b>                                       |                | BSTS/BSTS-FR    | •          |               |           | -55 to 90                       | [-67 to 194]  | 90                           | 121                                 | 3:1             |
|                                                         |                | HF              | •          |               |           | -55 to 90                       | [-67 to 194]  | 80                           | 121                                 | 3:1             |
|                                                         |                | HRHF/HRNF/HRSR  | •          |               |           | -55 to 90                       | [-67 to 194]  | 80                           | 121                                 | 5.6:1           |
|                                                         |                | RHW             | •          |               |           | -55 to 110                      | [-67 to 230]  | 110                          | 125                                 | 3:1             |
|                                                         |                | RMW             | •          |               |           | -55 to 110                      | [-67 to 230]  | 110                          | 125                                 | 3:1             |
|                                                         |                | SST/SST-FR      | •          |               |           | -55 to 90                       | [-67 to 194]  | 90                           | 121                                 | 3:1             |
| <b>Special Purpose</b>                                  | Elastomers     | DR-25           |            |               | •         | -75 to 150                      | [-103 to 302] | 150                          | 175                                 | 2:1             |
|                                                         |                | NT              |            |               | •         | -55 to 90                       | [-67 to 194]  | 90                           | 135                                 | 2:1             |
|                                                         |                | NT-MIL          |            |               | •         | -70 to 121                      | [-94 to 250]  | 90                           | 135                                 | 2:1             |
|                                                         |                | NTFR            |            |               | •         | -70 to 121                      | [-94 to 250]  | 90                           | 135                                 | 2:1             |
|                                                         |                | RW-200          |            |               | •         | -40 to 200                      | [-40 to 392]  | 100                          | 175                                 | 2:1             |
|                                                         |                | RW-200-E        |            |               | •         | -55 to 200                      | [-67 to 392]  | 100                          | 175                                 | 2:1             |
|                                                         |                | SFR             |            |               | •         | -75 to 180                      | [-103 to 356] | 135                          | 175                                 | 1.75:1          |
|                                                         |                | SRFR            |            |               | •         | -75 to 200                      | [-103 to 392] | 135                          | 175                                 | 1.5:1           |
|                                                         |                | HT-200          |            | •             |           | -70 to 200                      | [-94 to 392]  | 110                          | 130                                 | 2:1             |
|                                                         |                | RNF-150         |            | •             |           | -55 to 150                      | [-67 to 302]  | 110                          | 150                                 | 2:1             |
|                                                         | Fluoropolymers | RT-375          |            | •             |           | -55 to 150                      | [-67 to 302]  | 125                          | 150                                 | 2:1             |
|                                                         |                | RT555           |            | •             |           | -65 to 200                      | [-85 to 392]  | 150                          | 220                                 | 2:1             |
|                                                         |                | RW-175/RW-175-E |            | •             |           | -55 to 175                      | [-67 to 347]  | 155                          | 175                                 | 2:1             |
|                                                         |                | TFE and TFER    |            | •             |           | -67 to 250                      | [-89 to 482]  | 330                          | 340                                 | 1.8:1/<br>3.2:1 |
|                                                         |                | MT1000          |            | •             |           | -55 to 175                      | [-67 to 347]  | 155                          | 175                                 | 2:1             |
|                                                         |                | MT2000          | •          |               |           | -40 to 105                      | [-40 to 221]  | 110                          | 140                                 | 2.5:1           |
|                                                         | Medical-grade  | MT3000          |            | •             |           | -55 to 150                      | [-67 to 302]  | 110                          | 150                                 | 2:1             |
|                                                         |                | MT5000          | •          |               |           | -70 to 105                      | [-94 to 221]  | 90                           | 110                                 | 2:1             |
|                                                         |                | MT6000          | •          |               |           | -70 to 90                       | [-94 to 194]  | 90                           | 110                                 | 4:1             |
|                                                         |                | MT-FEP          |            | •             |           | -70 to 190                      | [-94 to 374]  | 190                          | 210                                 | 1.6:1           |
|                                                         |                | MT-LWA          | •          |               |           | Same as RNF-100-clear           |               |                              |                                     |                 |
|                                                         |                | MicroFit        |            | •             |           | -55 to 125                      | [-67 to 257]  | 155                          | 175                                 | 2.5:1           |
|                                                         |                | MFT-MT1000      | •          |               |           | -40 to 105                      | [-40 to 221]  | 110                          | 140                                 | 2.5:1           |

\*For specific MIL-Spec information for each product, refer to individual product pages or the Tubing Cross-Reference Guide on page x-xi.

\*\*Sizes 12/3 through 70/20 only.

†Clear is not flame-retardant.

‡ Sizes 1/8 through 3/4 only.

## Tubing Selection Guide (Continued)

| Size range<br>(inside<br>diameter as<br>supplied) | Colored | Clear | Flame-<br>retardant | UL 224 | CSA | VW-1 (UL/CSA) | MIL Spec* | USP Class VI | ABS | UL D486** | DESCRIPTION                                                        |
|---------------------------------------------------|---------|-------|---------------------|--------|-----|---------------|-----------|--------------|-----|-----------|--------------------------------------------------------------------|
| 1.6 mm to 38 mm                                   | •       | •     |                     |        |     |               |           |              |     |           | Non-flame-retardant polyolefin                                     |
| 3/64" to 4"                                       | •       |       | •                   | •      | •   | •             | •         |              |     |           | Highly flame-retardant, multi-spec polyolefin                      |
| 1/8" to 1"                                        | •       |       | •                   | •      | •   | •             |           |              |     |           | 3:1 shrink ratio, highly flame-retardant polyolefin                |
| 1 mm to 30 mm                                     | •       |       | •                   | •      | •   | •             |           |              |     |           | Highly flame-retardant polyolefin                                  |
| 3/64" to 1"                                       | •       |       | •                   | •      | •   | •             |           |              |     |           | Very-thin-wall, highly flame-retardant polyolefin                  |
| 1 mm to 10 mm                                     | •       |       | •                   | •      | •   | •             |           |              |     |           |                                                                    |
| 4 mm to 24 mm                                     | •       |       |                     |        |     |               |           |              |     |           | 2:1 shrink ratio, black, round, flexible tubing                    |
| 3/64" to 2"                                       | •       | •     |                     |        |     |               |           |              |     |           | Brightly colored, general purpose polyolefin                       |
| 1.6 mm to 38 mm                                   | •       | •     | •                   | •      | •   |               |           |              |     |           | General purpose, flame-retardant polyolefin†                       |
| 3 mm to 38 mm                                     | •       |       | •                   | •      | •   |               |           |              |     |           | Green and yellow striped polyolefin                                |
| 3/64" to 5"                                       | •       | •     | •                   | •      | •   |               | •         |              |     |           | High-performance flexible polyolefin†                              |
| 1.5 mm to 39 mm                                   | •       | •     | •                   | •      | •   |               |           |              |     |           | 3:1 shrink ratio general-purpose polyolefin†                       |
| 3/4" to 4 1/2"                                    | •       |       | •                   | •      |     |               | •         |              |     |           | 4:1 shrink ratio polyolefin                                        |
| 1.2 mm to 38 mm                                   | •       |       |                     |        |     |               |           |              |     |           | Shiny, tough polyolefin                                            |
| 3/64" to 3/4"                                     | •       | •     | •                   | •      | •   |               | •         |              |     |           | Flame-retardant polyolefin†                                        |
| .240" to .485"                                    | •       |       | •                   | •      | •   |               |           |              |     |           | Semirigid polyolefin for terminal insulation                       |
| 3 mm to 40 mm                                     | •       | •     | •                   | •      |     |               | •         |              |     |           | 3:1 and 4:1 shrink ratio adhesive-lined polyolefin†                |
| 4 mm to 52 mm                                     | •       |       | •                   | •      |     |               |           |              |     |           |                                                                    |
| 3 mm to 40 mm                                     | •       |       | •                   | •      |     | •             |           |              |     |           | Highly flame-retardant, 3:1 and 4:1 shrink ratio                   |
| 4 mm to 52 mm                                     | •       |       | •                   | •      |     | •             |           |              |     |           | adhesive-lined polyolefin†                                         |
| 1/8" to 1"                                        | •       |       | •                   | •      | •   |               |           |              |     |           | 3:1 shrink ratio adhesive-lined polyolefin                         |
| 4 mm to 48 mm                                     | •       |       | •                   |        |     |               |           |              |     |           | High-temperature adhesive-lined polyolefin                         |
| 3 mm to 39 mm                                     | •       | •     | •                   | •      |     |               |           |              |     |           | 3:1 shrink ratio commercial-grade adhesive-<br>lined tubing†       |
| 4 mm to 16 mm                                     |         | •     |                     |        |     |               |           |              |     |           | 4:1 shrink ratio, clear, dual wall tubing                          |
| 9 mm                                              |         | •     |                     |        |     |               |           |              |     |           | Very high shrink ratio, dual wall, flexible<br>polyolefin tubing   |
| 4 mm to 16 mm                                     | •       | •     |                     |        |     |               |           |              |     |           | Dual wall, moisture-proof polyolefin                               |
| 1/8" to 1 1/2"                                    | •       | •     | •                   | •      |     |               | •         |              |     |           | 2:1 adhesive-lined polyolefin†                                     |
| 5.7 mm to 17.5 mm                                 | •       | •     | •                   |        |     |               |           |              |     |           | High shrink ratio, dual wall, moisture proof,<br>semirigid tubing† |
| .225" to .700"                                    |         | •     |                     | •      |     |               |           |              |     |           | Clear high-shrink-ratio adhesive-lined polyolefin                  |
| .225" to .700"                                    | •       |       | •                   | •      |     |               |           |              |     |           | Flame-retardant adhesive-lined polyolefin                          |
| .300" to .700"                                    | •       |       | •                   |        |     |               |           |              |     |           | Fully flame-retardant, adhesive-lined polyolefin                   |
| 1/8" to 1"                                        | •       |       |                     | •      |     |               | •         |              |     |           | 3:1 shrink ratio encapsulant-lined polyolefin                      |
| .300" to .700"                                    | •       |       | •                   |        |     |               |           |              |     |           | High-temperature adhesive-lined polyolefin                         |
| .3" to 4.5"                                       | •       | •     | •                   |        |     |               |           |              | •   |           | Rugged, general purpose, thick-wall polyolefin†                    |
| .4" to 2.7"                                       | •       |       | •                   |        |     |               |           |              | •   |           | Highly flexible, thick-wall polyolefin                             |
| .6" to 4"                                         | •       |       | •                   |        |     |               |           |              | •   |           | High-shrink-ratio repair sleeve                                    |
| 12 mm to 390 mm                                   | •       |       |                     |        |     |               |           |              |     | •         | Heavy wall adhesive-lined polyolefin                               |
| 10 mm to 285 mm                                   | •       |       |                     |        |     |               |           |              |     |           | Medium wall polyolefin                                             |
| .3" to 4.5"                                       | •       |       | •                   |        |     |               | •         |              | •   |           | Self-sealing, dual wall polyolefin                                 |
| 1/8" to 3"                                        | •       |       | •                   |        |     |               | •         |              |     |           | Diesel-resistant elastomer                                         |
| 1/8" to 4"                                        | •       |       | •                   |        |     |               |           |              |     |           | Flexible general-purpose modified elastomer                        |
| 1/8" to 4"                                        | •       |       | •                   |        |     |               | •         |              |     |           | Flexible rugged modified elastomer                                 |
| 1/8" to 3"                                        | •       |       | •                   |        |     |               | •         |              |     |           | Very flexible rugged neoprene                                      |
| 1/8" to 2"                                        | •       |       | •                   |        |     |               | •         |              |     |           | High-temperature flexible elastomer                                |
| 1/8" to 2"                                        | •       |       | •                   |        |     |               | •         |              |     |           | High-temperature flexible elastomer                                |
| 1/4" to 2"                                        | •       |       | •                   |        |     |               | •         |              |     |           | Very flexible silicone                                             |
| 2.9 mm to 51 mm                                   | •       |       | •                   | •      |     | •             |           |              |     |           | Very flexible silicone rubber                                      |
| 3/64" to 1"                                       |         | •     | •                   |        |     |               | •         |              |     |           | High-clarity, very flexible fluoropolymer                          |
| 3/64" to 1"                                       | •       |       | •                   | •      |     | •             | •         |              |     |           | High-performance flexible fluoropolymer                            |
| 3/64" to 1 1/2"                                   | •       | •     | •                   | •      | •   | •             | •         |              |     |           | Clear high-performance flexible fluoropolymer                      |
| 1/8" to 2"                                        | •       |       | •                   | •      |     | •             |           |              |     |           | Fluid- and chemical-resistant fluoropolymer                        |
| 3/64" to 1 1/2"                                   | •       | •     | •                   | •      | •   | •             | •         |              |     |           | High-performance fluoropolymer                                     |
| 0.8 mm to 11.9 mm/<br>2 mm to 32 mm               |         | •     | •                   |        |     |               | •         |              |     |           | High-temperature tubing made of PTFE                               |
| 1/16" to 1"                                       | •       | •     |                     |        |     |               |           | •            |     |           | Autoclavable semirigid fluoropolymer                               |
| 1 mm to 10 mm                                     | •       | •     |                     |        |     |               |           | •            |     |           | Lubricious thin-wall polyolefin                                    |
| 1/16" to 1"                                       | •       |       |                     |        |     |               |           | •            |     |           | High-temperature flexible fluoropolymer                            |
| 1/16" to 1"                                       | •       | •     |                     |        |     |               |           | •            |     |           | Flexible polyolefin                                                |
| 1/16" to 1/2"                                     | •       | •     |                     |        |     |               |           | •            |     |           | High expansion ratio polyolefin                                    |
| .051" to .579"                                    | •       | •     |                     |        |     |               |           | •            |     |           | Heat-shrinkable fluorinated ethylene propylene                     |
|                                                   |         | •     |                     |        |     |               |           | •            |     |           | Heat-shrinkable polyolefin for laser-welding                       |
| .014" to .045"                                    | •       | •     |                     |        |     |               |           | •            |     |           | Semirigid medical-grade fluoropolymer microtubing                  |
| .014" to .045"                                    | •       | •     |                     |        |     |               |           | •            |     |           | Lubricious medical-grade polyolefin microtubing                    |

## Tubing Selection Guide (Continued)

| PRODUCT                               |                |                             | Polyolefin | Fluoropolymer | Elastomer | Operating Temperature<br>°C / [°F] |              | Min. shrink temperature<br>(°C) | Min. full recovery temperature<br>(°C) | Shrink ratio  |
|---------------------------------------|----------------|-----------------------------|------------|---------------|-----------|------------------------------------|--------------|---------------------------------|----------------------------------------|---------------|
| <b>Special Purpose</b><br>(Continued) | Caps           | ES Caps                     | •          |               |           | -40 to 105                         | [-40 to 221] | 100                             | 135                                    | 4:1           |
|                                       |                | PD Caps                     | •          |               |           | -55 to 110                         | [-67 to 230] | 125                             | 135                                    | 3:1           |
|                                       |                | TC Caps                     | •          |               |           | -55 to 135                         | [-67 to 275] | 110                             | 135                                    | 2.5:1         |
|                                       | Conduit        | HCTE                        |            | •             |           | -55 to 200                         | [-67 to 392] | N/A                             | N/A                                    | N/A           |
|                                       | Kits           | RayBlock 85                 | •          |               |           | -40 to 85                          | [-40 to 185] | 80                              | 110                                    | 4:1           |
|                                       |                | RayBlock 105                | •          |               |           | -40 to 105                         | [-40 to 221] | 80                              | 110                                    | 4:1           |
|                                       |                | Tubing Kits and Mini-Spools | •          |               |           | Various; see page 139-140          |              | See page 139-140                | See page 139-140                       | 2:1 up to 4:1 |
|                                       | Low Toxicity   | XFFR                        | •          |               |           | -55 to 105                         | [-67 to 221] | 70                              | 121                                    | 3:1           |
|                                       |                | ZH-100                      | •          |               |           | -30 to 105                         | [-22 to 221] | 80                              | 120                                    | 2:1           |
|                                       |                | ZH2                         | •          |               |           | -30 to 125                         | [-22 to 257] | 70                              | 90                                     | 2:1           |
|                                       |                | ZH4                         | •          |               |           | -30 to 125                         | [-22 to 257] | 70                              | 90                                     | 2:1           |
|                                       |                | ZHTM                        | •          |               |           | -30 to 105                         | [-22 to 221] | 80                              | 121                                    | 2:1           |
|                                       | Edging Matl    | Rayrim                      | •          |               |           | -55 to 80                          | [-67 to 176] | 120                             | 150                                    | N/A           |
|                                       | Fiber & Fabric | HFT5000                     |            |               |           | -40 to 125                         | [-40 to 257] | 80                              | 110                                    | 2:1           |
|                                       | Braids         | Versaflex                   |            |               |           | -50 to 150                         | [-58 to 302] | N/A                             | N/A                                    | N/A           |
|                                       |                | Versaflex-FR                |            |               |           | -50 to 150                         | [-58 to 302] | N/A                             | N/A                                    | N/A           |

\*For specific MIL-Spec information for each product, refer to individual product pages or the Tubing Cross-Reference Guide on page x-xi.

\*\*Sizes 12/3 through 70/20 only.

†Clear is not flame-retardant.

## Tubing Selection Guide (Continued)

| Size range<br>(inside<br>diameter as<br>supplied) | Colored | Clear | Flame-<br>retardant | UL 224 | CSA | VW-1 (UL/CSA) | MIL Spec* | USP Class VI | ABS | UL D486** | DESCRIPTION                                                         |
|---------------------------------------------------|---------|-------|---------------------|--------|-----|---------------|-----------|--------------|-----|-----------|---------------------------------------------------------------------|
| .225" to .427"                                    | •       | •     | •                   | •      |     |               |           |              |     |           | High-ratio, adhesive-lined capst†                                   |
| 1/8" to 1/2"                                      | •       |       |                     | •      |     |               |           |              |     |           | Semirigid encapsulant-lined polyolefin caps                         |
| 1/16" to 1/4"                                     | •       |       | •                   | •      |     |               |           |              |     |           | Semirigid flame-retardant polyolefin caps                           |
| .187" to 2"                                       | •       |       | •                   |        |     |               |           |              |     |           | Modified ETFE, helically convoluted tubing                          |
| 12 mm to 32 mm                                    | •       |       | •                   |        |     |               |           |              |     |           | Heat-shrinkable water blocking system                               |
| 12 mm to 32 mm                                    | •       |       | •                   |        |     |               |           |              |     |           | Heat-shrinkable water blocking system                               |
| See page 139-140                                  | •       | •     | •                   | •      | •   | •             | •         |              |     |           | Smaller packaging options for single wall and adhesive-lined tubing |
| .4" to 3"                                         | •       |       | •                   |        |     |               |           |              | •   |           | Halogen-free, flame-retardant polyolefin                            |
| 1/8" to 2"                                        | •       |       | •                   |        |     |               |           |              |     |           | Thin-wall, low-fire-hazard polyolefin                               |
| 0.8 mm to 30 mm                                   | •       |       | •                   | •      | •   | •             |           |              |     |           | Highly flame-retardant ZEROHAL polyolefin                           |
| 0.6 mm to 10 mm                                   | •       |       | •                   | •      | •   | •             |           |              |     |           | Very-thin-wall highly flame-retardant ZEROHAL polyolefin            |
| 3 mm to 40 mm                                     | •       |       | •                   |        |     |               |           |              |     |           | Low toxicity, flexible polyolefin                                   |
| 0.8 mm to 4.5 mm                                  | •       |       |                     |        |     |               |           |              |     |           | Protective self-adhering edging material                            |
| 12 mm to 100 mm                                   | •       |       |                     |        |     |               |           |              |     |           | Heat-shrinkable, fabric tubing                                      |
| 3 mm to 50 mm                                     | •       |       |                     |        |     |               |           |              |     |           | Expandable, braided polyester sleeving                              |
| 1/8" to 2"                                        | •       |       | •                   |        |     |               |           |              |     |           | Flame-retardant, expandable polyester sleeving                      |



## Specification Cross-Reference Guide

| Product Type            | UL File     | CSA File     | AMS-DTL-23053* Sheet | Class | MIL-PRF-46846 Type | Class | Raychem Specification | Page No. |
|-------------------------|-------------|--------------|----------------------|-------|--------------------|-------|-----------------------|----------|
| ATUM                    | E85381**    |              | /4                   | 3     |                    |       | RW-2063 & RK-6024     | 1-1      |
| BRST                    |             |              |                      |       |                    |       | RK-6766               | 1-3      |
| BSTS                    |             |              |                      |       |                    |       | RW-2017               | 1-5      |
| BSTS-FR                 |             |              |                      |       |                    |       | RW-2017               | 1-5      |
| CGAT                    | E85381      |              |                      |       |                    |       | RW-2050               | 1-7      |
| CGPE-105                |             |              |                      |       |                    |       | CGPE-105 SCD          | 1-9      |
| CGPT                    | E35586      | LR31929      |                      |       |                    |       | RW-2059               | 1-11     |
| CRN Type 1 (black)      | E35586‡     | LR31929‡     | /6                   | 1     |                    |       | RT-360, Type 1        | 1-13     |
| CRN Type 2 (clear)      |             |              | /6                   | 2     |                    |       | RT-360, Type 2        | 1-13     |
| DCPT                    | E35586      | LR31929      |                      |       |                    |       | RW-2056               | 1-15     |
| DR-25                   |             |              | /16                  |       |                    |       | RT-1116               | 1-17     |
| DSPL                    |             |              |                      |       |                    |       | RK-6755               | 1-19     |
| DWFR                    | E35586      |              |                      |       |                    |       | DWFR SCD              | 1-21     |
| DWP-125                 | E35586      | LR31929      |                      |       |                    |       | DWP-125 SCD           | 1-23     |
| DWTC                    |             |              |                      |       |                    |       | RK-6204               | 1-25     |
| ES1000                  | E85381      |              |                      |       |                    |       | RT-1113               | 1-27     |
| ES2000                  | E85381      |              |                      |       |                    |       | RT-1112               | 1-29     |
| ES Caps                 | E85381      |              |                      |       |                    |       | RW-3006               | 1-31     |
| FL2500                  |             |              |                      |       |                    |       | FL2500 SCD            | 1-33     |
| HCTE                    |             |              |                      |       |                    |       | RT-1162               | 1-35     |
| HF                      |             |              |                      |       |                    |       | RW-2023               | 1-37     |
| HFT5000                 | E199379     |              |                      |       |                    |       | RW-2060               | 1-39     |
| HRHF                    |             |              |                      |       |                    |       | RW-2013               | 1-41     |
| HRNF                    |             |              |                      |       |                    |       | RW-2013               | 1-41     |
| HRSR                    |             |              |                      |       |                    |       | RW-2013               | 1-41     |
| HRHT                    |             |              |                      |       |                    |       | HRHT SCD              | 1-43     |
| HT-200                  |             |              | /18                  | 3     |                    |       | RW-1200               | 1-45     |
| HTAT                    |             |              |                      |       |                    |       | RW-2052               | 1-47     |
| LSTT                    |             |              |                      |       |                    |       | RW-2051               | 1-49     |
| MFT-MT1000              |             |              |                      |       |                    |       | Altera MicroFit SCD   | 1-51     |
| MFT-MT2000              |             |              |                      |       |                    |       | Altera MicroFit SCD   | 1-51     |
| MT1000                  |             |              |                      |       |                    |       | MT1000 SCD            | 1-53     |
| MT2000                  |             |              |                      |       |                    |       | MT2000 SCD            | 1-55     |
| MT3000                  |             |              |                      |       |                    |       | MT3000 SCD            | 1-57     |
| MT5000                  |             |              |                      |       |                    |       | MT5000 SCD            | 1-59     |
| MT6000                  |             |              |                      |       |                    |       | MT6000 SCD            | 1-61     |
| MT-FEP                  |             |              |                      |       |                    |       | MT-FEP SCD            | 1-63     |
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| NTFR                    |             |              |                      |       |                    |       | RT-511                | 1-71     |
| PD Caps                 | E85381      |              |                      |       |                    |       | PD Caps SCD           | 1-73     |
| PTCM                    |             |              |                      |       |                    |       | RK-6768               | 1-75     |
| RayBlock 85             |             |              |                      |       |                    |       | RW-2101               | 1-77     |
| RayBlock 105            |             |              |                      |       |                    |       | RW-2102               | 1-79     |
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| RHW                     | E91151***   |              |                      |       |                    |       | RHW SCD               | 1-87     |
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| RNF-100 Type 1 (colors) | E35586      | LR31929      | /5                   | 1     |                    |       | RT-350, Type 1        | 1-91     |
| RNF-100 Type 2 (clear)  |             |              | /5                   | 2     |                    |       | RT-350, Type 2        | 1-93     |
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| RNF-3000                | E35586      | LR31929      |                      |       |                    |       | RW-2053               | 1-97     |
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| RPPM                    |             |              |                      |       |                    |       | RK-6214               | 1-101    |
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| RT555                   | E85381      |              |                      |       |                    |       | RT-555                | 1-107    |
| RW-175                  | E35586 VW-1 | LR31929 VW-1 | /8                   |       |                    |       | RW-3029/2             | 1-109    |
| RW-175-E                | E35586 VW-1 | LR31929 VW-1 |                      |       |                    |       | RW-3029/1             | 1-109    |
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| RW-200-E                |             |              |                      |       | III                | 1     | RW-3037               | 1-111    |
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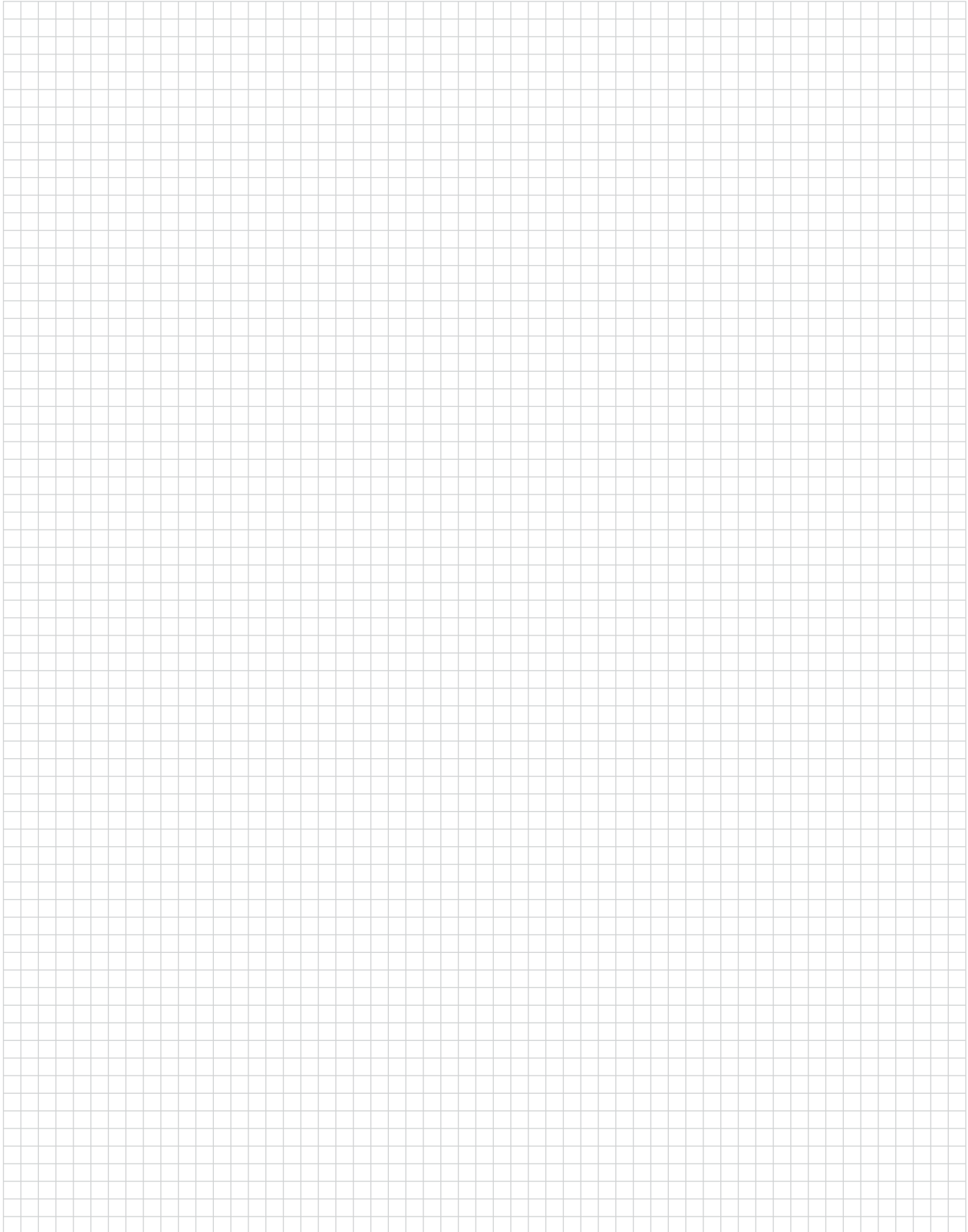
## Specification Cross-Reference Guide (Continued)

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| TUGA-GP      |             |              |                      |                      |                    |                     | RW-2201               | 1-133    |
| URHT         |             |              |                      |                      |                    |                     | URHT SCD              | 1-135    |
| Versafit     | E35586 VW-1 | LR31929 VW-1 | /5                   | 1 & 3                |                    |                     | RW-3009               | 1-137    |
| Versafit-3X  | E35586 VW-1 | LR31929 VW-1 |                      |                      |                    |                     | RW-3009               | 1-139    |
| Versafit V2  | E35586 VW-1 | LR31929 VW-1 |                      |                      |                    |                     | RW-3023               | 1-141    |
| Versafit V4  | E85381 VW-1 | LR31929 VW-1 |                      |                      |                    |                     | RW-3023               | 1-143    |
| Versaflex    |             |              |                      |                      |                    |                     | RK-6772               | 1-145    |
| Versaflex-FR |             |              |                      |                      |                    |                     |                       | 1-145    |
| XFFR         |             |              |                      |                      |                    |                     | RW-2016               | 1-147    |
| ZH2          | E35586 VW-1 | LR31929 VW-1 |                      |                      |                    |                     | RW-3036               | 1-149    |
| ZH4          | E85381 VW-1 | LR31929 VW-1 |                      |                      |                    |                     | RW-3036               | 1-151    |
| ZH-100       |             |              |                      |                      |                    |                     | RW-2031               | 1-153    |
| ZHTM         |             |              |                      |                      |                    |                     | RW-2058               | 1-155    |

\*Formerly MIL-I-23053 and MIL-DTL-23053 \*\*Black only, except sizes 3/1 and 4/1. \*\*\*Sizes 12/3 through 70/20 only.

†Black only †† Overexpanded †††With exception to dimensions and longitudinal change.

‡Sizes 1/8 through 3/4 only.



## ATUM

### High-Shrink-Ratio, Adhesive-Lined Polyolefin Tubing

#### Product Facts

- 3:1 and 4:1 shrink ratios allow for connector-to-cable sealing
- Tubing environmentally seals and protects components and interconnections
- Medium wall provides increased mechanical protection
- The adhesive in ATUM tubing bonds to a wide variety of plastics, rubbers, and metals, including polyethylene, aluminum, steel, and copper
- RoHS compliant



#### Applications

Environmentally seals and protects a wide variety of electrical applications, including back end connector sealing, breakouts, and connector-to-cable transitions. High expansion ratio makes it possible to repair most damaged cable jackets without removing connectors.

#### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 110°C [230°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series | UL**  | Military                  | Raychem                                       |
|--------|------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------|
| ATUM   | E85381<br>600V, 110°C                                                                    | AMS-DTL-23053/4,* Class 3 | RW-2063 - Black<br>RK-6024 - Colors and clear |

\*Formerly MIL-I-23053/4 and MIL-DTL-23053/4. Sizes 3/1, 6/2, 12/4, 24/8, and 40/13 only.

\*\*Black only, except sizes 3/1 and 4/1.

Available in: Americas Europe Asia Pacific

**ATUM** (Continued)

**Product Dimensions**

| Size       | Inside Diameter              |                                 | Recovered Wall Thickness**  |                                       |
|------------|------------------------------|---------------------------------|-----------------------------|---------------------------------------|
|            | Minimum Expanded as Supplied | Maximum Recovered After Heating | Total Wall After Heating    | Adhesive Wall After Heating (Nominal) |
| <b>3:1</b> |                              |                                 |                             |                                       |
| 3/1        | 3.0 [0.118]                  | 1.0 [0.039]                     | 1.00 ± 0.28 [0.039 ± 0.010] | 0.50 [0.020]                          |
| 4.5/1.5    | 4.5 [0.177]                  | 1.5 [0.059]                     | 1.10 ± 0.25 [0.043 ± 0.011] | 0.50 [0.020]                          |
| 6/2        | 6.0 [0.236]                  | 2.0 [0.079]                     | 1.00 ± 0.28 [0.039 ± 0.010] | 0.50 [0.020]                          |
| 9/3        | 9.0 [0.354]                  | 3.0 [0.118]                     | 1.40 ± 0.28 [0.055 ± 0.010] | 0.61 [0.024]                          |
| 12/4       | 12.0 [0.472]                 | 4.0 [0.157]                     | 1.78 ± 0.38 [0.070 ± 0.015] | 0.76 [0.030]                          |
| 19/6       | 19.0 [0.748]                 | 6.0 [0.236]                     | 2.25 ± 0.55 [0.088 ± 0.022] | 0.76 [0.030]                          |
| 24/8       | 24.0 [0.940]                 | 8.0 [0.315]                     | 2.54 ± 0.55 [0.100 ± 0.022] | 1.02 [0.040]                          |
| 40/13      | 40.0 [1.570]                 | 13.0 [0.512]                    | 2.54 ± 0.55 [0.100 ± 0.022] | 1.02 [0.040]                          |
| <b>4:1</b> |                              |                                 |                             |                                       |
| 4/1        | 4.0 [0.157]                  | 1.0 [0.039]                     | 1.00 ± 0.28 [0.039 ± 0.010] | 0.50 [0.020]                          |
| 8/2        | 8.0 [0.315]                  | 2.0 [0.079]                     | 1.00 ± 0.28 [0.039 ± 0.010] | 0.50 [0.020]                          |
| 12/3       | 12.0 [0.472]                 | 3.0 [0.118]                     | 1.40 ± 0.28 [0.055 ± 0.010] | 0.61 [0.024]                          |
| 16/4       | 16.0 [0.630]                 | 4.0 [0.157]                     | 1.78 ± 0.38 [0.070 ± 0.015] | 0.76 [0.030]                          |
| 24/6       | 24.0 [0.945]                 | 6.0 [0.236]                     | 2.25 ± 0.55 [0.088 ± 0.022] | 0.76 [0.030]                          |
| 32/8       | 32.0 [1.260]                 | 8.0 [0.315]                     | 2.54 ± 0.55 [0.100 ± 0.022] | 1.02 [0.040]                          |
| 52/13      | 52.0 [2.050]                 | 13.0 [0.512]                    | 2.54 ± 0.55 [0.100 ± 0.022] | 1.02 [0.040]                          |

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

**Ordering Information**

|                          |                                                                                                                                         |                                                                                              |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Color                    | Standard                                                                                                                                | Black (-0)                                                                                   |
|                          | Nonstandard                                                                                                                             | Clear in 3:1 sizes only (-X, non-flame-retardant jacket); other colors available on request. |
| Size selection           | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                              |
| Standard packaging***    | In 1.2-meter [4-foot] lengths or on spools.                                                                                             |                                                                                              |
| Ordering description**** | Specify product name, size and color (for example, ATUM 8/2-0).                                                                         |                                                                                              |

\*\*\*Only 1.2 meter [4-foot] lengths are standard in the Americas. ATUM tubing on spools is nonstandard.

\*\*\*\*For supply to MIL spec., add -MS to ordering description.

## BRST

### Simple Specification, Single Wall Polyolefin Tubing

#### Product Facts

- 2:1 shrink ratio
- Non-flame-retardant
- Quick shrinking
- Satin finish
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Provides excellent electrical insulation. Can be used for noise suppression and where mechanical protection is required.

#### Installation

Minimum shrink temperature: 95°C [203°F]  
Minimum full recovery temperature: 130°C [266°F]

#### Operating Temperature Range

-40°C to 120°C  
[-40°F to 248°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| BRST   | RK-6766 |

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               |          |        |              |

**BRST** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 4/2   | 4 [0.157]                    | 2 [0.079]                       | 0.4 ± 0.08 [0.016 ± 0.003]  |
| 6/3   | 6 [0.236]                    | 3 [0.118]                       | 0.4 ± 0.08 [0.016 ± 0.003]  |
| 10/5  | 10 [0.394]                   | 5 [0.197]                       | 0.5 ± 0.08 [0.020 ± 0.003]  |
| 16/8  | 16 [0.630]                   | 8 [0.315]                       | 0.75 ± 0.08 [0.030 ± 0.003] |
| 24/12 | 24 [0.945]                   | 12 [0.472]                      | 0.85 ± 0.08 [0.033 ± 0.003] |

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

**Ordering Information**

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools.                                                                              |            |
| Ordering description | Specify product name, size and color (for example, BRST-4/2-0).                         |            |

## BSTS/BSTS-FR

### General Purpose, Heat-Shrinkable Tubing

#### Product Facts

- Excellent thick-wall insulation and abrasion protection
- No adhesive – can be removed easily
- Expansion ratios as high as 3:1
- Availability in flame-retardant material with FR callout (see “Ordering information and Part numbering system” on the next page)
- BSTS has the following agency approvals:
  - ABS (American Bureau of Shipping)
  - Lloyd's (Lloyd's Register of Shipping)
- RoHS compliant



#### Applications

BSTS heat-shrinkable tubing is made of a rugged polymer that resists moisture, fungus, and weathering. It also has excellent electrical properties. This tubing is useful in applications where insulation, abrasion resistance, and strain relief are important. When used with sealant tape (S-1305 for flame-retardant or S-1278 for non-flame-retardant), it can provide a watertight system in non-pressurized applications.

#### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 121°C [250°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series  | Industry               | Raychem |
|---------|------------------------|---------|
| BSTS    | —                      | RW-2017 |
| BSTS-FR | ASTM D 685, nonburning | RW-2017 |

Available in:

Americas

Europe

Asia Pacific



## BSTS/BSTS-FR (Continued)

### Product Dimensions

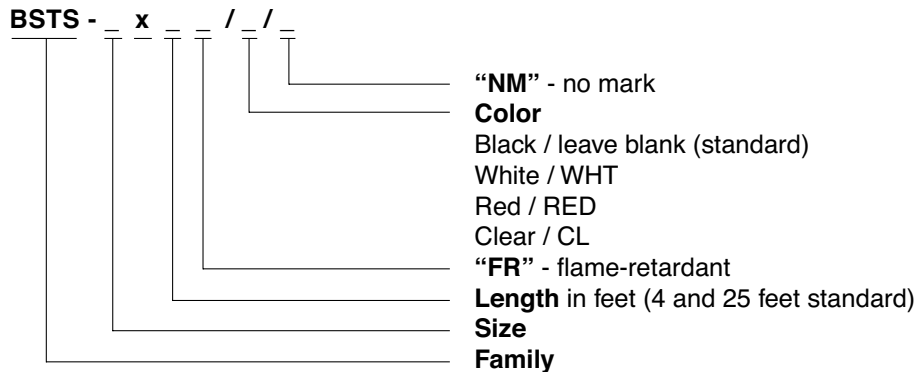
| Size    | Inside Diameter              |                                 | Wall Thickness (Nominal) |                            |
|---------|------------------------------|---------------------------------|--------------------------|----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Expanded as Supplied     | Recovered After Heating*** |
| BSTS-03 | 7.62 [0.300]                 | 2.54 [0.100]                    | 0.63 [0.025]             | 1.78 [0.070]               |
| BSTS-04 | 10.16 [0.400]                | 3.81 [0.150]                    | 0.63 [0.025]             | 1.78 [0.070]               |
| BSTS-07 | 19.05 [0.750]                | 5.59 [0.220]                    | 0.76 [0.030]             | 2.41 [0.095]               |
| BSTS-11 | 27.94 [1.100]                | 9.52 [0.375]                    | 1.02 [0.040]             | 3.05 [0.120]               |
| BSTS-13 | 33.02 [1.300]                | 9.52 [0.375]                    | 0.89 [0.035]             | 3.05 [0.120]               |
| BSTS-15 | 38.10 [1.500]                | 12.70 [0.500]                   | 1.27 [0.050]             | 3.56 [0.140]               |
| BSTS-17 | 43.18 [1.700]                | 12.70 [0.500]                   | 1.14 [0.045]             | 3.56 [0.140]               |
| BSTS-20 | 50.80 [2.000]                | 19.05 [0.750]                   | 1.27 [0.050]             | 3.94 [0.160]               |
| BSTS-27 | 65.58 [2.700]                | 22.86 [0.900]                   | 1.27 [0.050]             | 3.94 [0.160]               |
| BSTS-30 | 76.20 [3.000]                | 31.75 [1.250]                   | 1.27 [0.050]             | 3.94 [0.160]               |
| BSTS-35 | 88.90 [3.500]                | 31.75 [1.250]                   | 1.27 [0.050]             | 3.94 [0.160]               |
| BSTS-40 | 101.60 [4.000]               | 44.45 [1.750]                   | 1.27 [0.050]             | 3.94 [0.160]               |
| BSTS-45 | 114.30 [4.500]               | 44.45 [1.750]                   | 1.27 [0.050]             | 3.94 [0.160]               |

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

### Ordering Information

|                      |                                                                                                                                         |                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black                                                       |
|                      | Nonstandard                                                                                                                             | White, Yellow, Red and Clear (Clear is non-flame retardant) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                             |
| Standard packaging   | 1.2-meter [4-foot] or 7.5-meter [25-foot] lengths.                                                                                      |                                                             |
| Ordering description | See below.                                                                                                                              |                                                             |

### Part Numbering System



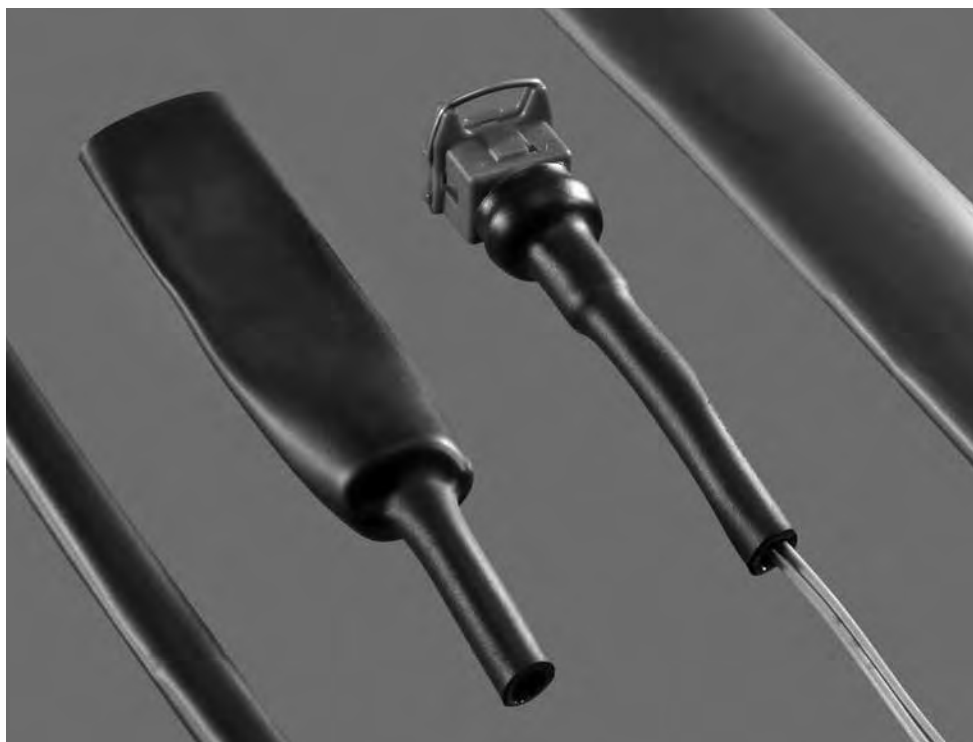
Example: BSTS-11X4/NM

## CGAT

### Adhesive-Lined, Flexible, Polyolefin Heat-Shrinkable Tubing

#### Product Facts

- 3:1 Shrink ratio
- High-strength bonding
- Moisture-proof
- Environmental sealing
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

CGAT is a flexible polyolefin heat-shrinkable tubing with an inner meltable adhesive lining designed for the commercial marketplace. It is suitable for the environmental protection of electrical components and the sealing of conductors. Typical applications are environmental sealing for electrical components, wire breakouts and cable jackets.

#### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 115°C [239°F]

#### Operating Temperature Range

-30°C to 80°C  
[-22°F to 176°F]

#### Specifications/Approvals

| Series | UL*  | Raychem |
|--------|-----------------------------------------------------------------------------------------|---------|
| CGAT   | E85381<br>600V, 80°C                                                                    | RW-2050 |

\*Black only. Clear product is not flame-retardant

Available in: Americas Europe Asia Pacific

**CGAT** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness* |                        |
|-------|------------------------------|---------------------------------|---------------------------|------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating             | After Heating          |
|       |                              |                                 | Black                     | Clear                  |
| 3/1   | 3.0 [0.118]                  | 1.0 [0.039]                     | 1.00±0.25 [0.039±.010]    | 1.00±0.30 [0.039±.012] |
| 6/2   | 6.0 [0.236]                  | 2.0 [0.079]                     | 1.00±0.25 [0.039±.010]    | 1.00±0.30 [0.039±.012] |
| 9/3   | 9.0 [0.354]                  | 3.0 [0.118]                     | 1.35±0.25 [0.053±.010]    | 1.40±0.30 [0.055±.012] |
| 12/4  | 12.0 [0.472]                 | 4.0 [0.157]                     | 1.50±0.25 [0.059±.010]    | 1.75±0.40 [0.039±.012] |
| 18/6  | 18.0 [0.709]                 | 6.0 [0.236]                     | 1.70±0.25 [0.067±.010]    | 2.25±0.55 [0.089±.022] |
| 24/8  | 24.0 [0.945]                 | 8.0 [0.315]                     | 1.90±0.25 [0.075±.010]    | 2.55±0.55 [0.100±.022] |
| 39/13 | 39.0 [1.535]                 | 13.0 [0.512]                    | 2.10±0.25 [0.083±.010]    | 2.55±0.55 [0.100±.022] |

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

**Ordering Information**

|                      |                                                                                         |                                                  |
|----------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------|
| Color                | Standard                                                                                | Black (-0) Clear (X, non-flame-retardant jacket) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                                                  |
| Standard packaging** | In 1.2 meter (4 foot) lengths or on spools.                                             |                                                  |
| Ordering description | Specify product name, size and color (for example, CGAT-3/1-0).                         |                                                  |

\*\*Available in the convenient RaySpool packaging/dispensing system, for sizes 3/1 to 24/8.

## Brightly Colored, Shiny, Non-Flame-Retardant Polyolefin Tubing

### Product Facts

- Bright, shiny surface; clear version offers exceptional clarity
- Can be easily hot-stamped
- Economical, yet offers the improved performance of a crosslinked material
- Conforms to substrates more uniformly and with less longitudinal change than most PVC-based materials
- RoHS compliant

## CGPE-105



### Applications

Attractive covering for many automotive, appliance, and consumer-goods applications. Commercial grade tubing for applications where a flame-retardant product is not needed. Provides both insulation and protection of components and wires while also providing a smooth, glossy finish with a choice of seven colors as well as clear. Exceptional transparency of clear CGPE-105 makes it a well-suited choice for protecting marked surfaces.

Minimum shrink temperature: 85°C [185°F]

Minimum full recovery temperature: 110°C [230°F] for black; 100°C [212°F] for all other colors and clear

### Operating Temperature Range

-70°C to 105°C  
[-94°F to 221°F]

### Installation

### Specifications/Approvals

| Series   | Raychem      |
|----------|--------------|
| CGPE-105 | CGPE-105 SCD |

#### Available in:

Americas

Europe

Asia Pacific

**CGPE-105** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64  | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.40 ± 0.08 [0.016 ± 0.003] |
| 1/16  | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 3/32  | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/4   | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.89 ± 0.12 [0.035 ± 0.005] |
| 1 1/2 | 38.1 [1.500]                 | 19.1 [0.750]                    | 1.02 ± 0.15 [0.040 ± 0.006] |
| 2     | 50.8 [2.000]                 | 25.4 [1.000]                    | 1.14 ± 0.18 [0.045 ± 0.007] |

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

**Ordering Information**

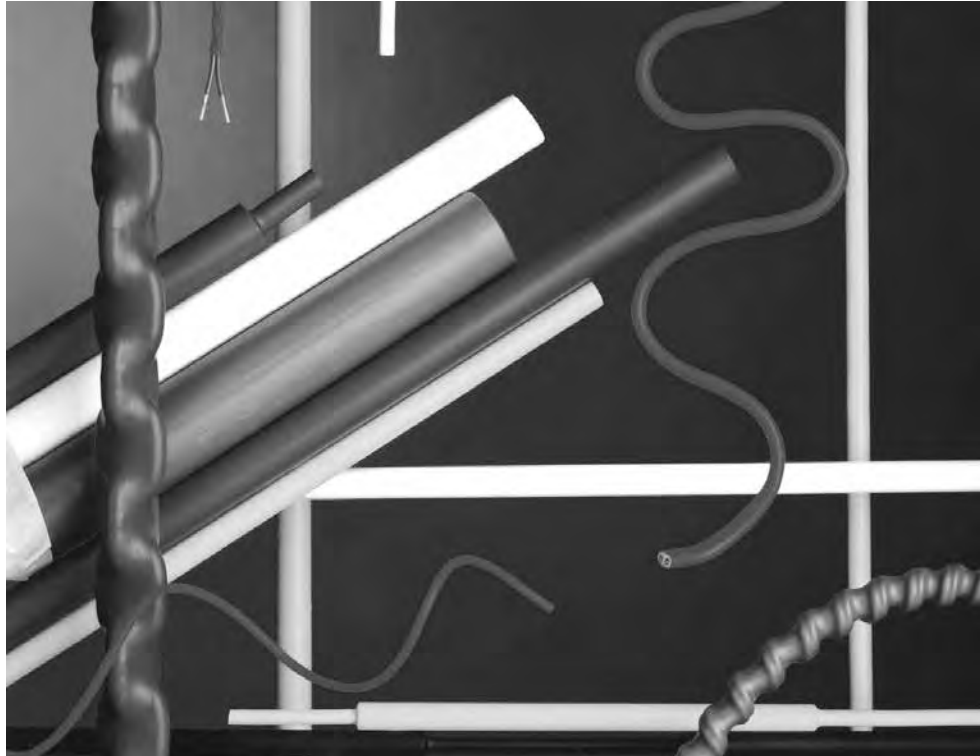
|                      |                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Black (-0), White (-9), Clear (-X), Red (-2), Blue (-6), Yellow (-4)<br>Green (-5), Violet (-7)                                            |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered.<br>Special order sizes are available upon request. |
| Standard packaging   | On spools.                                                                                                                                 |
| Ordering description | Specify product name, size and color (for example, CGPE-105-1/4-0).                                                                        |

## CGPT

### General Purpose, Flame-Retardant\* Polyolefin Tubing

#### Product Facts

- 2:1 and 3:1 shrink ratio
- Very good chemical and solvent resistance
- Flexible
- Excellent physical and electrical performance
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

CGPT is a tough, flexible, general purpose polyolefin tubing with good resistance to common fluids and solvents and a high dielectric strength. Its unique blend of chemical, electrical, and physical properties makes it suitable for a wide range of applications, including electrical insulation, strain relief, cable bundling, color-coding and identification of wires, cables, pipes, and electrical and electronic components, and mechanical protection.

#### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 120°C [248°F]

#### Operating Temperature Range

-40°C to 135°C  
[-40°F to 275°F]

#### Specifications/Approvals

| Series | UL  | CSA  | Raychem |
|--------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| CGPT   | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                  | RW-2059 |

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

Available in:

Americas

Europe

Asia Pacific

**CGPT** (Continued)

**Product Dimensions**

| Size       | Inside Diameter              |                                 | Recovered Wall Thickness**     |
|------------|------------------------------|---------------------------------|--------------------------------|
|            | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating                  |
| <b>2:1</b> |                              |                                 |                                |
| 1.2/06     | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.45 ± 0.12 [0.018 ± 0.005]    |
| 1.6/0.8    | 1.6 [0.062]                  | 0.8 [0.031]                     | 0.45 ± 0.12 [0.018 ± 0.005]    |
| 2.4/1.2    | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.50 ± 0.12 [0.019 ± 0.005]    |
| 3.2/1.6    | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.50 ± 0.12 [0.019 ± 0.005]*** |
| 4.8/2.4    | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.50 ± 0.12 [0.019 ± 0.005]*** |
| 6.4/3.2    | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.65 ± 0.15 [0.026 ± 0.006]*** |
| 9.5/4.8    | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.65 ± 0.15 [0.026 ± 0.006]*** |
| 12.7/6.4   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.65 ± 0.15 [0.026 ± 0.006]*** |
| 19/9.5     | 19.0 [0.748]                 | 9.5 [0.375]                     | 0.75 ± 0.15 [0.029 ± 0.006]*** |
| 25.4/12.7  | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.90 ± 0.20 [0.035 ± 0.008]*** |
| 32/16      | 32.0 [1.250]                 | 16.0 [0.630]                    | 0.95 ± 0.20 [0.037 ± 0.008]    |
| 38/19      | 38.0 [1.496]                 | 19.0 [0.748]                    | 1.00 ± 0.20 [0.039 ± 0.008]*** |
| 51/26      | 51.0 [2.000]                 | 26.0 [1.000]                    | 1.15 ± 0.25 [0.045 ± 0.010]    |
| 76/38      | 76.0 [2.992]                 | 38.0 [1.496]                    | 1.25 ± 0.25 [0.049 ± 0.010]    |
| 102/51     | 102.0 [4.016]                | 51.0 [2.008]                    | 1.40 ± 0.30 [0.055 ± 0.012]    |
| <b>3:1</b> |                              |                                 |                                |
| 1.5/0.5    | 1.5 [0.059]                  | 0.5 [0.020]                     | 0.45 ± 0.12 [0.018 ± 0.005]    |
| 3/1        | 3.0 [0.118]                  | 1.0 [0.040]                     | 0.55 ± 0.12 [0.022 ± 0.005]    |
| 6/2        | 6.0 [0.236]                  | 2.0 [0.079]                     | 0.65 ± 0.12 [0.026 ± 0.005]    |
| 9/3        | 9.0 [0.354]                  | 3.0 [0.118]                     | 0.75 ± 0.15 [0.030 ± 0.006]    |
| 12/4       | 12.0 [0.472]                 | 4.0 [0.157]                     | 0.75 ± 0.15 [0.030 ± 0.006]    |
| 18/6       | 18.0 [0.709]                 | 6.0 [0.236]                     | 0.85 ± 0.15 [0.033 ± 0.006]    |
| 24/8       | 24.0 [0.945]                 | 8.0 [0.315]                     | 1.00 ± 0.20 [0.039 ± 0.008]    |
| 39/13      | 39.0 [1.540]                 | 13.0 [0.512]                    | 1.15 ± 0.25 [0.045 ± 0.010]    |

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

**Ordering Information**

|                        |                                                                                                                                         |                                                                                                                                        |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Color                  | Standard                                                                                                                                | Black (-0), White (-9), Red (-2), Blue (-6), Yellow (-4), Brown (-1), Grey (-8), Clear (-X), Yellow/Green (-45) as indicated by an *** |
|                        | Nonstandard                                                                                                                             | Orange (-3), Green (-5), Violet (-7), in 2:1 sizes, 1.2/0.6 through 51/26 only.                                                        |
| Size selection         | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                                                                        |
| Standard packaging**** | On spools.                                                                                                                              |                                                                                                                                        |
| Ordering description   | Specify product name, size and color (for example, CGPT 4.8/2.4-0).                                                                     |                                                                                                                                        |

\*\*\*\*Available in the convenient RaySpool packaging/dispensing system for sizes:

2:1 - 2.4/1.2 up to 25.4/12.7

3:1 - 3/1 up to 24/8

## CRN

### Semirigid, Flame-Retardant, Polyolefin Tubing

#### Product Facts

- 2:1 shrink ratio
- High abrasion resistance
- Transfer of flex stress away from typically weak points such as solder and crimp joints, helping ensure a reliable connection
- Flame-retardance (black only)
- Outstanding physical and electrical performance
- Excellent chemical and solvent-resistance properties
- RoHS compliant



#### Applications

Well-suited for wire strain-relief applications such as soldered or crimped connections, wire splices, and terminations. Provides mechanical protection for delicate components. Can be used for component packaging and for rugged marking of cables.

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

#### Installation

#### Specifications/Approvals

| Series             | UL**  | CSA**  | Military                  | Raychem                   |
|--------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------|---------------------------|
| CRN Type 1 (black) | E35586<br>600 V, 125°C                                                                   | LR31929<br>(black only)<br>600 V, 125°C                                                   | AMS-DTL-23053/6*, Class I | RT-360, Type 1<br>RK-6003 |
| CRN Type 2 (clear) | —                                                                                        | —                                                                                         | AMS-DTL-23053/6*, Class 2 | RT-360, Type 2            |

\*Formerly MIL-I-23053/6 and MIL-DTL-23053/6.

\*\* Sizes 1/8 through 3/4 only.

Available in: Americas Europe Asia Pacific



**CRN** (Continued)

**Product Dimensions**

| Size | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|------|------------------------------|---------------------------------|-----------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64 | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/16 | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/32 | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/8  | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/16 | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 1/4  | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/8  | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 1/2  | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 3/4  | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.89 ± 0.12 [0.035 ± 0.005] |

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

**Ordering Information**

|                         |                                                                                                                                         |                                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Color                   | Standard                                                                                                                                | Black (-0)                      |
|                         | Nonstandard                                                                                                                             | Clear (-X, not flame-retardant) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                 |
| Standard packaging      | In 1.2-meter [4-foot] lengths.                                                                                                          |                                 |
| Ordering description*** | Specify product name, size and color (for example, CRN 1/4-0).                                                                          |                                 |

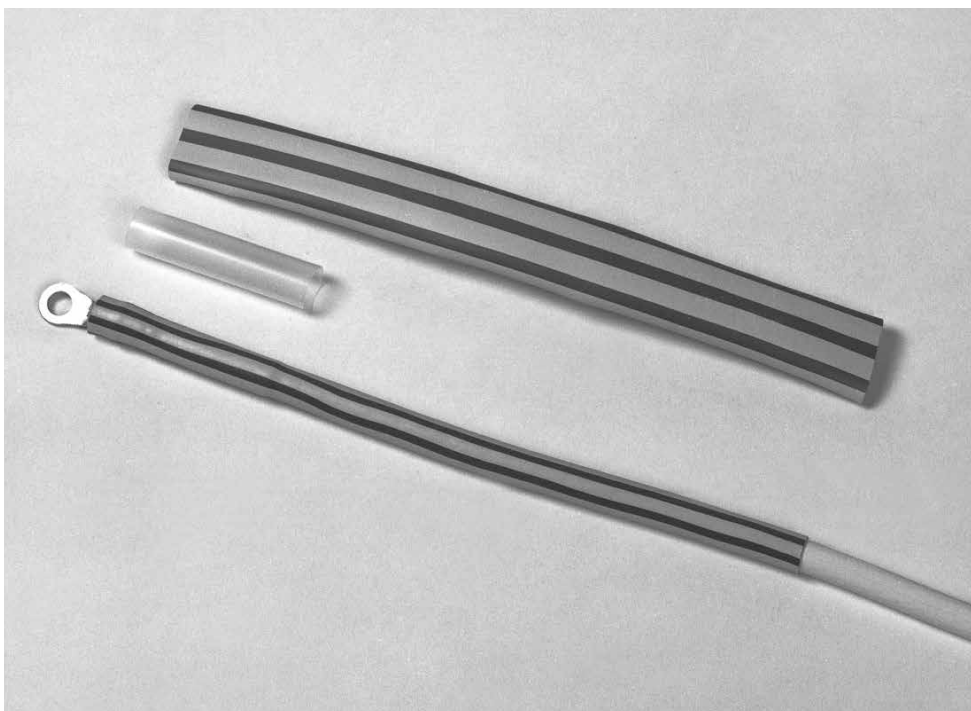
\*\*\*Europe only. For supply to MIL spec., add -MS to ordering description.

## Flexible, Flame-Retardant, Dual-Color, Polyolefin Tubing

### Product Facts

- 2:1 and 3:1 shrink ratio
- Dual colors (yellow/green) for instant identification
- Co-extrusion of tubing colors, giving color permanence superior to that of conventional ink marking
- Flame-retardance
- Flexibility: able to conform to irregular shapes
- Excellent physical, chemical, and electrical properties that meet industry standards for highly reliable, general purpose tubing
- RoHS compliant

## DCPT



### Applications

Used to identify "ground" on wires and in cables, and to jacket and insulate light-duty harnesses.

Easily marked by conventional techniques for additional identification of wires and cables.

### Installation

Minimum shrink temperature: 95°C [203°F]

Minimum full recovery temperature: 120°C [248°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series | UL  | CSA  | Military             | Agency                                              | Raychem |
|--------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------|---------|
| DCPT   | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                 | VG 95343 Pt 5 Type A | AFS 2270<br>DIN 29807<br>VDE 0341<br>Pt 9005 Type A | RW-2056 |

Available in:

Americas

Europe

Asia Pacific

## DCPT (Continued)

### Product Dimensions

| Size       | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|------------|------------------------------|---------------------------------|-----------------------------|
|            | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| <b>2:1</b> |                              |                                 |                             |
| 3/1.5      | 3.0 [0.118]                  | 1.5 [0.059]                     | 0.51 ± 0.10 [0.020 ± 0.004] |
| 6/3        | 6.0 [0.236]                  | 3.0 [0.118]                     | 0.58 ± 0.10 [0.023 ± 0.004] |
| 8/4        | 8.0 [0.315]                  | 4.0 [0.158]                     | 0.64 ± 0.10 [0.025 ± 0.004] |
| 10/5       | 10.0 [0.394]                 | 5.0 [0.197]                     | 0.64 ± 0.10 [0.025 ± 0.004] |
| 12/6       | 12.0 [0.472]                 | 6.0 [0.236]                     | 0.64 ± 0.10 [0.025 ± 0.004] |
| 19/9       | 19.0 [0.748]                 | 9.0 [0.354]                     | 0.76 ± 0.12 [0.030 ± 0.005] |
| 26/13      | 26.0 [1.024]                 | 13.0 [0.512]                    | 0.89 ± 0.12 [0.035 ± 0.005] |
| 38/19      | 38.0 [1.500]                 | 19.0 [0.748]                    | 1.00 ± 0.12 [0.039 ± 0.005] |
| <b>3:1</b> |                              |                                 |                             |
| 3/1        | 3.0 [0.118]                  | 1.0 [0.039]                     | 0.55 ± 0.10 [0.022 ± 0.004] |
| 6/2        | 6.0 [0.236]                  | 2.0 [0.079]                     | 0.65 ± 0.10 [0.026 ± 0.004] |
| 9/3        | 9.0 [0.354]                  | 3.0 [0.118]                     | 0.75 ± 0.15 [0.030 ± 0.006] |
| 12/4       | 12.0 [0.472]                 | 4.0 [0.157]                     | 0.75 ± 0.15 [0.030 ± 0.006] |
| 18/6       | 18.0 [0.709]                 | 6.0 [0.236]                     | 0.85 ± 0.15 [0.033 ± 0.006] |
| 24/8       | 24.0 [0.945]                 | 8.0 [0.315]                     | 1.00 ± 0.20 [0.039 ± 0.008] |
| 39/13      | 39.0 [1.535]                 | 13.0 [0.512]                    | 1.15 ± 0.20 [0.045 ± 0.008] |
| 51/19      | 51.0 [2.000]                 | 19.0 [0.748]                    | 1.02 ± 0.15 [0.040 ± 0.006] |

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

### Ordering Information

|                      |                                                                                                                                         |                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Color                | Standard                                                                                                                                | Yellow/green stripe (-45) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                           |
| Standard packaging   | On spools.                                                                                                                              |                           |
| Ordering description | Specify product name, size and color (for example, DCPT 8/4-45).                                                                        |                           |

## Heat-Shrinkable, Flexible, Chemical and Abrasion Resistant Tubing

### Product Facts

- Flame-retardant
- System 25 tubing
- Shrink ratio 2:1
- RoHS compliant

## DR-25



### Applications

Specially formulated for optimum high-temperature fluid resistance, and long term heat resistance. Resistant to aviation and diesel fuels, hydraulic fluids and lubricating oils.

Particularly suitable as a jacketing material for military ground vehicle cables and harnesses. It is also well suited for the demands of motorsport cable harnesses. When used in conjunction

with System 25 heat-shrinkable molded shapes and S1125 high performance adhesive, these products provide a complete cable harness system.

### Installation

Minimum shrink temperature: 150°C [302°F]

Minimum full recovery temperature: 175°C [347°F]

### Operating Temperature Range

-75°C to 150°C  
[-103°F to 302°F]  
(per VG 95343 Part 5 Type D)

### Specifications/Approvals

| Series | Military                                                                                                                 | Raychem              |
|--------|--------------------------------------------------------------------------------------------------------------------------|----------------------|
| DR-25  | AMS-DTL-23053/16*<br>VG95343 Part 5 Type D<br>VDE 0341/Pt 9005<br>Def Stan 59-97 Issue 3 Type 6B<br>BS 4G-198 Part 3 10A | RT-1116<br>RK-6008/1 |

\*Formerly MIL-I-23053/16 and MIL-DTL-23053/16.

#### Available in:

Americas

Europe

Asia Pacific

**DR-25** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.76 ± 0.15 [0.030 ± 0.006] |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.84 ± 0.15 [0.033 ± 0.006] |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.89 ± 0.15 [0.035 ± 0.006] |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 1.02 ± 0.20 [0.040 ± 0.008] |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 1.22 ± 0.20 [0.048 ± 0.008] |
| 3/4   | 19.0 [0.748]                 | 9.5 [0.375]                     | 1.45 ± 0.28 [0.057 ± 0.011] |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 1.78 ± 0.28 [0.070 ± 0.011] |
| 1 1/2 | 38.0 [1.500]                 | 19.1 [0.750]                    | 2.41 ± 0.41 [0.095 ± 0.016] |
| 2     | 51.0 [2.000]                 | 25.4 [1.000]                    | 2.79 ± 0.41 [0.110 ± 0.016] |
| 3     | 76.0 [3.000]                 | 38.0 [1.500]                    | 3.18 ± 0.50 [0.125 ± 0.020] |

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

**Ordering Information**

|                         |                                                                                                                                         |            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                   | Standard                                                                                                                                | Black (-0) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging      | On spools.                                                                                                                              |            |
| Ordering description*** | Specify product name, size and color (for example, DR-25 1/8-0).                                                                        |            |

\*\*\*Europe only. For supply to Def Stan and BS add -DS or -BS to ordering description.

## Commercial, Dual Wall, Heat-Shrinkable Tubing to Seal and Protect Splices

### Product Facts

- 4:1 shrink ratio allows a few sizes to cover a wide range of applications
- Flame-retardant jacket (black only)
- Performs well at elevated temperatures and in aggressive environments
- Provides excellent environmental sealing from dust, dirt and many fluids, which can cause wire splices to corrode or electrical systems to fail
- Mechanically tough tubing provides protection from flexing and abrasion
- RoHS compliant

## DSPL



### Applications

Specially designed for environmental sealing, electrical insulation and protection of electrical splices, terminals and other components in areas where they will be exposed to moisture.

### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 135°C [275°F]

### Operating Temperature Range

-40°C to 125°C  
[-40°F to 257°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| DSPL   | RK-6755 |

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               |          |        |              |

**DSPL** (Continued)

**Product Dimensions**

| Part Number | Minimum Expanded as Supplied | Maximum Recovered After Heating | Recovered Wall Thickness* |
|-------------|------------------------------|---------------------------------|---------------------------|
|             |                              |                                 | After Heating             |
| DSPL-NR1    | 5.69 [0.224]                 | 1.27 [0.050]                    | 1.15 [0.045]              |
| DSPL-NR2    | 7.49 [0.295]                 | 1.65 [0.065]                    | 1.40 [0.055]              |
| DSPL-NR3    | 10.80 [0.425]                | 2.40 [0.094]                    | 1.80 [0.071]              |
| DSPL-NR4    | 17.50 [0.689]                | 4.50 [0.177]                    | 2.10 [0.083]              |

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

**Ordering Information**

|                      |                                                                                           |                                          |
|----------------------|-------------------------------------------------------------------------------------------|------------------------------------------|
| Color                | Standard                                                                                  | Black (-0), Clear (-X) (except DSPL-NR4) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered.** |                                          |
| Standard packaging   | In cut pieces and 1.2 meter [4-foot] lengths.                                             |                                          |
| Ordering description | Specify product name, size and color (for example, DSPL-NR1-0).                           |                                          |

\*\* Sleeves are number coded to assist with correct size selection

## DWFR

**Dual Wall, Highly Flame-Retardant, UL VW-1 Rated Heat-Shrinkable Tubing**

### Product Facts

- Highly flame-retardant with UL VW-1 flammability rating
- 3:1 and 4:1 shrink ratios provide design versatility
- Moisture-resistant seal
- Withstands mechanical stress for increased product reliability
- RoHS compliant



### Applications

DWFR is a highly flame-retardant, high shrink ratio, dual wall tubing with a UL VW-1 flammability rating. Made from a polyolefin jacket with an integrally bonded meltable thermoplastic adhesive inner wall, it is designed to insulate and environmentally seal and protect components and other electrical connections and terminations. It bonds to a wide variety of plastic, rubber and metal substrates.

This black tubing's 3:1 and 4:1 shrink ratios allow only a limited number of sizes to cover and protect a broad range of irregularly shaped substrates with widely varying dimensions. It is suitable for sealing and protecting connector-to-cable transitions, repairing damaged cable jackets, creating and sealing breakouts in harnesses, and more.

### Installation

Minimum shrink temperature: 60°C [140°F]  
Minimum full recovery temperature: 110°C [256°F]

### Operating Temperature Range

-40°C to 110°C  
[-40°F to 230°F]

### Specifications/Approvals

| Series | UL  | Raychem  |
|--------|----------------------------------------------------------------------------------------|----------|
| DWFR   | E35586 VW-1<br>600 V, 125°C                                                            | DWFR SCD |

Available in:

Americas

Europe

Asia Pacific



**DWFR** (Continued)**Product Dimensions**

| Size       | Inside Diameter              |                                 | Recovered Wall Thickness*        |                                     |
|------------|------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|            | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Total Wall After Heating | Minimum Adhesive Wall After Heating |
| <b>3:1</b> |                              |                                 |                                  |                                     |
| 3/1        | 3.0 [0.118]                  | 1.0 [0.039]                     | 1.12 ± 0.25 [0.044 ± 0.010]      | 0.25 [0.010]                        |
| 6/2        | 6.0 [0.236]                  | 2.0 [0.079]                     | 1.14 ± 0.25 [0.045 ± 0.010]      | 0.25 [0.010]                        |
| 9/3        | 9.0 [0.354]                  | 3.0 [0.118]                     | 1.40 ± 0.25 [0.055 ± 0.010]      | 0.56 [0.022]                        |
| 12/4       | 12.0 [0.472]                 | 4.0 [0.157]                     | 1.78 ± 0.36 [0.070 ± 0.014]      | 0.58 [0.023]                        |
| 19/6       | 19.0 [0.748]                 | 6.0 [0.236]                     | 2.25 ± 0.50 [0.088 ± 0.020]      | 0.58 [0.023]                        |
| 24/8       | 24.0 [0.945]                 | 8.0 [0.315]                     | 2.54 ± 0.50 [0.100 ± 0.020]      | 0.79 [0.031]                        |
| 40/13      | 40.0 [1.575]                 | 13.0 [0.512]                    | 2.54 ± 0.50 [0.100 ± 0.020]      | 0.86 [0.034]                        |
| <b>4:1</b> |                              |                                 |                                  |                                     |
| 4/1        | 4.0 [0.157]                  | 1.0 [0.039]                     | 1.12 ± 0.25 [0.044 ± 0.010]      | 0.25 [0.010]                        |
| 8/2        | 8.0 [0.315]                  | 2.0 [0.079]                     | 1.14 ± 0.25 [0.045 ± 0.010]      | 0.25 [0.010]                        |
| 12/3       | 12.0 [0.472]                 | 3.0 [0.118]                     | 1.40 ± 0.25 [0.055 ± 0.010]      | 0.56 [0.022]                        |
| 16/4       | 16.0 [0.630]                 | 4.0 [0.157]                     | 1.78 ± 0.36 [0.070 ± 0.014]      | 0.58 [0.023]                        |
| 24/6       | 24.0 [0.945]                 | 6.0 [0.236]                     | 2.25 ± 0.50 [0.088 ± 0.020]      | 0.58 [0.023]                        |
| 32/8       | 32.0 [1.260]                 | 8.0 [0.315]                     | 2.54 ± 0.50 [0.100 ± 0.020]      | 0.79 [0.031]                        |
| 52/13      | 52.0 [2.047]                 | 13.0 [0.512]                    | 2.54 ± 0.50 [0.100 ± 0.020]      | 0.86 [0.034]                        |

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

**Ordering Information**

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | In 1.2-meter [4-foot] lengths.                                                          |            |
| Ordering description | Specify product name, size, color and packaging (for example DWFR-3/1-0-STK).           |            |

## DWP-125

**Flexible, High-Shrink-Ratio,  
Adhesive-Lined,  
Polyolefin Tubing**

### Product Facts

- 3:1 shrink ratio allows for insulation and sealing of irregular shapes
- Medium wall provides increased mechanical protection while maintaining flexibility when installed
- Adhesive bonds to a wide variety of plastics, rubber, and metals, including polyethylene, neoprene, and steel
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Environmentally seals and protects a wide variety of electrical applications, including wire splices, breakouts, and connector-to-cable transitions. Suitable for applications where UL recognized/CSA certified adhesive-lined tubing is required.

### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 125°C [257°F]

### Operating Temperature Range

-40°C to 110°C  
[-40°F to 230°F]

### Specifications/Approvals

| Series  | UL  | CSA  | Raychem     |
|---------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------|
| DWP-125 | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                   | DWP-125 SCD |

Available in:

Americas

Europe

Asia Pacific

## DWP-125 (Continued)

### Product Dimensions

| Size | Inside Diameter              |                                 | Recovered Wall Thickness*        |                                     |
|------|------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Total Wall After Heating | Nominal Adhesive Wall After Heating |
| 1/8  | 3.2 [0.125]                  | 1.0 [0.040]                     | 1.02 [0.040]                     | 0.18 [0.007]                        |
| 3/16 | 4.8 [0.187]                  | 1.5 [0.060]                     | 1.40 [0.055]                     | 0.51 [0.020]                        |
| 1/4  | 6.4 [0.250]                  | 2.0 [0.080]                     | 1.45 [0.057]                     | 0.56 [0.022]                        |
| 3/8  | 9.5 [0.375]                  | 3.1 [0.120]                     | 1.65 [0.065]                     | 0.68 [0.027]                        |
| 1/2  | 12.7 [0.500]                 | 4.0 [0.157]                     | 1.78 [0.070]                     | 0.76 [0.030]                        |
| 3/4  | 19.1 [0.750]                 | 5.8 [0.230]                     | 2.03 [0.080]                     | 0.76 [0.030]                        |
| 1    | 25.4 [1.000]                 | 8.1 [0.320]                     | 2.50 [0.100]                     | 0.76 [0.030]                        |

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

### Ordering Information

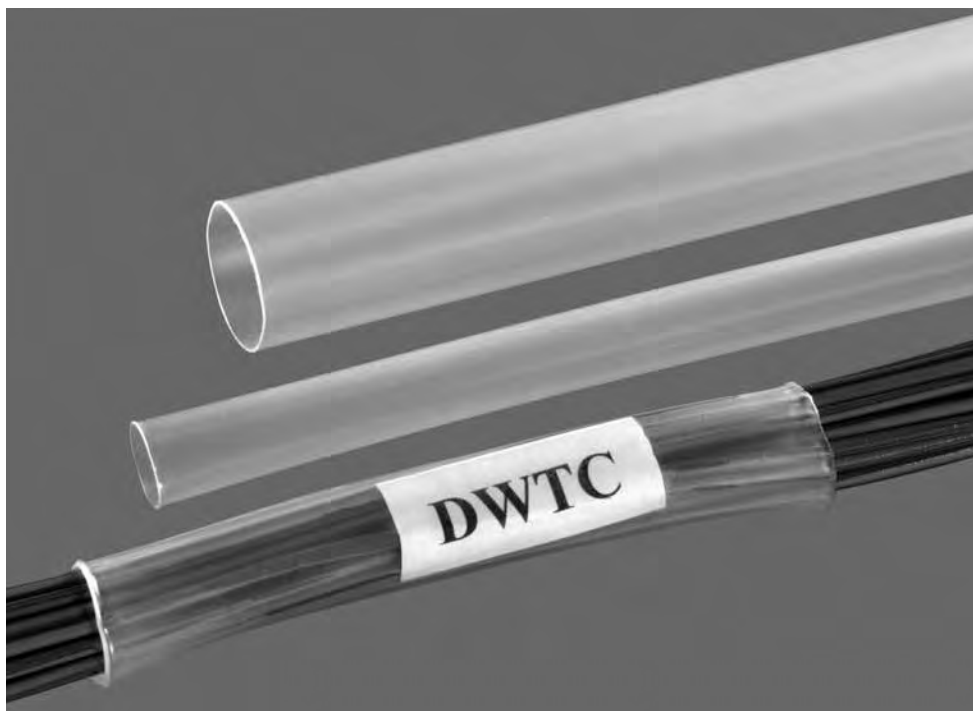
|                      |                                                                                                                                         |                                                                                                                                        |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0)                                                                                                                             |
|                      | Nonstandard                                                                                                                             | White (-9), Red (-2), Blue (-6), Yellow (-4), Green (-5), Clear (-X, non-flame-retardant jacket). Other colors available upon request. |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                                                                        |
| Standard packaging   | In 1.2-meter [4-foot] lengths.                                                                                                          |                                                                                                                                        |
| Ordering description | Specify product name, size and color (for example, DWP-125 1/4-0).                                                                      |                                                                                                                                        |

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

### Product Facts

- Excellent mechanical strength
- Abrasion resistance
- Excellent optical clarity
- Environmental sealing
- Shrink ratio 4:1
- RoHS compliant

## DWTC



### Applications

DWTC is a 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. In particular, it adheres well to PVC. Available in clear, 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-shrink-ratio means that only four sizes are needed to give protection to a full range of irregular shapes with widely varying dimensions.

### Installation

Minimum shrink temperature: 60°C [140°F]

Minimum full recovery temperature: 100°C [212°F]

### Operating Temperature Range

-55°C to 75°C  
[-67°F to 167°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| DWTC   | RK-6204 |

#### Available in:

Americas

Europe

Asia Pacific

**DWTC** (Continued)

**Product Dimensions**

| Size | Inside Diameter              |                                 | Recovered Wall Thickness*        |                                     |
|------|------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Total Wall After Heating | Nominal Adhesive Wall After Heating |
| 4/1  | 4.0 [0.158]                  | 1.0 [0.039]                     | 0.8 [0.032]                      | 0.3 [0.012]                         |
| 8/2  | 8.0 [0.315]                  | 2.0 [0.079]                     | 0.9 [0.035]                      | 0.3 [0.012]                         |
| 12/3 | 12.0 [0.472]                 | 3.0 [0.118]                     | 1.2 [0.047]                      | 0.4 [0.016]                         |
| 16/4 | 16.0 [0.630]                 | 4.0 [0.158]                     | 1.5 [0.059]                      | 0.5 [0.020]                         |

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

**Ordering Information**

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools, in 1.2-meter [4-foot] lengths.                                               |            |
| Ordering description | Specify product name, size and color (for example DWTC-4/1-X-STK).                      |            |

## ES1000

### Clear, High-Shrink-Ratio, Adhesive-Lined, Semirigid Polyolefin Tubing

#### Product Facts

- 4:1 shrink ratio allows a few sizes to cover a wide range of splice and component diameters
- Mechanically tough 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
- UL recognized
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Specially designed for environmental sealing and electrical insulation of wire splices, terminations, and components where see-through inspection is required.

#### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-40°C to 130°C  
[-40°F to 266°F]

#### Specifications/Approvals

| Series | UL  | Raychem |
|--------|----------------------------------------------------------------------------------------|---------|
| ES1000 | E85381<br>600 V, 125°C                                                                 | RT-1113 |

Available in:

Americas

Europe

Asia Pacific

**ES1000** (Continued)

**Product Dimensions**

| Part        | Inside Diameter (Including Core) |                         | Recovered Wall Thickness* |                           |                             |
|-------------|----------------------------------|-------------------------|---------------------------|---------------------------|-----------------------------|
|             | Minimum                          | Maximum                 | Minimum                   | Minimum                   | Minimum                     |
|             | Expanded as Supplied             | Recovered After Heating | Total Wall After Heating  | Jacket Wall After Heating | Adhesive Wall After Heating |
| ES1000-No.1 | 5.72 [0.225]                     | 1.27 [0.050]            | 1.20 [0.047]              | 0.64 [0.025]              | 0.56 [0.022]                |
| ES1000-No.2 | 7.44 [0.293]                     | 1.65 [0.065]            | 1.52 [0.060]              | 0.76 [0.030]              | 0.76 [0.030]                |
| ES1000-No.3 | 10.85 [0.427]                    | 2.41 [0.095]            | 1.91 [0.075]              | 0.89 [0.035]              | 1.02 [0.040]                |
| ES1000-No.4 | 17.78 [0.700]                    | 4.45 [0.175]            | 2.41 [0.095]              | 1.04 [0.041]              | 1.37 [0.054]                |

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

**Ordering Information**

|                      |                                                                                                   |            |
|----------------------|---------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                          | Clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered.           |            |
| Standard packaging   | Cut pieces.                                                                                       |            |
| Marking              | Tubing will be printed with its numbered size (such as ES-1, ES-2, ES-3, or ES-4).                |            |
| Ordering description | Specify product name, numbered size, color, and cut length (for example, ES1000-NO. 2-B9-X-50MM). |            |

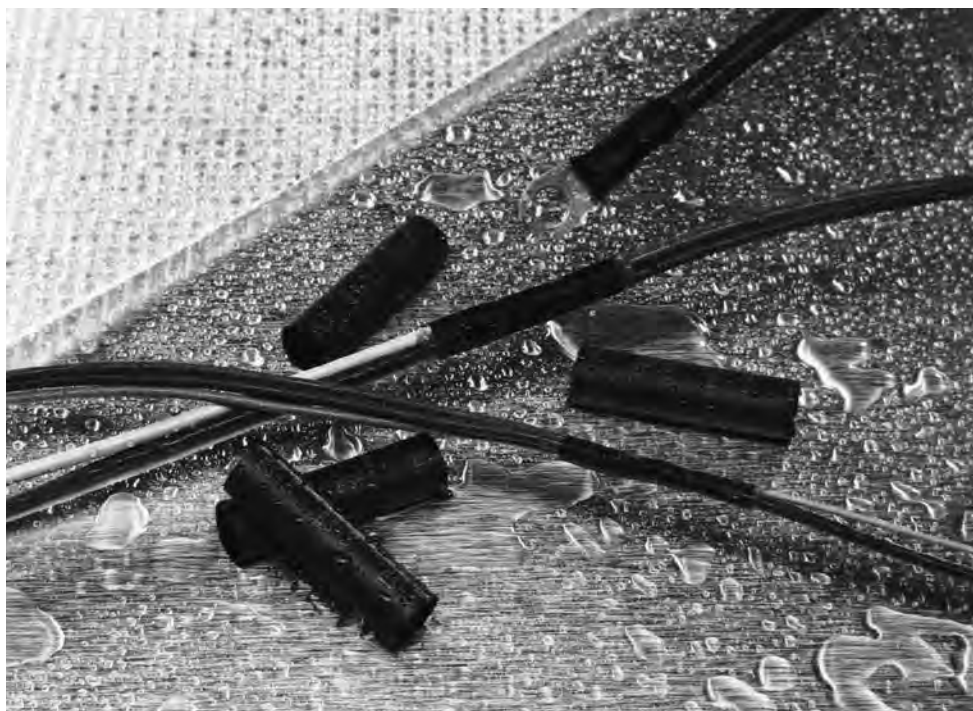


## ES2000

### Flame-Retardant, High-Shrink-Ratio, Adhesive-Lined Semirigid Polyolefin Tubing

#### Product Facts

- 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
- UL recognized
- RoHS compliant



#### Applications

Specially designed for environmental sealing and electrical insulation of wire splices, terminations, and components.

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-40°C to 130°C  
[-40°F to 266°F]

#### Installation

#### Specifications/Approvals

| Series | UL  | Raychem |
|--------|----------------------------------------------------------------------------------------|---------|
| ES2000 | E85381<br>600 V, 125°C                                                                 | RT-1112 |

Available in:

Americas

Europe

Asia Pacific



**ES2000** (Continued)

**Product Dimensions**

| Part        | Inside Diameter (Including Core) |                         | Recovered Wall Thickness* |                           |                             |
|-------------|----------------------------------|-------------------------|---------------------------|---------------------------|-----------------------------|
|             | Minimum                          | Maximum                 | Minimum                   | Minimum                   | Minimum                     |
|             | Expanded as Supplied             | Recovered After Heating | Total Wall After Heating  | Jacket Wall After Heating | Adhesive Wall After Heating |
| ES2000-No.1 | 5.72 [0.225]                     | 1.27 [0.050]            | 1.20 [0.047]              | 0.64 [0.025]              | 0.56 [0.022]                |
| ES2000-No.2 | 7.44 [0.293]                     | 1.65 [0.065]            | 1.52 [0.060]              | 0.76 [0.030]              | 0.76 [0.030]                |
| ES2000-No.3 | 10.85 [0.427]                    | 2.41 [0.095]            | 1.91 [0.075]              | 0.89 [0.035]              | 1.02 [0.040]                |
| ES2000-No.4 | 17.78 [0.700]                    | 4.45 [0.175]            | 2.41 [0.095]              | 1.04 [0.041]              | 1.37 [0.054]                |

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

**Ordering Information**

|                      |                                                                                                   |            |
|----------------------|---------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                          | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered.           |            |
| Standard packaging   | Cut pieces.                                                                                       |            |
| Marking              | Tubing will be printed with its numbered size (such as ES-1, ES-2, ES-3, or ES-4).                |            |
| Ordering description | Specify product name, numbered size, color, and cut length (for example, ES2000-NO. 2-B9-0-50MM). |            |

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

### Product Facts

- 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
- UL recognized
- RoHS compliant

## ES Caps



### Applications

Specially designed to provide mechanical and environmental protection of stub splices in electrical harnesses. Clear caps allow see-through inspection; black caps are flame-retardant.

### Installation

Minimum shrink temperature: 100°C [212°F]  
Minimum full recovery temperature: 135°C [275°F]

### Operating Temperature Range

-40°C to 105°C  
[-40°F to 221°F]

### Specifications/Approvals

| Series  | UL  | Raychem |
|---------|----------------------------------------------------------------------------------------|---------|
| ES Caps | E85381<br>600 V, 125°C                                                                 | RW-3006 |

#### Available in:

Americas

Europe

Asia Pacific

## ES Caps (Continued)

### Product Dimensions

| Part Number | Standard Length* as Supplied<br>(Millimeters) | Inside Diameter<br>(Including Core) |                   | Recovered Wall Thickness** |                     |                  |
|-------------|-----------------------------------------------|-------------------------------------|-------------------|----------------------------|---------------------|------------------|
|             |                                               | Minimum Expanded                    | Maximum Recovered | Minimum Total Wall         | Minimum Jacket Wall | Minimum Adhesive |
|             |                                               | as supplied                         | After Heating     | After Heating              | After Heating       | After Heating    |
| ES Cap-No.1 | 30, 35                                        | 5.72 [0.225]                        | 1.27 [0.050]      | 1.20 [0.047]               | 0.64 [0.025]        | 0.56 [0.022]     |
| ES Cap-No.2 | 30, 35                                        | 7.44 [0.293]                        | 1.65 [0.065]      | 1.52 [0.060]               | 0.76 [0.030]        | 0.76 [0.030]     |
| ES Cap-No.3 | 40, 50                                        | 10.85 [0.427]                       | 2.41 [0.095]      | 1.91 [0.075]               | 0.89 [0.035]        | 1.02 [0.040]     |

\*Other cap lengths available upon request.

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

### Ordering Information

|                      |                                                                                                                                 |                        |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Color                | Standard                                                                                                                        | Black (-0), clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Other cap lengths available on request. |                        |
| Standard packaging   | In pieces.                                                                                                                      |                        |
| Marking              | Caps will be marked with their numbered size (such as ES-1, ES-2, or ES-3).                                                     |                        |
| Ordering description | Specify product name, size, color, and length (for example, ES CAP-NO. 2-B9-X-35MM).                                            |                        |

## FL2500

### Fully Flame-Retardant, Adhesive-Lined, Polyolefin Heat-Shrinkable Tubing

#### Product Facts

- 4:1 shrink ratio allows a few sizes to cover a wide range of wire terminations and components
- Flame-retardant tubing jacket and adhesive provide full flame-retardancy
- Fully flame-retardant and mechanically tough, the tubing provides strain relief and abrasion protection of wire splices, terminals and other components
- Thick high-performance adhesive lining offers permanent sealing of splices, fusible links, terminals and in-line components
- RoHS compliant



1

Heat-shrinkable Tubing

#### Applications

Tough flame-retardant polyolefin tubing lined with a flame-retardant adhesive provides the optimum solution for applications where full flame-retardancy is preferred or specified.

Rated to 135°C [275°F] for 3000 hours, FL2500 is suitable for use in the automotive harness market and other harsh environments. As the tubing shrinks, the adhesive lining melts and flows to fill all voids and create a complete seal against moisture, oils, chemicals and other fluids.

#### Installation

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-40°C to 135°C  
[-40°F to 275°F]

#### Specifications/Approvals

| Series | Raychem    |
|--------|------------|
| FL2500 | FL2500 SCD |

Available in:

Americas

Europe

Asia Pacific

**FL2500** (Continued)

**Product Dimensions**

| Part Number  | Inside Diameter (Including Core) |                                 | Recovered Wall Thickness*  |                                     |
|--------------|----------------------------------|---------------------------------|----------------------------|-------------------------------------|
|              | Minimum Expanded as Supplied     | Maximum Recovered After Heating | Total Wall After Heating   | Minimum Adhesive Wall After Heating |
| FL2500-No. 1 | 7.62 [0.300]                     | 1.65 [0.065]                    | 1.52 ± 0.3 [0.060 ± 0.012] | 0.71 [0.028]                        |
| FL2500-No. 2 | 9.02 [0.355]                     | 2.29 [0.090]                    | 1.52 ± 0.3 [0.060 ± 0.012] | 0.71 [0.028]                        |
| FL2500-No. 3 | 11.56 [0.455]                    | 2.54 [0.100]                    | 2.29 ± 0.3 [0.090 ± 0.012] | 1.32 [0.052]                        |
| FL2500-No. 4 | 17.79 [0.700]                    | 4.45 [0.175]                    | 2.54 ± 0.3 [0.100 ± 0.012] | 1.35 [0.053]                        |

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

**Ordering Information**

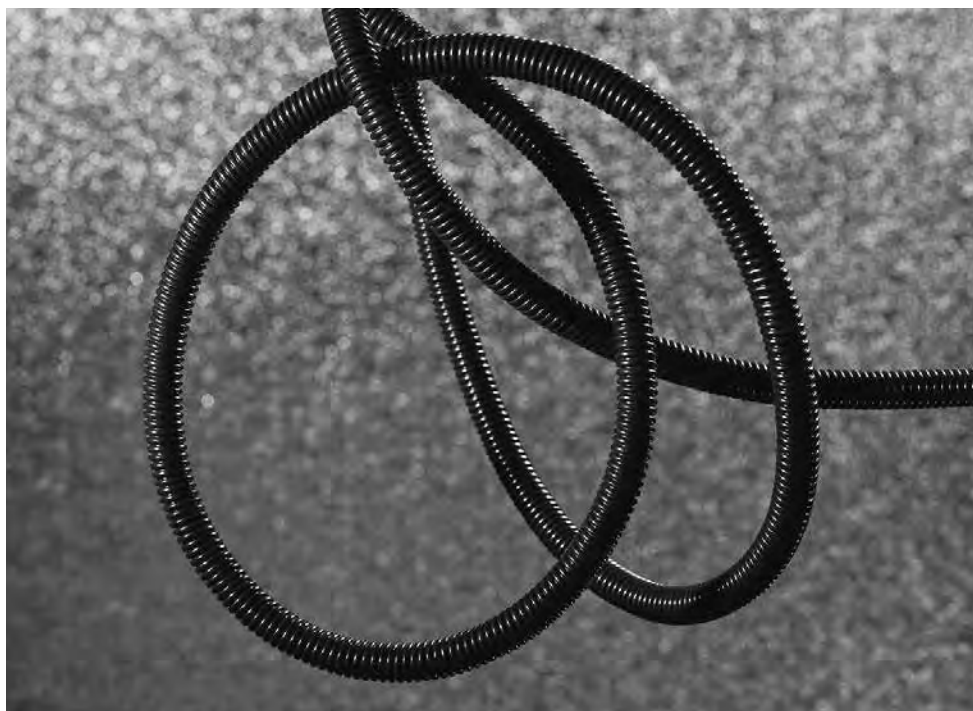
|                      |                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------|
| Color                | Black (-0) with a white adhesive liner.                                                 |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |
| Standard packaging   | Cut pieces.                                                                             |
| Marking              | Tubing will be marked with its numbered size (such as FL-1, FL-2, FL-3, or FL-4).       |
| Ordering description | Specify product name, size, color, and cut length (for example, FL2500-NO.2-I9-0-50MM). |

## HCTE

### Helical Convolex Tubing with a High Crush Resistance

#### Product Facts

- Highly flame-retardant
- Highly flexible and fluid resistant
- Not heat-shrinkable
- High crush resistance
- System 300 conduit tubing
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

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 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.

#### Operating Temperature Range

-55°C to 200°C  
[-67°F to 392°F]

#### Specifications/Approvals

| Series | Military        | Raychem |
|--------|-----------------|---------|
| HCTE   | VG 96936 Part 6 | RT-1162 |

Available in:

Americas

Europe

Asia Pacific

**HCTE** (Continued)

**Product Dimensions**

| Size | Inside Diameter<br>Minimum | Outside Diameter<br>Maximum | Maximum<br>Wall Thickness |
|------|----------------------------|-----------------------------|---------------------------|
| 0187 | 4.60 [0.181]               | 8.10 [0.320]                | 0.46 [0.018]              |
| 0281 | 6.90 [0.273]               | 10.50 [0.414]               | 0.46 [0.018]              |
| 0312 | 7.70 [0.306]               | 11.80 [0.450]               | 0.46 [0.018]              |
| 0375 | 9.20 [0.364]               | 12.90 [0.510]               | 0.46 [0.018]              |
| 0437 | 10.80 [0.427]              | 14.50 [0.571]               | 0.46 [0.018]              |
| 0500 | 12.30 [0.485]              | 16.50 [0.650]               | 0.58 [0.023]              |
| 0625 | 15.40 [0.608]              | 19.50 [0.770]               | 0.58 [0.023]              |
| 0750 | 17.90 [0.730]              | 23.60 [0.930]               | 0.58 [0.023]              |
| 0875 | 21.80 [0.860]              | 27.20 [1.073]               | 0.58 [0.023]              |
| 1000 | 24.70 [0.975]              | 31.10 [1.226]               | 0.58 [0.023]              |
| 1250 | 30.70 [1.210]              | 35.30 [1.539]               | 0.58 [0.023]              |
| 1500 | 36.50 [1.437]              | 46.50 [1.832]               | 0.58 [0.023]              |
| 1625 | 39.60 [1.562]              | 50.17 [1.975]               | 0.58 [0.023]              |
| 1750 | 42.67 [1.688]              | 52.88 [2.082]               | 0.58 [0.023]              |
| 2000 | 49.20 [1.937]              | 59.23 [2.332]               | 0.58 [0.023]              |

**Ordering Information**

|                      |                                                                                           |            |
|----------------------|-------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                  | Black (-0) |
| Size selection       | Always order a conduit size that will ensure that a "fill factor" of 70% is not exceeded. |            |
| Standard packaging   | On spools.                                                                                |            |
| Ordering description | Specify product name, size and color (for example, HCTE-0187-0).                          |            |

## High-Flex, Heavy-Wall, Heat-Shrinkable Tubing

### Product Facts

- Offers high flexibility
- Provides excellent insulation and abrasion protection, per U.S. Mine Safety and Health Administration (MSHA) regulations
- Flame-retardant
- HF has the following agency approvals:
  - ABS (American Bureau of Shipping)
  - Lloyd's (Lloyd's Register of Shipping)
- RoHS compliant

## HF



### Applications

Developed for cable jacketing applications where cable flexibility is important, high-flex (HF) tubing is good for jacketing cables where sharp bends or turns are required. Also suitable for situations where the cable is subject to motion. Such situations are common for industrial machinery, transportation equipment, robotics, welding, and many other cabling applications. To

complete the cable jacket seal, the ends may be sealed for further water and corrosion protection by using available tape sealant or adhesive.

### Installation

Minimum shrink temperature: 80°C [176°F]

Minimum full recovery temperature: 121°C [250°F]

### Operating Temperature Range

-55°C to 90°C  
[-67°F to 194°F]

### Specifications/Approvals

| Series | Agency       | Raychem |
|--------|--------------|---------|
| HF     | ABS, Lloyd's | RW-2023 |

#### Available in:

Americas

Europe

Asia Pacific



## HF (Continued)

### Product Dimensions

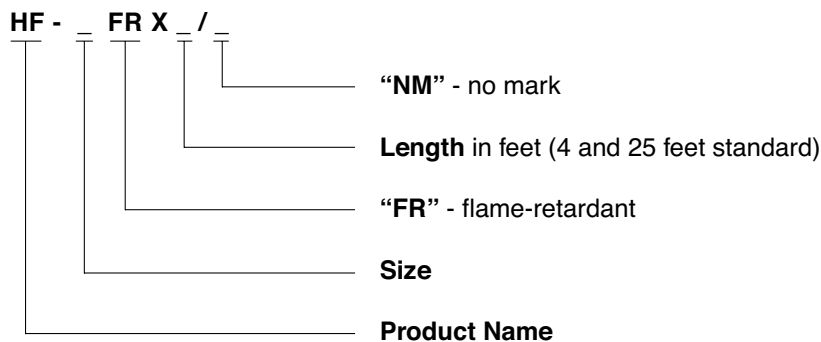
| Size | Standard Nominal Length (m/ft) | Inside Diameter              |                                 | Wall Thickness**                |
|------|--------------------------------|------------------------------|---------------------------------|---------------------------------|
|      |                                | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating |
| HF04 | 1.2, 7.5 [4, 25]               | 10.16 [0.400]                | 3.81 [0.150]                    | 1.52 [0.060]                    |
| HF07 | 1.2, 7.5 [4, 25]               | 19.05 [0.750]                | 5.59 [0.220]                    | 1.52 [0.060]                    |
| HF11 | 1.2, 7.5 [4, 25]               | 27.94 [1.100]                | 9.52 [0.375]                    | 2.67 [0.105]                    |
| HF13 | 1.2, 7.5 [4, 25]               | 33.02 [1.300]                | 9.52 [0.375]                    | 2.67 [0.105]                    |
| HF15 | 1.2, 7.5 [4, 25]               | 38.10 [1.500]                | 12.70 [0.500]                   | 3.05 [0.120]                    |
| HF17 | 1.2, 7.5 [4, 25]               | 43.14 [1.700]                | 12.70 [0.500]                   | 3.05 [0.120]                    |
| HF20 | 1.2, 7.5 [4, 25]               | 50.80 [2.000]                | 19.05 [0.750]                   | 3.56 [0.140]                    |
| HF27 | 1.2, 7.5 [4, 25]               | 68.58 [2.700]                | 22.86 [0.900]                   | 3.94 [0.155]                    |

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

### Ordering Information

|                      |                                                                                                    |       |
|----------------------|----------------------------------------------------------------------------------------------------|-------|
| Color                | Standard                                                                                           | Black |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered.            |       |
| Standard packaging   | 1.2-meter [4-foot] or 7.5-meter [25-foot] lengths. Nonstandard lengths are available upon request. |       |
| Ordering description | See below.                                                                                         |       |

### Part Numbering System



Example: HF-17FRX25/NM

## HFT5000

1

Heat-shrinkable Tubing

### Heat-Shrinkable Fabric Tubing

#### Product Facts

- Highly flexible woven fabric tubing
- Polyethylene/polyester construction for excellent abrasion resistance
- Halogen free
- Heat-shrinkable to grip substrates tightly without additional fixing
- 2:1 shrink ratio for easy installation onto different substrate diameters and sizes
- Highly flexible woven fabric construction for easy, compliant installation onto awkward substrates such as bent hoses
- Outstanding abrasion resistance over a wide temperature range
- Easily cut with standard industrial cutting equipment
- Resistant to harsh environments
- Multifilament construction that ensures soft, safe handling
- Low shrink temperature for safe installation onto heat sensitive substrates
- RoHS compliant



#### Applications

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

The woven construction makes HFT5000 extremely flexible and resistant to trapping water, heat and humidity. Provides outstanding abrasion, chafing and cutting protection, even at high-temperatures.

#### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 110°C [230°F]  
Maximum storage temperature: 60°C [140°F]

#### Operating Temperature Range

3000 hours:  
-40°C to 125°C  
[-40°F to 257°F]  
1000 hours:  
-40°C to 150°C  
[-40°F to 302°F]

#### Specifications/Approvals

| Series  | UL  | Raychem |
|---------|----------------------------------------------------------------------------------------|---------|
| HFT5000 | E199379<br>Rated 105°C                                                                 | RW-2060 |

Available in:

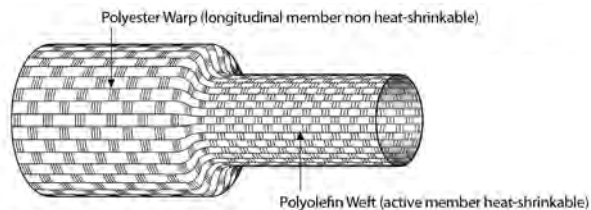
Americas

Europe

Asia Pacific

## HFT5000 (Continued)

### Product Dimensions



| Size                            | Inside Diameter  |                   |
|---------------------------------|------------------|-------------------|
|                                 | Minimum Expanded | Maximum Recovered |
|                                 | as Supplied      | After             |
| <b>Heating</b>                  |                  |                   |
| <b>Standard</b>                 |                  |                   |
| 12/6                            | 12 [0.47]        | 6 [0.24]          |
| 20/10                           | 20 [0.79]        | 10 [0.39]         |
| 30/15                           | 30 [1.18]        | 15 [0.59]         |
| 40/20                           | 40 [1.57]        | 20 [0.79]         |
| 50/25                           | 50 [1.97]        | 25 [0.98]         |
| 60/30                           | 60 [2.36]        | 30 [1.18]         |
| 70/35                           | 70 [2.76]        | 35 [1.38]         |
| 100/50                          | 100 [3.94]       | 50 [1.97]         |
| <b>Non-Standard High Volume</b> |                  |                   |
| 25/12                           | 25 [0.98]        | 12 [0.47]         |
| 34/17                           | 34 [1.34]        | 17 [0.67]         |
| 80/40                           | 80 [3.15]        | 40 [1.57]         |

### Ordering Information

|                      |                                                                     |            |
|----------------------|---------------------------------------------------------------------|------------|
| Color                | Standard                                                            | Black (-0) |
| Standard packaging   | On spools.                                                          |            |
| Ordering description | Specify product name, size and color (for example, HFT5000-12/6-0). |            |

## HRHF/HRNF/HRSR

### High-Ratio, Heat-Shrinkable Tubing

#### Product Facts

- Offers toughness and durability
- Provides excellent insulation and abrasion protection
- Is available in flame-retardant material
- Shrinks to fit (5.6:1)
- FR callouts meet all of the requirements of AMS-DTL-23053/15\*, except for some of the tubing sizes, which do not meet the exact recovered wall thickness requirements
- HRHF and HRSR have the following agency approvals:
  - ABS (American Bureau of Shipping)
  - Lloyd's (Lloyd's Register of Shipping)
- RoHS compliant



#### Applications

High-ratio (HR) heat-shrinkable tubing, with expansion ratios as high as 5.6 to 1, is designed to accommodate large size differences between cables and cable connectors and backshells, thus simplifying repair of damaged cable. High-ratio tubing is available in semirigid flame-retardant (SR), standard (NF), or high-flex flame-retardant (HF) material and with or without

factory-applied sealants and adhesives. The water-proofing sealant provides environmental sealing and is watertight in wet and corrosive locations. The thermoplastic adhesive coating offers excellent strain relief and environmental sealing.

#### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 121°C [250°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series | Agency       | Raychem |
|--------|--------------|---------|
| HRSR   | ABS, Lloyd's | RW-2013 |
| HRHF   | ABS, Lloyd's | RW-2013 |
| HRNF   | —            | RW-2013 |

Available in:

Americas

Europe

Asia Pacific

## HRHF/HRNF/HRSR (Continued)

### Product Dimensions

| Size†   | Inside Diameter              |                                 | Recovered Wall Thickness†† |
|---------|------------------------------|---------------------------------|----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal After Heating      |
| HR**060 | 15.24 [0.600]                | 3.81 [0.150]                    | 1.52 [0.060]               |
| HR**125 | 31.75 [1.250]                | 6.10 [0.240]                    | 1.52 [0.060]               |
| HR**175 | 44.45 [1.750]                | 8.00 [0.315]                    | 2.41 [0.095]               |
| HR**200 | 50.80 [2.000]                | 9.52 [0.375]                    | 2.67 [0.105]               |
| HR**250 | 63.50 [2.500]                | 12.70 [0.500]                   | 3.05 [0.120]               |
| HR**300 | 76.20 [3.000]                | 19.05 [0.750]                   | 3.05 [0.120]               |
| HR**400 | 101.60 [4.000]               | 22.86 [0.900]                   | 3.56 [0.140]               |

†For \*\* substitute HF, NF or SR for material required.

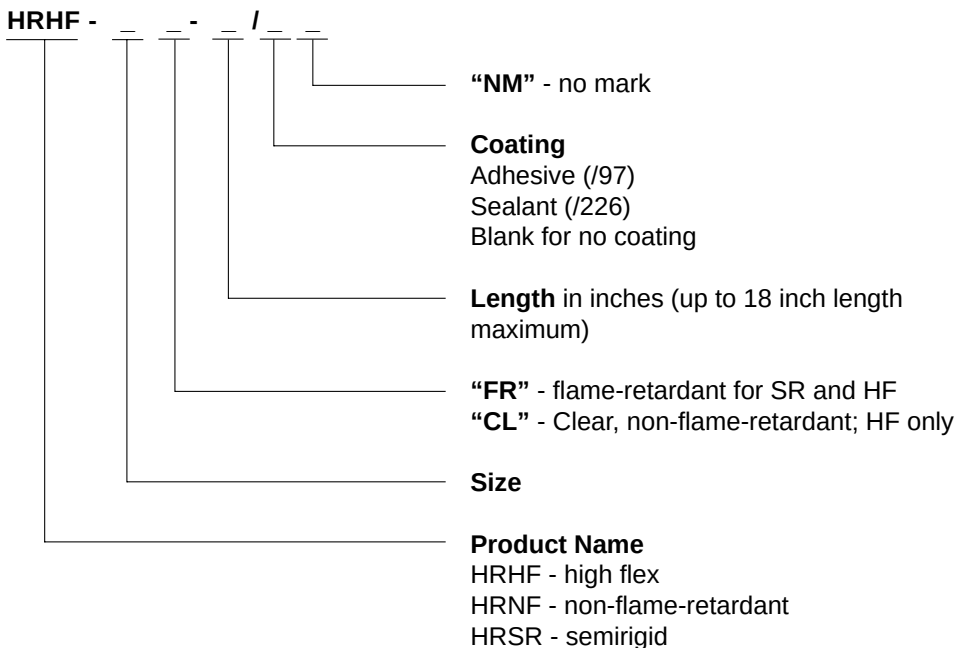
††Wall thickness will be less if tubing recovery is restricted during shrinkage.

### Ordering Information

|                      |                                                                                                                                 |                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Color                | Standard                                                                                                                        | Black (-0)                                                  |
|                      | Nonstandard                                                                                                                     | Clear available on request (not flame-retardant; HRHF only) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Other sizes are available upon request. |                                                             |
| Standard packaging   | Up to 18 inch lengths maximum.*                                                                                                 |                                                             |
| Ordering description | See below.                                                                                                                      |                                                             |

\*Cutting tolerance is  $\pm 0.125$ ".

### Part Numbering System



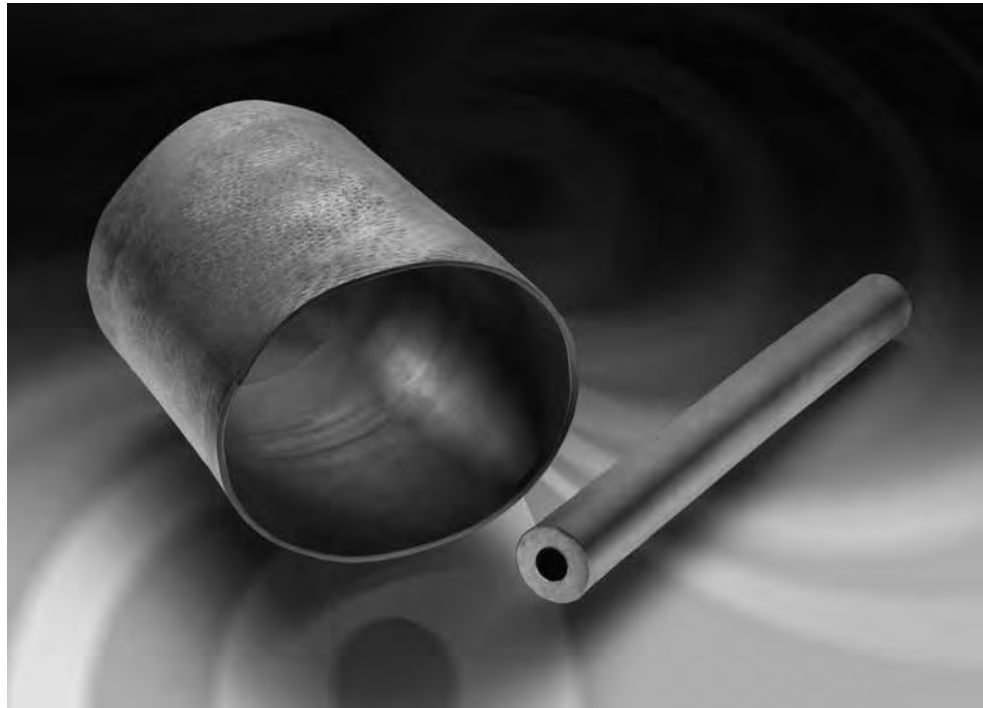
Example: HRHF-125FR-10/226-NM

## HRHT

**High-Ratio, High-Temperature, Flexible, Thick Wall Polyolefin Heat-Shrinkable Tubing**

### Product Facts

- Shrink ratios as high as 6:1
- Specially formulated for thick wall insulation, strain relief and abrasion protection
- Flame-retardant passing ASTM D 635
- Excellent performance in both hot and cold environments
- Optional factory applied adhesive provides watertight environmental sealing in wet and corrosive locations
- RoHS compliant



### Applications

High-ratio (HR), high-temperature (HT) heat-shrinkable tubing, with shrink ratios as high as 6-to-1, is designed to conform to odd shapes and shrink over large transitions, allowing for the repair and sealing of cable connectors and equipment. This product can be used to seal the back end of a connector or simply repair the damaged outer insulation of a cable or wire. Cable

harnesses can be repaired and released without disassembly.

HRHT tubing is available with an optional hot melt adhesive lining. A high-performance adhesive is also available for more demanding applications.

### Installation

Minimum shrink temperature: 135°C [275°F]

Minimum full recovery temperature: 150°C [302°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series | Military                | Raychem  |
|--------|-------------------------|----------|
| HRHT   | SAE-AS81765/1, Type II* | HRHT SCD |

\*heat-shrinkable, crosslinked, flexible polyolefin

Available in:

Americas

Europe

Asia Pacific

## HRHT (Continued)

### Product Dimensions

| Size†    | Inside Diameter              |                                 | Wall Thickness††                |
|----------|------------------------------|---------------------------------|---------------------------------|
|          | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating |
| HRHT-1/X | 19.05 [0.750]                | 3.05 [0.120]                    | 3.94 [0.155]                    |
| HRHT-2/X | 38.16 [1.500]                | 5.84 [0.230]                    | 3.94 [0.155]                    |
| HRHT-3/X | 50.80 [2.000]                | 9.14 [0.360]                    | 3.94 [0.155]                    |
| HRHT-4/X | 76.20 [3.000]                | 12.70 [0.500]                   | 3.94 [0.155]                    |
| HRHT-5/X | 114.30 [4.500]               | 19.05 [0.750]                   | 3.94 [0.155]                    |

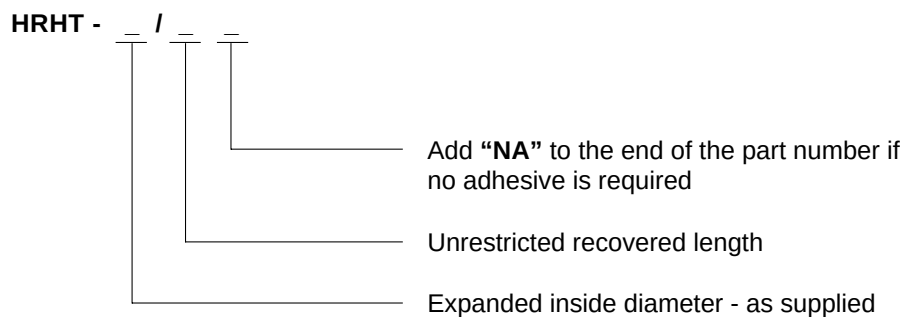
†"X" indicates recovered length in inches (e.g. for 3.0-inch length: HRHT-2/3). The tolerance shall be +/- 10% of the specified recovered length.

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | In pieces.                                                                              |            |
| Ordering description | Specify product name, size and cut length (for example, HRHT-1/3).                      |            |

### Part Numbering System



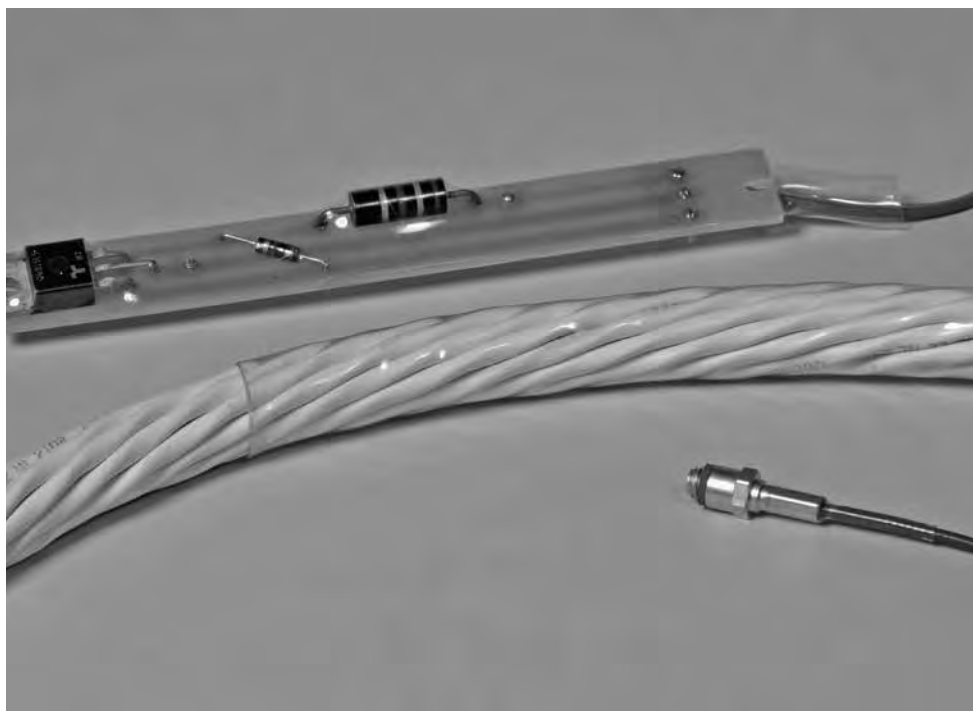


## HT-200

**High-Clarity,  
Highly Flame-Resistant,  
Very Flexible, Fluoropolymer  
Tubing**

### Product Facts

- 2:1 shrink ratio for all standard sizes
- Tough, very flexible, very-thin-wall insulation
- High flame resistance; meets the requirements of AMS-DTL-23053, Test C, and ASTM D2671, Procedure C
- High and low temperature performance that meets or exceeds military and industrial standards
- Protection from most industrial solvents, fuels and chemicals
- Meets NASA outgassing requirements
- RoHS compliant



### Applications

Provides very-thin-wall insulation and strain relief of multipin connectors, solder joints and other delicate electrical connections and terminations. It is well-suited for applications that require dense packing of components such as downhole sensors. Provides superior chemical and solvent resistance when used for bundling and jacketing of wires and cables. Suitable

for applications requiring low outgassing materials such as wire bundling and label protection in satellites.

### Installation

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 130°C [266°F]

### Operating Temperature Range

-70°C to 200°C  
[-94°F to 392°F]

### Specifications/Approvals

| Series | Military                    | Raychem |
|--------|-----------------------------|---------|
| HT-200 | AMS-DTL-23053/18., Class 3* | RW-1200 |

\* Formerly MIL-I-23053/18 and MIL-DTL-23053/18.

Available in:

Americas

Europe

Asia Pacific



## HT-200 (Continued)

### Product Dimensions

| Size | Inside Diameter              |                                 | Wall Thickness†                 |
|------|------------------------------|---------------------------------|---------------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating |
| 3/64 | 1.17 [0.046]                 | 0.58 [0.023]                    | 0.25 ± 0.05 [0.010 ± 0.002]     |
| 1/16 | 1.60 [0.063]                 | 0.79 [0.031]                    | 0.25 ± 0.05 [0.010 ± 0.002]     |
| 3/32 | 2.36 [0.093]                 | 1.17 [0.046]                    | 0.25 ± 0.05 [0.010 ± 0.002]     |
| 1/8  | 3.17 [0.125]                 | 1.57 [0.063]                    | 0.25 ± 0.05 [0.010 ± 0.002]     |
| 3/16 | 4.74 [0.187]                 | 2.36 [0.093]                    | 0.25 ± 0.05 [0.010 ± 0.002]     |
| 1/4  | 6.35 [0.250]                 | 3.17 [0.125]                    | 0.33 ± 0.05 [0.013 ± 0.002]     |
| 3/8  | 9.50 [0.375]                 | 4.74 [0.187]                    | 0.33 ± 0.05 [0.013 ± 0.002]     |
| 1/2  | 12.70 [0.500]                | 6.35 [0.250]                    | 0.33 ± 0.05 [0.013 ± 0.002]     |
| 3/4  | 19.05 [0.750]                | 9.50 [0.375]                    | 0.43 ± 0.08 [0.017 ± 0.003]     |
| 1    | 25.40 [1.000]                | 12.70 [0.500]                   | 0.48 ± 0.08 [0.019 ± 0.003]     |

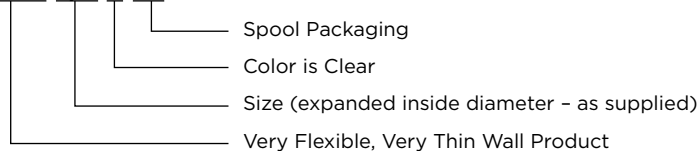
†Wall thickness will be less if tubing recovery is restricted during shrinkage.

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools.                                                                              |            |
| Ordering description | Specify product name, size and color (for example, HT-200-1/4-X).                       |            |

### Part Numbering System

#### HT-200-3/8-X-SP



## HTAT

**Semiflexible, Dual Wall,  
Moisture-Resistant,  
Heat-Shrinkable Tubing**

### Product Facts

- 4:1 shrink ratio
- Environmental sealing
- High-strength bonding
- Well-suited connector sealing covering large diameter differences
- RoHS compliant



### Applications

Designed to provide environmental sealing for a range of substrates, at elevated temperatures. Manufactured by TE from radiation-crosslinked 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 barrier.

An operating range of -55°C to 125°C [-67°F to 257°F] and a high-shrink-ratio as standard, mean that the tubing offers superior environmental protection to a wide range of irregular shapes with varying dimensions. The jacket is flame-retardant to reduce flame propagation.

### Installation

Minimum shrink temperature: 80°C [176°F]

Minimum full recovery temperature: 110°C [230°F]

### Operating Temperature Range

-55°C to 125°C  
[-67°F to 257°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| HTAT   | RW-2052 |

Available in: Americas Europe Asia Pacific

**HTAT** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness*        |                                     |
|-------|------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Total Wall After Heating | Nominal Adhesive Wall After Heating |
| 4/1   | 4.0 [0.158]                  | 1.0 [0.039]                     | 1.00 [0.039]                     | 0.40 [0.016]                        |
| 8/2   | 8.0 [0.315]                  | 2.0 [0.079]                     | 1.00 [0.039]                     | 0.50 [0.020]                        |
| 12/3  | 12.0 [0.472]                 | 3.0 [0.118]                     | 1.40 [0.055]                     | 0.60 [0.024]                        |
| 16/4  | 16.0 [0.630]                 | 4.0 [0.158]                     | 1.75 [0.069]                     | 0.75 [0.030]                        |
| 24/6  | 24.0 [0.945]                 | 6.0 [0.236]                     | 2.25 [0.088]                     | 0.80 [0.032]                        |
| 32/8  | 32.0 [1.260]                 | 8.0 [0.315]                     | 2.50 [0.098]                     | 1.00 [0.039]                        |
| 48/13 | 48.0 [1.890]                 | 13.0 [0.512]                    | 2.55 [0.100]                     | 1.00 [0.039]                        |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | In 1.2-meter [4-foot] lengths.                                                                                                          |            |
| Ordering description | Specify product name, size and color (for example, HTAT 8/2-0).                                                                         |            |

## LSTT

**Low-Shrink-Temperature,  
Non-Flame-Retardant,  
Heat-Shrinkable, Polyolefin  
tubing**

### Product Facts

- 2:1 shrink ratio
- Rapid recovery at low temperatures
- Can be used with temperature-sensitive materials
- Flexible
- Not flame-retardant
- Excellent physical and electrical performance
- RoHS compliant



Heat-shrinkable Tubing

### Applications

LSTT is a highly flexible, low-shrink-temperature, heat-shrinkable tubing. 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, such as PVC jacketed wire and cable. Although not flame-

retardant, LSTT meets the automotive flame propagation standard MVSS 302.

Typical applications include electrical termination insulation, color-coding, covering of heat-sensitive devices, cosmetic coverings, and mechanical protection.

### Installation

Minimum shrink temperature: 65°C [149°F]

Minimum full recovery temperature: 110°C [230°F]

### Operating Temperature Range

-40°C to 125°C  
[-40°F to 257°F]

### Specifications/Approvals

| Series | Industry | Raychem |
|--------|----------|---------|
| LSTT   | MVSS302  | RW-2051 |

Available in:

Americas

Europe

Asia Pacific

**LSTT** (Continued)

**Product Dimensions**

| Size   | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|--------|------------------------------|---------------------------------|-----------------------------|
|        | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal After Heating       |
| 1.6    | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.50 ± 0.12 [0.018 ± 0.005] |
| 2.4    | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.55 ± 0.12 [0.022 ± 0.005] |
| 3.2    | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.55 ± 0.12 [0.022 ± 0.005] |
| 4.8    | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.55 ± 0.12 [0.022 ± 0.005] |
| 6.4    | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 9.5    | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 12.7   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 19.0   | 19.0 [0.748]                 | 9.5 [0.375]                     | 0.80 ± 0.15 [0.032 ± 0.006] |
| 25.4   | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.95 ± 0.18 [0.037 ± 0.007] |
| 32.0   | 32.0 [1.260]                 | 16.0 [0.630]                    | 1.05 ± 0.20 [0.041 ± 0.008] |
| 38.0   | 38.0 [1.496]                 | 19.0 [0.748]                    | 1.05 ± 0.20 [0.041 ± 0.008] |
| 52.0** | 52.0 [2.047]                 | 26.0 [1.024]                    | 1.14 ± 0.18 [0.045 ± 0.007] |

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

\*\*Available in black only.

**Ordering Information**

|                      |                                                                                                                                 |                                               |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Color                | Standard                                                                                                                        | Black (-0), red (-2), blue (-6), yellow (-4)  |
|                      | Nonstandard                                                                                                                     | Green (-5), grey (-8), white (-9), clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Other sizes are available upon request. |                                               |
| Standard packaging   | On spools***                                                                                                                    |                                               |
| Ordering description | Specify product name, size and color (for example, LSTT 6.4-0).                                                                 |                                               |

\*\*\*Available in the convenient RaySpool packaging/dispensing system, for sizes 2.4 up to 25.4

## MicroFit

### Small-Diameter, High-Shrink-Ratio Tubing

#### Product Facts

- Small diameter
- High shrink ratio
- Thin wall
- Polyolefin and fluoropolymer materials
- RoHS compliant
- ISO 10993-1 compliant
- USP Class VI material, no heavy metals
- Compatibility with gamma, ETO, steam and dry-heat sterilization



#### Applications

The family of MicroFit small diameter, high-shrink-ratio tubing is suitable for electrical insulation, mechanical protection, and strain relief in smaller, more compact medical devices and commercial electronics products. Offered in a variety of materials.

#### Installation

Minimum full recovery temperature:

175°C [347°F] (MT1000)

140°C [284°F] (MT2000)

#### Operating Temperature Range

MT1000: -55°C to 150°C  
[-67°F to 302°F]

MT2000: -40°C to 105°C  
[-40°F to 221°F]

#### Specifications/Approvals

| Series                                                | Material              | Raychem             |
|-------------------------------------------------------|-----------------------|---------------------|
| MT1000 is semi-rigid polyvinylidene fluoride material | USP Class VI (MT1000) | Altera MicroFit SCD |
| MT2000 is medical grade polyolefin material           | USP Class VI (MT2000) |                     |

Available in:

Americas

Europe

Asia Pacific

## MicroFit (Continued)

### Product Dimensions

| Size            | As Supplied mm [inches]      | Recovered mm [inches]         |                               |
|-----------------|------------------------------|-------------------------------|-------------------------------|
|                 | Expanded I.D.<br>Minimum (D) | Recovered I.D.<br>Maximum (d) | Recovered Wall<br>Maximum (W) |
| MFT-*-No. 14-** | 0.356 [0.014]                | 0.203 [0.008]                 | 0.152 [0.006]                 |
| MFT-*-No. 2-**  | 0.610 [0.024]                | 0.305 [0.012]                 | 0.152 [0.006]                 |
| MFT-*-No. 33-** | 1.143 [0.045]                | 0.432 [0.017]                 | 0.118 [0.007]                 |
| MFT-*-No. 65-** | 0.635 [0.025]                | 0.254 [0.010]                 | 0.330 [0.013]                 |

\*Replace single asterisk with material type: MT1000 or MT2000.

\*\*Replace double asterisk with color-code number.

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

### Ordering Information

|                      |                                                                                         | MT1000           | MT2000                                                    |
|----------------------|-----------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------|
| Color                | Standard                                                                                | Translucent (-X) | Black (-0), clear (-X)                                    |
|                      | Nonstandard                                                                             | Black (-0)       | White (-9), red (-2), yellow (-4), blue (-6), orange (-3) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                  |                                                           |
| Standard packaging   | On plastic spools****                                                                   |                  |                                                           |
| Ordering description | Specify product name, material, size and color (for example, MFT-MT2000-NO.14-0).       |                  |                                                           |

\*\*\*\*MFT-MT1000 and MFT-MT2000 are double bagged.

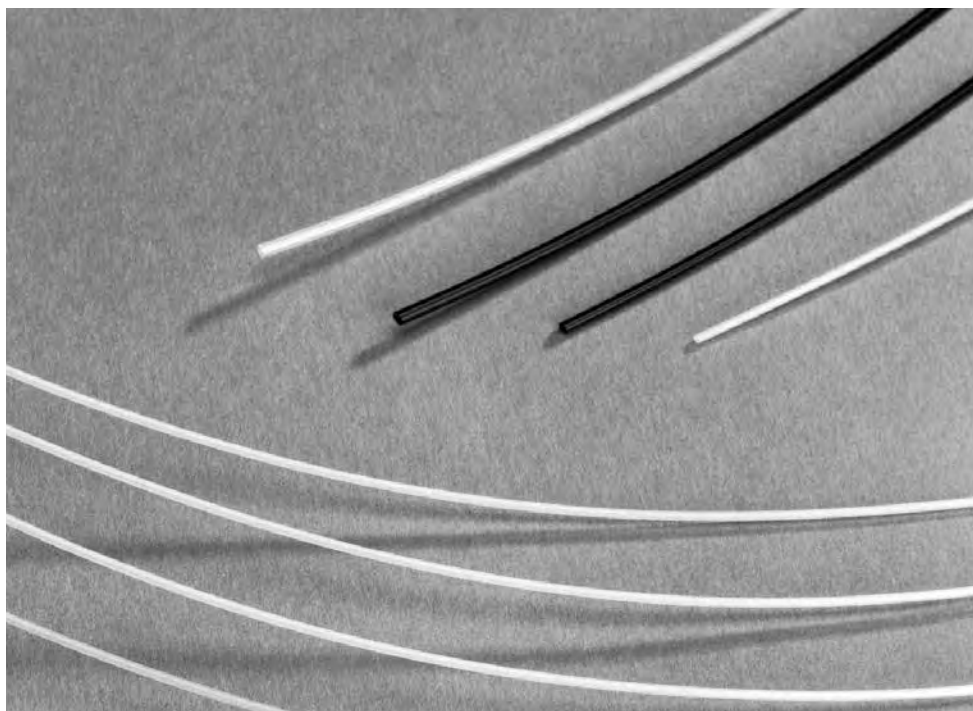


**Altera Medical-Grade,  
USP Class VI,  
High-Temperature,  
Semirigid,  
Fluoropolymer Tubing**

#### Product Facts

- 2:1 shrink ratio
- Tough, semirigid, very-thin-wall insulation
- Excellent resistance to a variety of fluids
- Optional inner adhesive lining (MT1000A)
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Double-bagged packaging
- Compatibility with gamma, ETO, steam, and dry-heat sterilization
- RoHS compliant

## MT1000



#### Applications

Well-suited for electrical insulation and strain relief of components that are exposed to high temperatures - either during operation or during sterilization.

Thin-wall construction is well-suited for applications with clearance constraints.

#### Installation

Minimum shrink temperature: 155°C [311°F]

Minimum full recovery temperature: 175°C [347°F]

#### Operating Temperature Range

-55°C to 150°C  
[-67°F to 302°F]

#### Specifications/Approvals

| Series  | Material     | Raychem     |
|---------|--------------|-------------|
| MT1000  | USP Class VI | MT1000 SCD  |
| MT1000A | USP Class VI | MT1000A SCD |

Available in:

Americas

Europe

Asia Pacific



**MT1000** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 3/64           | 1.17 [0.046]                | 0.58 [0.023]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/16           | 1.60 [0.063]                | 0.79 [0.031]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 3/32           | 2.36 [0.093]                | 1.17 [0.046]                | 0.20 [0.009]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/8            | 3.18 [0.125]                | 1.58 [0.062]                | 0.20 [0.009]          | 0.31 [0.12]                | 0.25 [0.010] |
| 3/16           | 4.75 [0.187]                | 2.36 [0.093]                | 0.20 [0.009]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/4            | 6.35 [0.250]                | 3.18 [0.125]                | 0.28 [0.011]          | 0.38 [0.15]                | 0.33 [0.013] |
| 3/8            | 9.53 [0.375]                | 4.75 [0.187]                | 0.28 [0.011]          | 0.38 [0.15]                | 0.33 [0.013] |
| 1/2            | 12.70 [0.500]               | 6.35 [0.250]                | 0.28 [0.011]          | 0.38 [0.15]                | 0.33 [0.013] |

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

**Ordering Information**

|                      |                                                                                                                                         |                              |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Color                | Standard                                                                                                                                | Black (-0), Translucent (-X) |
|                      | Nonstandard                                                                                                                             | White (-9)                   |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                              |
| Standard packaging   | In 1.2-meter (4-foot) lengths, double bagged.                                                                                           |                              |
| Ordering description | Specify product name, size and color (for example, MT1000-1/8-X). Specify MT1000A for adhesive-lined constructions (special order).     |                              |

## MT2000

**Altera Medical-Grade,  
USP Class VI, Lubricious,  
Thin-Wall, Polyolefin Tubing**

### Product Facts

- 2.5:1 shrink ratio
- Lubricity comparable to FEP
- Excellent electrical insulation properties
- Can be manufactured with a very thin wall
- Optional inner adhesive lining (MT2000A)
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Plastic spools and double-bagged packaging
- Compatibility with gamma and ETO sterilization
- RoHS compliant



1

Heat-shrinkable Tubing

### Applications

Especially suitable for medical applications requiring lubricity, flexibility, and excellent electrical insulation performance. A cost-effective alternative to FEP (fluorinated ethylene-propylene) while maintaining performance after gamma sterilization.

### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 140°C [284°F]

### Operating Temperature Range

-40°C to 105°C  
[-40°F to 221°F]

### Specifications/Approvals

| Series  | Material     | Raychem     |
|---------|--------------|-------------|
| MT2000  | USP Class VI | MT2000 SCD  |
| MT2000A | USP Class VI | MT2000A SCD |

Available in:

Americas

Europe

Asia Pacific

**MT2000** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 1 mm           | 1.0 [0.040]                 | 0.45 [0.018]                | 0.20 [0.008]          | 0.30 [0.12]                | 0.25 [0.010] |
| 2 mm           | 2.0 [0.080]                 | 0.80 [0.032]                | 0.20 [0.008]          | 0.30 [0.12]                | 0.25 [0.010] |
| 3 mm           | 3.0 [0.120]                 | 1.20 [0.048]                | 0.20 [0.008]          | 0.30 [0.12]                | 0.25 [0.010] |
| 6 mm           | 6.0 [0.240]                 | 2.40 [0.096]                | 0.20 [0.008]          | 0.30 [0.12]                | 0.25 [0.010] |
| 10 mm          | 10.0 [0.400]                | 4.00 [0.160]                | 0.30 [0.012]          | 0.41 [0.16]                | 0.36 [0.014] |

**Ordering Information**

|                      |                                                                                                                                         |                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0), clear (-X)                                    |
|                      | Nonstandard                                                                                                                             | White (-9), red (-2), blue (-6), yellow (-4), orange (-3) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                           |
| Standard packaging   | On plastic spools, double-bagged.                                                                                                       |                                                           |
| Ordering description | Specify product name, size and color (for example, MT2000-3.0-0). Specify MT2000A for adhesive-lined constructions (special order).     |                                                           |

## MT3000

**Altera Medical-Grade,  
USP Class VI,  
High-Temperature, Flexible,  
Fluoropolymer Tubing**

### Product Facts

- 2:1 shrink ratio
- Tough, flexible, very-thin-wall insulation
- Excellent resistance to a variety of fluids
- Optional inner adhesive lining (MT3000A)
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Plastic spools and double-bagged packaging
- Compatibility with steam (limited cycles), gamma, ETO, and dry-heat sterilization
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Used for electrical insulation and strain relief of components that are exposed to high temperatures - either during operation or during sterilization. Exceptional flexibility and thin-wall construction are well-suited for applications where pliancy coupled with small overall bundle size is desired.

### Installation

Minimum shrink temperature: 140°C [284°F]  
Minimum full recovery temperature: 150°C [302°F]

### Operating Temperature Range

-55°C to 140°C  
[-67°F to 284°F]

### Specifications/Approvals

| Series  | Material     | Raychem     |
|---------|--------------|-------------|
| MT3000  | USP Class VI | MT3000 SCD  |
| MT3000A | USP Class VI | MT3000A SCD |

Available in:

Americas

Europe

Asia Pacific

**MT3000** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 3/64           | 1.17 [0.046]                | 0.58 [0.023]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/16           | 1.60 [0.063]                | 0.79 [0.031]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 3/32           | 2.36 [0.093]                | 1.17 [0.046]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/8            | 3.18 [0.125]                | 1.58 [0.062]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 3/16           | 4.75 [0.187]                | 2.36 [0.093]                | 0.20 [0.008]          | 0.31 [0.12]                | 0.25 [0.010] |
| 1/4            | 6.35 [0.250]                | 3.18 [0.125]                | 0.28 [0.009]          | 0.38 [0.15]                | 0.33 [0.012] |
| 3/8            | 9.53 [0.375]                | 4.75 [0.187]                | 0.28 [0.009]          | 0.38 [0.15]                | 0.33 [0.012] |
| 1/2            | 12.70 [0.500]               | 6.35 [0.250]                | 0.28 [0.009]          | 0.38 [0.15]                | 0.33 [0.012] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
|                      | Nonstandard                                                                                                                             | White (-9) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On plastic spools, double-bagged.                                                                                                       |            |
| Ordering description | Specify product name, size and color (for example, MT3000 1/4-0).                                                                       |            |

## MT5000

**Altera Medical-Grade,  
USP Class VI, Flexible,  
Polyolefin Tubing**

### Product Facts

- 2:1 shrink ratio
- Flexibility; variety of colors
- Excellent electrical insulation properties
- Inner adhesive lining optional (MT5000A)
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Plastic spools and double-bagged packaging
- Compatibility with gamma and ETO sterilization
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Especially suitable for applications requiring excellent electrical insulation performance and resistance to abrasion and harmful solvents such as electrosurgical instruments. Also used for strain relief, color coding, and identification of many medical components and devices.

### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 110°C [230°F]

### Operating Temperature Range

-70°C to 90°C  
[-94°F to 194°F]

### Specifications/Approvals

| Series  | Material     | Raychem     |
|---------|--------------|-------------|
| MT5000  | USP Class VI | MT5000 SCD  |
| MT5000A | USP Class VI | MT5000A SCD |

Available in:

Americas

Europe

Asia Pacific

**MT5000** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 3/64           | 1.17 [0.046]                | 0.58 [0.023]                | 0.33 [0.013]          | 0.48 [0.019]               | 0.40 [0.016] |
| 1/16           | 1.60 [0.063]                | 0.79 [0.031]                | 0.35 [0.014]          | 0.50 [0.020]               | 0.43 [0.017] |
| 3/32           | 2.36 [0.093]                | 1.17 [0.046]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.50 [0.020] |
| 1/8            | 3.18 [0.125]                | 1.58 [0.062]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.50 [0.020] |
| 3/16           | 4.75 [0.187]                | 2.36 [0.093]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.50 [0.020] |
| 1/4            | 6.35 [0.250]                | 3.18 [0.125]                | 0.56 [0.022]          | 0.71 [0.028]               | 0.64 [0.025] |
| 3/8            | 9.53 [0.375]                | 4.75 [0.187]                | 0.56 [0.022]          | 0.71 [0.028]               | 0.64 [0.025] |
| 1/2            | 12.70 [0.500]               | 6.35 [0.250]                | 0.56 [0.022]          | 0.71 [0.028]               | 0.64 [0.025] |
| 3/4            | 19.05 [0.750]               | 9.53 [0.375]                | 0.69 [0.027]          | 0.84 [0.033]               | 0.76 [0.030] |

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

**Ordering Information**

|                      |                                                                                                                                         |                                               |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0), clear (-X), and blue (-6)         |
|                      | Nonstandard                                                                                                                             | White (-9), red (-2), yellow (-4), green (-5) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                               |
| Standard packaging   | On plastic spools, double-bagged.                                                                                                       |                                               |
| Ordering description | Specify product name, size and color (for example, MT5000-1/4-0). Specify MT5000A for adhesive-lined constructions (special order).     |                                               |

## MT6000

**Altera Medical-Grade, USP Class VI, High Shrink Ratio, Polyolefin Tubing**

### Product Facts

- 4:1 shrink ratio or greater
- Custom and larger shrink ratios available
- Flexible; variety of colors
- Excellent electrical insulation properties
- Inner adhesive lining optional (MT6000A)
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Plastic spools and double-bagged packaging
- Compatibility with gamma and ETO sterilization
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Designed for applications that need 4:1 or larger shrink ratios. Provides excellent electrical insulation performance and resistance to abrasion and harmful solvents. Also used for strain relief, color coding, identification of components and devices, and process aid.

### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 110°C [230°F]

### Operating Temperature Range

-70°C to 90°C  
[-94°F to 194°F]

### Specifications/Approvals

| Series  | Material     | Raychem     |
|---------|--------------|-------------|
| MT6000  | USP Class VI | MT6000 SCD  |
| MT6000A | USP Class VI | MT6000A SCD |

Available in:

Americas

Europe

Asia Pacific



**MT6000** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 3/16           | 4.75 [0.187]                | 1.17 [0.046]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.51 [0.020] |
| 1/4            | 6.35 [0.250]                | 1.57 [0.062]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.51 [0.020] |
| 3/8            | 9.53 [0.375]                | 2.36 [0.093]                | 0.43 [0.017]          | 0.58 [0.023]               | 0.51 [0.020] |
| 1/2            | 12.70 [0.500]               | 3.18 [0.125]                | 0.56 [0.022]          | 0.71 [0.028]               | 0.64 [0.025] |

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

**Ordering Information**

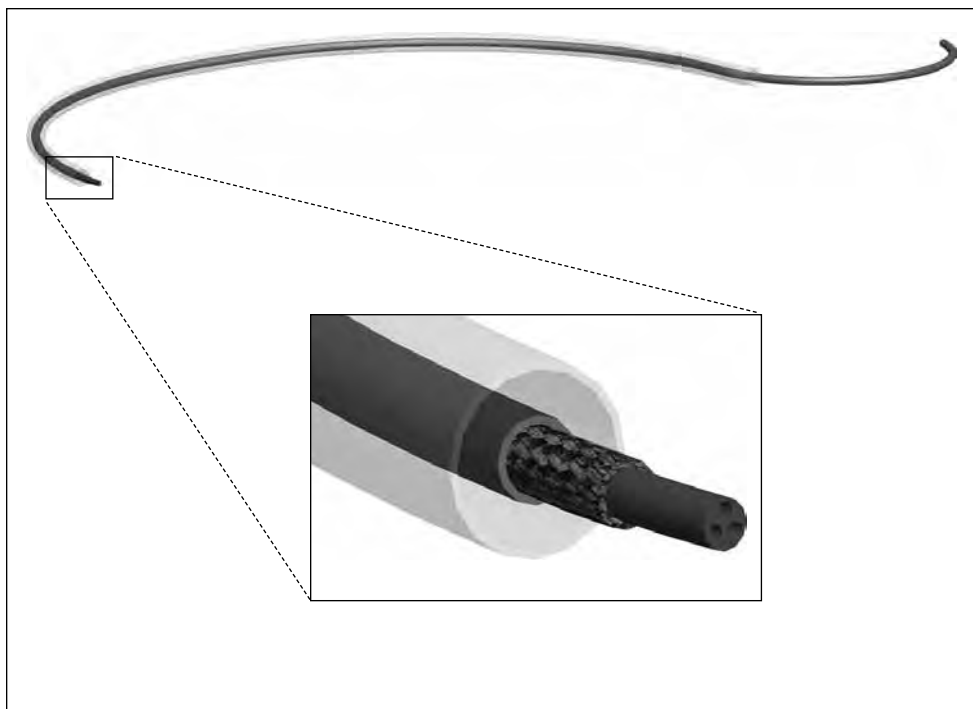
|                      |                                                                                                                                        |                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Color                | Standard                                                                                                                               | Black (-0), clear (-X)                                   |
|                      | Nonstandard                                                                                                                            | Blue (-6), red (-2), white (-9), yellow (-4), green (-5) |
| Size selection       | Always order the largest size that will recover snugly over the substrate. Special order sizes are available upon request.             |                                                          |
| Standard packaging   | On plastic spools, double-bagged.                                                                                                      |                                                          |
| Ordering description | Specify product name, size and color (for example, MT6000-3/16-X)<br>Specify MT6000A for adhesive-lined constructions (special order). |                                                          |

## Altera Medical-Grade, USP Class VI, Heat-Shrinkable FEP Tubing

### Product Facts

- Standard 1.6:1 shrink ratio
- Tight control of longitudinal change, standard +/- 5%
- High temperature, low friction, non-reactive material
- Excellent electrical insulation, mechanical protection, and chemical resistance
- Cut pieces, double bagged
- Transparent and resistant to UV damage
- USP Class VI material, no heavy metals
- ISO 10993-1 compliant
- Compatible with autoclave sterilization; ethylene oxide, steam, and dry-heat
- RoHS compliant

## MT-FEP (Heat-Shrinkable Fluorinated Ethylene Propylene)



### Applications

Designed specifically to meet the demanding needs of the catheter and medical device industry. Well-suited for process aid as well as electrical insulation, mechanical protection, and chemical resistance.

Minimum shrink temperature: 190°C [374°F]

Minimum full recovery temperature: 210°C [410°F]

### Installation

### Specifications/Approvals

| Series | Material     | Raychem    |
|--------|--------------|------------|
| MT-FEP | USP Class VI | MT-FEP SCD |

Available in:

Americas

Europe

Asia Pacific

**MT-FEP** (Continued)

**Product Dimensions**

| Size           | As Supplied mm [inches]     |                             | Recovered mm [inches] |                            |              |
|----------------|-----------------------------|-----------------------------|-----------------------|----------------------------|--------------|
|                | Inside Diameter Minimum (D) | Inside Diameter Maximum (d) | Minimum               | Wall Thickness (W) Maximum |              |
| <b>Nominal</b> |                             |                             |                       |                            |              |
| 1/32           | 0.9 [0.035]                 | 0.6 [0.025]                 | 0.15 [0.006]          | 0.25 [0.010]               | 0.20 [0.008] |
| 3/64           | 1.1 [0.045]                 | 0.8 [0.032]                 | 0.15 [0.006]          | 0.25 [0.010]               | 0.20 [0.008] |
| 1/16           | 1.6 [0.063]                 | 1.0 [0.040]                 | 0.15 [0.006]          | 0.25 [0.010]               | 0.20 [0.008] |
| 3/32           | 2.7 [0.093]                 | 1.4 [0.056]                 | 0.15 [0.006]          | 0.25 [0.010]               | 0.20 [0.008] |
| 1/8            | 3.2 [0.125]                 | 1.9 [0.075]                 | 0.18 [0.007]          | 0.33 [0.013]               | 0.25 [0.010] |
| 3/16           | 4.8 [0.188]                 | 2.9 [0.115]                 | 0.18 [0.007]          | 0.33 [0.013]               | 0.25 [0.010] |
| 1/4            | 6.4 [0.250]                 | 3.8 [0.150]                 | 0.18 [0.007]          | 0.33 [0.013]               | 0.25 [0.010] |
| 3/8            | 9.5 [0.375]                 | 5.7 [0.225]                 | 0.23 [0.009]          | 0.38 [0.015]               | 0.30 [0.012] |
| 1/2            | 12.7 [0.500]                | 7.6 [0.300]                 | 0.28 [0.011]          | 0.48 [0.019]               | 0.38 [0.015] |

**Ordering Information**

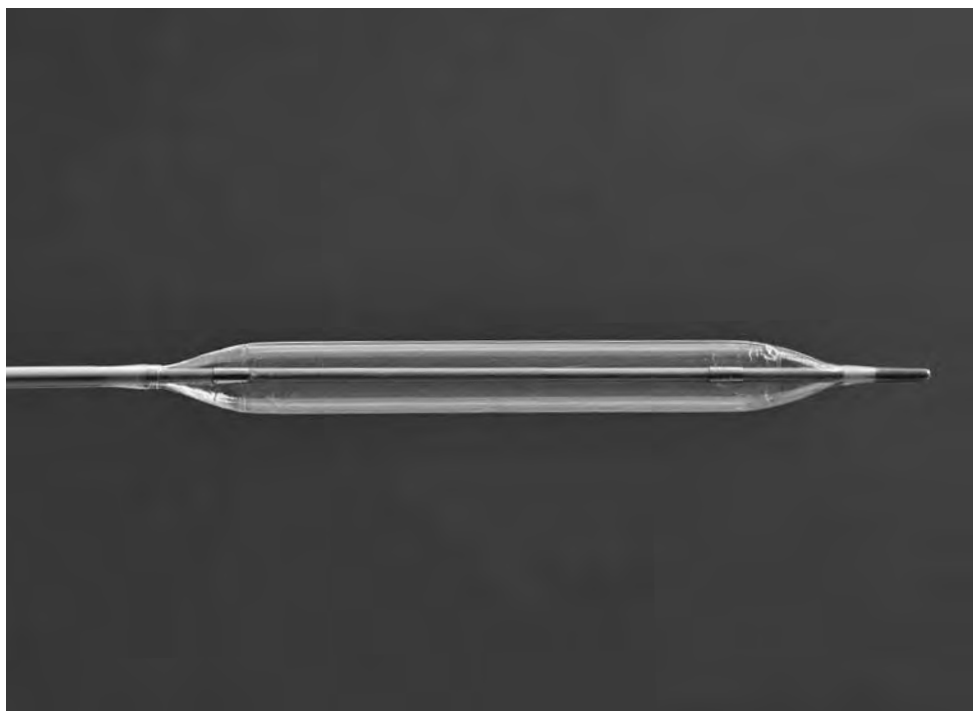
|                      |                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------|
| Color                | Clear (-X) standard                                                                                     |
| Size selection       | Order the appropriate FEP size based on your substrate. Special order sizes are available upon request. |
| Standard packaging   | In 4-foot (1.2 meter) lengths (-stk) double bagged.                                                     |
| Ordering description | Specify product name and size (for example, MT-FEP-093-056-X-STK).                                      |

## MT-LWA

### Altera Medical Grade, Laser-Welding Application Process Aid, Polyolefin Tubing

#### Product Facts

- 3:1 shrink ratio, custom ratios and sizes available
- Flexible; forms to irregular shapes
- Good clarity needed for laser welding and other bonding operations
- Excellent electrical insulation properties
- Removes easily after application, good axial tear propagation
- On plastic spools double bag packaging
- USP Class VI, no heavy metals
- ISO 10993-1 compliant
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Well-suited for laser-welding operations of stents and balloons, hot jaw bonding or other secondary value-added processes. Heat-shrinkable product will hold joints in place during operation and removes easily without residue or damage to the end product.

#### Installation

Minimum shrink temperature: 95°C [203°F]  
Minimum full recovery temperature: 121°C [250°F]

#### Specifications/Approvals

| Series | Raychem    |
|--------|------------|
| MT-LWA | MT-LWA SCD |

Available in: Americas Europe Asia Pacific

**MT-LWA** (Continued)

**Product Dimensions**
**2:1 Expansion  
Ratio Dimensions  
(±)**

| Size | As Supplied mm [inches]      | Recovered mm [inches]       |                             |
|------|------------------------------|-----------------------------|-----------------------------|
|      | Inside Diameter (D)          | Inside Diameter (d)         | Wall Thickness (W)          |
| 1/32 | 1.02 ± 0.13 [0.040 ± 0.005]  | 0.33 ± 0.05 [0.013 ± 0.002] | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/64 | 1.40 ± 0.13 [0.055 ± 0.005]  | 0.51 ± 0.08 [0.020 ± 0.003] | 0.31 ± 0.05 [0.012 ± 0.002] |
| 1/16 | 1.83 ± 0.13 [0.072 ± 0.005]  | 0.69 ± 0.10 [0.027 ± 0.004] | 0.43 ± 0.08 [0.017 ± 0.003] |
| 3/32 | 2.72 ± 0.20 [0.107 ± 0.008]  | 1.07 ± 0.10 [0.042 ± 0.004] | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/8  | 3.56 ± 0.25 [0.140 ± 0.010]  | 1.45 ± 0.13 [0.057 ± 0.005] | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/16 | 5.21 ± 0.25 [0.205 ± 0.010]  | 2.18 ± 0.18 [0.086 ± 0.007] | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/4  | 6.99 ± 0.38 [0.275 ± 0.015]  | 2.97 ± 0.20 [0.117 ± 0.008] | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/8  | 10.54 ± 0.51 [0.415 ± 0.020] | 4.34 ± 0.41 [0.171 ± 0.016] | 0.64 ± 0.08 [0.025 ± 0.003] |

**3:1 Expansion  
Ratio Dimensions (Min./  
Max)**

| Size  | As Supplied mm [inches]        | Recovered mm [inches]          |                               |
|-------|--------------------------------|--------------------------------|-------------------------------|
|       | Inside Diameter (D)<br>Minimum | Inside Diameter (d)<br>Maximum | Wall Thickness (W)<br>Nominal |
| 0.032 | 0.81 [0.032]                   | 0.28 [0.011]                   | 0.25 ± 0.05 [0.010 ± 0.002]   |
| 0.063 | 1.60 [0.063]                   | 0.53 [0.021]                   | 0.41 ± 0.05 [0.016 ± 0.002]   |
| 0.078 | 1.98 [0.078]                   | 0.64 [0.025]                   | 0.41 ± 0.05 [0.016 ± 0.002]   |
| 0.094 | 2.39 [0.094]                   | 0.79 [0.031]                   | 0.51 ± 0.08 [0.020 ± 0.003]   |
| 0.110 | 2.79 [0.110]                   | 0.86 [0.034]                   | 0.51 ± 0.08 [0.020 ± 0.003]   |
| 0.125 | 3.18 [0.125]                   | 1.07 [0.042]                   | 0.51 ± 0.08 [0.020 ± 0.003]   |
| 0.188 | 4.78 [0.188]                   | 1.60 [0.063]                   | 0.51 ± 0.08 [0.020 ± 0.003]   |
| 0.250 | 6.35 [0.250]                   | 2.11 [0.083]                   | 0.64 ± 0.08 [0.025 ± 0.003]   |
| 0.375 | 9.53 [0.375]                   | 3.18 [1.125]                   | 0.64 ± 0.08 [0.025 ± 0.003]   |

**Ordering Information**

|                      |                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Color                | Clear (-X) Only                                                                                                               |
| Size selection       | Always order the largest size that will recover snugly over the substrate.<br>Special order sizes are available upon request. |
| Standard packaging   | On plastic spools (SP), double-bagged.                                                                                        |
| Ordering description | Specify product name and size (for example, MT-LWA-032-X-SP).                                                                 |

## NT

### Flexible, General Purpose Modified Elastomeric Tubing

#### Product Facts

- Remains flexible at temperatures as low as -55°C [-67°F]
- Offers good resistance to abrasion and physical abuse while providing the flexibility and strain relief needed in general-purpose harnessing applications
- Resistant to most common fluids and solvents
- RoHS compliant



#### Applications

Widely used for insulation, strain relief, and abrasion protection on cable harnesses and wire bundles in the commercial electronics industries where a reliable general-purpose tubing is needed. Suitable for applications requiring some exposure to common fluids and solvents.

#### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-55°C to 90°C  
[-67°F to 194°F]

#### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| NT     | RT-510  |

Available in:

Americas

Europe

Asia Pacific

**NT** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.061]                     | 0.69 ± 0.20 [0.027 ± 0.008] |
| 3/16  | 4.8 [0.187]                  | 2.5 [0.100]                     | 0.84 ± 0.25 [0.033 ± 0.010] |
| 1/4   | 6.4 [0.250]                  | 3.6 [0.143]                     | 0.89 ± 0.25 [0.035 ± 0.010] |
| 3/8   | 9.5 [0.375]                  | 5.5 [0.214]                     | 1.01 ± 0.25 [0.040 ± 0.010] |
| 1/2   | 12.7 [0.500]                 | 7.3 [0.286]                     | 1.21 ± 0.38 [0.048 ± 0.015] |
| 5/8   | 15.9 [0.625]                 | 9.1 [0.357]                     | 1.32 ± 0.38 [0.052 ± 0.015] |
| 3/4   | 19.1 [0.750]                 | 10.9 [0.428]                    | 1.44 ± 0.38 [0.057 ± 0.015] |
| 7/8   | 22.2 [0.875]                 | 12.7 [0.500]                    | 1.65 ± 0.38 [0.065 ± 0.015] |
| 1     | 25.4 [1.000]                 | 14.5 [0.570]                    | 1.77 ± 0.51 [0.070 ± 0.020] |
| 1 1/4 | 31.8 [1.250]                 | 18.1 [0.714]                    | 2.20 ± 0.51 [0.087 ± 0.020] |
| 1 1/2 | 38.1 [1.500]                 | 21.8 [0.857]                    | 2.41 ± 0.51 [0.095 ± 0.020] |
| 1 3/4 | 44.5 [1.750]                 | 25.4 [1.000]                    | 2.71 ± 0.51 [0.107 ± 0.020] |
| 2     | 50.8 [2.000]                 | 29.0 [1.140]                    | 2.79 ± 0.51 [0.110 ± 0.020] |
| 3     | 76.2 [3.000]                 | 43.4 [1.710]                    | 3.17 ± 0.51 [0.125 ± 0.020] |
| 4     | 101.6 [4.000]                | 57.9 [2.280]                    | 3.55 ± 0.51 [0.140 ± 0.020] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, NT 1/4-0).                                                                           |            |

## NT-MIL

### Flexible, Rugged, Modified Elastomeric Tubing

#### Product Facts

- Remains flexible at temperatures as low as -70°C [94°F] without cracking
- Withstands heat shock at 200°C [392°F] without dripping, flowing or cracking
- Offers outstanding resistance to abrasion and physical abuse while providing flexibility and strain relief needed in rugged harnessing applications
- Resistant to most fluids and solvents, including aviation and ground vehicle fuels, lubricating oil, and hydraulic fluids
- Meets the stringent requirements of SAE-AMS-DTL-23053/1, Classes 1 and 2
- RoHS compliant



#### Applications

Widely used for insulation, strain relief and abrasion protection on cable harnesses and wire bundles in the military and aerospace industries where a reliable rugged tubing is needed. Especially suitable for applications requiring exposure to common fluids and solvents.

#### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-70°C to 121°C  
[-94°F to 250°F]

#### Specifications/Approvals

| Series | Military                        | Raychem |
|--------|---------------------------------|---------|
| NT-MIL | AMS-DTL-23053/1*, Classes 1 & 2 | RW-3030 |

\*Formerly MIL-I-23053/1 and MIL-DTL-23053/1



**NT-MIL** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.061]                     | 0.69 ± 0.20 [0.027 ± 0.008] |
| 3/16  | 4.8 [0.187]                  | 2.5 [0.100]                     | 0.84 ± 0.25 [0.033 ± 0.010] |
| 1/4   | 6.4 [0.250]                  | 3.6 [0.143]                     | 0.89 ± 0.25 [0.035 ± 0.010] |
| 3/8   | 9.5 [0.375]                  | 5.4 [0.211]                     | 1.01 ± 0.25 [0.040 ± 0.010] |
| 1/2   | 12.7 [0.500]                 | 7.3 [0.286]                     | 1.21 ± 0.38 [0.048 ± 0.015] |
| 5/8   | 15.9 [0.625]                 | 9.1 [0.357]                     | 1.32 ± 0.38 [0.052 ± 0.015] |
| 3/4   | 19.1 [0.750]                 | 10.9 [0.428]                    | 1.44 ± 0.38 [0.057 ± 0.015] |
| 7/8   | 22.2 [0.875]                 | 12.7 [0.500]                    | 1.65 ± 0.38 [0.065 ± 0.015] |
| 1     | 25.4 [1.000]                 | 14.5 [0.570]                    | 1.77 ± 0.51 [0.070 ± 0.020] |
| 1 1/4 | 31.8 [1.250]                 | 18.1 [0.714]                    | 2.20 ± 0.51 [0.087 ± 0.020] |
| 1 1/2 | 38.1 [1.500]                 | 21.8 [0.857]                    | 2.41 ± 0.51 [0.095 ± 0.020] |
| 1 3/4 | 44.5 [1.750]                 | 25.4 [1.000]                    | 2.71 ± 0.51 [0.107 ± 0.020] |
| 2     | 50.8 [2.000]                 | 29.0 [1.140]                    | 2.79 ± 0.51 [0.110 ± 0.020] |
| 3     | 76.2 [3.000]                 | 43.4 [1.710]                    | 3.17 ± 0.51 [0.125 ± 0.020] |
| 4     | 101.6 [4.000]                | 57.9 [2.280]                    | 3.55 ± 0.51 [0.140 ± 0.020] |

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

**Ordering Information**

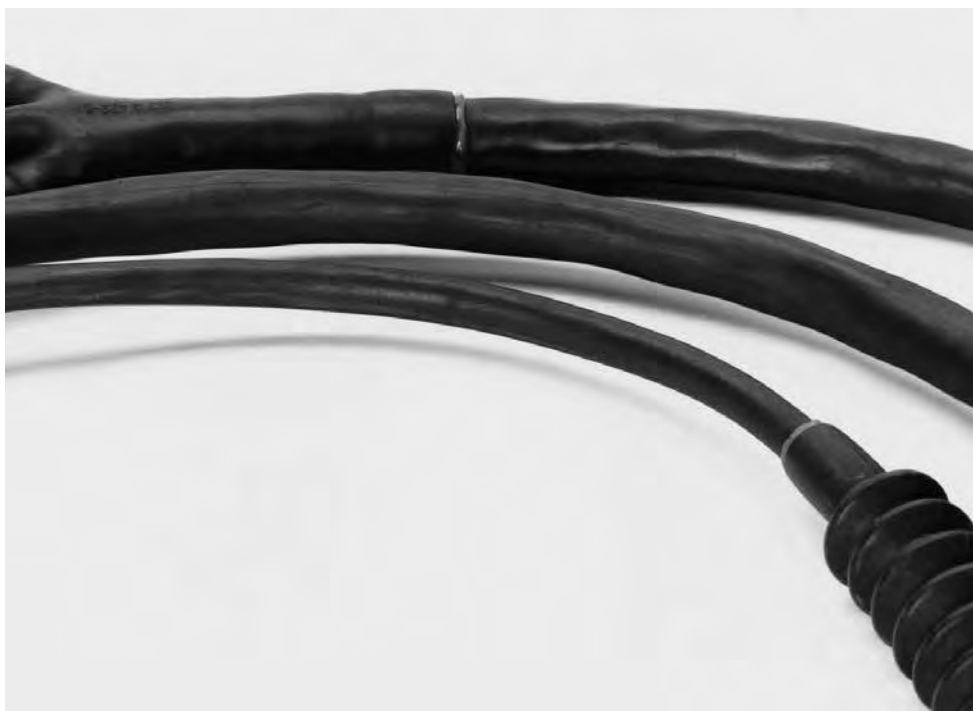
|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, NT-MIL 1/4-0).                                                                       |            |

## Very Flexible, Rugged Neoprene Elastomer Tubing

### Product Facts

- Remains flexible at low temperatures without cracking
- Offers outstanding resistance to abrasion and physical abuse while providing the flexibility and strain relief needed for rugged applications
- Resistant to most fluids and solvents, including aviation and ground-vehicle fuels, lubricating oil, and hydraulic fluids (see Raychem Specification RT-511)
- Performance exceeds the stringent requirements of SAE-AMS-DTL-23053/1, Class 2
- System 20
- RoHS compliant

## NTFR



### Applications

Widely used for insulation, strain relief, and abrasion protection on cable harnesses and wire bundles in the military and aerospace industries. Especially suitable for applications requiring exposure to fluids and solvents at elevated temperatures.

### Installation

Minimum shrink temperature: 90°C [194°F]  
Minimum full recovery temperature: 135°C [275°F]

### Operating Temperature Range

-70°C to 121°C  
[-94°F to 250°F]

### Specifications/Approvals

| Series | Military   | Raychem |
|--------|------------|---------|
| NTFR   | SC-X-15112 | RT-511  |

#### Available in:

Americas

Europe

Asia Pacific

**NTFR** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.061]                     | 0.69 ± 0.20 [0.027 ± 0.008] |
| 3/16  | 4.8 [0.187]                  | 2.5 [0.100]                     | 0.84 ± 0.25 [0.033 ± 0.010] |
| 1/4   | 6.4 [0.250]                  | 3.6 [0.143]                     | 0.89 ± 0.25 [0.035 ± 0.010] |
| 3/8   | 9.5 [0.375]                  | 5.5 [0.214]                     | 1.01 ± 0.25 [0.040 ± 0.010] |
| 1/2   | 12.7 [0.500]                 | 7.3 [0.286]                     | 1.21 ± 0.38 [0.048 ± 0.015] |
| 5/8   | 15.9 [0.625]                 | 9.1 [0.357]                     | 1.32 ± 0.38 [0.052 ± 0.015] |
| 3/4   | 19.1 [0.750]                 | 10.9 [0.428]                    | 1.44 ± 0.38 [0.057 ± 0.015] |
| 7/8   | 22.2 [0.875]                 | 12.7 [0.500]                    | 1.65 ± 0.38 [0.065 ± 0.015] |
| 1     | 25.4 [1.000]                 | 14.5 [0.570]                    | 1.77 ± 0.51 [0.070 ± 0.020] |
| 1 1/4 | 31.8 [1.250]                 | 18.1 [0.714]                    | 2.20 ± 0.51 [0.087 ± 0.020] |
| 1 1/2 | 38.1 [1.500]                 | 21.8 [0.857]                    | 2.41 ± 0.51 [0.095 ± 0.020] |
| 1 3/4 | 44.5 [1.750]                 | 25.4 [1.000]                    | 2.71 ± 0.51 [0.107 ± 0.020] |
| 2     | 50.8 [2.000]                 | 29.0 [1.140]                    | 2.79 ± 0.51 [0.110 ± 0.020] |
| 3     | 76.2 [3.000]                 | 43.4 [1.710]                    | 3.17 ± 0.51 [0.125 ± 0.020] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, NTFR 1/4-0).                                                                         |            |

## PD Caps

### Semirigid, Encapsulant-Lined, Polyolefin Caps

#### Product Facts

- 3:1 shrink ratio
- Permanent or temporary way to terminate wires
- Rapid, simple installation
- Rugged protection against abrasion, vibration, and flexing
- PD caps provide a splash-resistant, moisture-resistant covering (but not intended for use where immersion in fluids is required)
- RoHS compliant



#### Applications

PD Caps offer an improved, inexpensive way to encapsulate crimped electrical connections, including those on motor coils. Their encapsulant lining melts and flows to fill surface irregularities of the substrate. These vibration-proof caps are used to insulate and terminate dead-end electrical cables, fixtures, connectors, and other electrical components.

#### Installation

Minimum shrink temperature: 125°C [257°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series  | UL  | Raychem     |
|---------|----------------------------------------------------------------------------------------|-------------|
| PD Caps | E85381<br>600 V, 125°C                                                                 | PD Caps SCD |

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |

## PD Caps (Continued)

### Product Dimensions

| Size | Length                      |                                  | Inside Diameter              |                                 | Recovered Wall Thickness**<br>Total Wall After Heating |
|------|-----------------------------|----------------------------------|------------------------------|---------------------------------|--------------------------------------------------------|
|      | Nominal Overall as Supplied | Minimum Open Barrel as Supplied* | Minimum Expanded as Supplied | Maximum Recovered After Heating |                                                        |
| 1/8  | 25.4 [1.00]                 | 12.7 [0.50]                      | 3.18 [0.125]                 | 0.58 [0.023]                    | 1.22 ± 0.15 [0.048 ± 0.006]                            |
| 3/16 | 25.4 [1.00]                 | 15.2 [0.60]                      | 4.75 [0.187]                 | 1.52 [0.060]                    | 1.57 ± 0.20 [0.062 ± 0.008]                            |
| 1/4  | 28.4 [1.12]                 | 15.2 [0.60]                      | 6.35 [0.250]                 | 2.03 [0.080]                    | 1.98 ± 0.25 [0.078 ± 0.010]                            |
| 3/8  | 31.8 [1.25]                 | 18.3 [0.72]                      | 9.53 [0.375]                 | 2.29 [0.090]                    | 2.08 ± 0.25 [0.082 ± 0.010]                            |
| 1/2  | 38.1 [1.50]                 | 21.6 [0.85]                      | 12.70 [0.500]                | 2.29 [0.090]                    | 2.54 ± 0.25 [0.100 ± 0.010]                            |

\*See glossary for definition of "barrel."

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

### Ordering Information

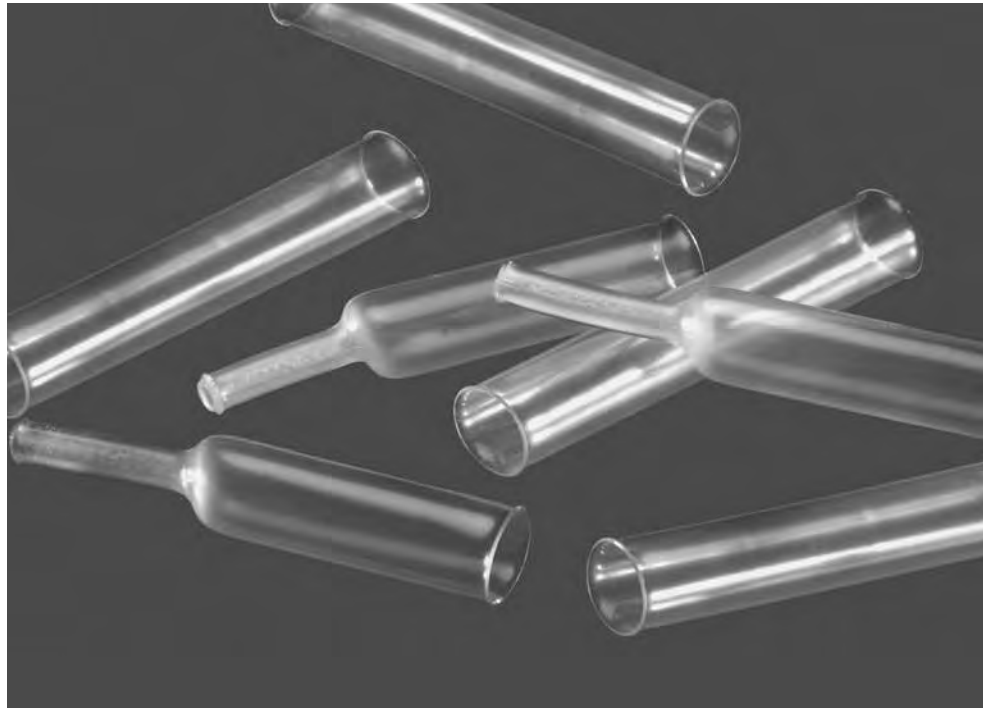
|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | In pieces.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, PD Caps 1/4-0).                                                                      |            |

## PTCM

**Very High-Shrink-Ratio,  
Dual Wall, Flexible Heat-  
Shrinkable Tubing**

### Product Facts

- 6:1 shrink ratio
- Exceptional abrasion and cut through resistance
- Low shrink temperature for rapid installation
- Excellent mechanical strength
- RoHS compliant



Heat-shrinkable Tubing

### Applications

PTCM is a flexible, heat-shrinkable, dual wall tubing with an integrally bonded meltable adhesive liner. PTCM offers outstanding mechanical and environmental protection to wire splices and terminals and is used for moisture proof encapsulation of a wide variety of components. In particular, it adheres well to PVC. With an impressive 6:1 expansion ratio, one product can protect and insulate a

wide range of applications. PTCM also offers exceptional clarity for protection of substrates that may need to be inspected during service.

### Installation

Minimum shrink temperature: 60°C [140°F]

Minimum full recovery temperature: 80°C [176°F]

### Operating Temperature Range

-40°C to 85°C  
[-40°F to 185°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| PTCM   | RK-6768 |

Available in: Americas Europe Asia Pacific

## PTCM (Continued)

### Product Dimensions

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 9/1.5 | 9.0 [0.354]                  | 1.5 [0.059]                     | 1.60 ± 0.20 [0.062 ± 0.008] |

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Clear (-X) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools.                                                                              |            |
| Ordering description | PTCM-9/1.5-X-SP                                                                         |            |

## RayBlock 85

### Heat-Shrinkable Water-Blocking System

#### Product Facts

- Environmentally seals wire bundles of up to 20 wires
- Withstands temperature excursions to 105°C [221°F]
- Provides excellent strain relief and reduces noise
- Offers a low-profile installed product only marginally larger than the cable bundle itself
- RoHS compliant



#### Applications

Designed to provide consistent sealing for cable bundles and the back of connectors. The wires are placed within the channels of a specially formulated hot-melt adhesive profile, 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.

#### Installation

Minimum shrink temperature: 80°C [176°F]

Minimum full recovery temperature: 110°C [230°F]

#### Operating Temperature Range

-40°C to 85°C  
[-40°F to 185°F]

#### Specifications/Approvals

| Series      | Raychem                    |
|-------------|----------------------------|
| RayBlock 85 | RayBlock 85 SCD<br>RW-2101 |

Available in: Americas Europe Asia Pacific



## RayBlock 85 (Continued)

### Product Dimensions

| Part No.                | No. of Channels | Profile        |              |               | Tubing Inside Diameter       |                                 |                |
|-------------------------|-----------------|----------------|--------------|---------------|------------------------------|---------------------------------|----------------|
|                         |                 | Outside Height | Length       | Width         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Length |
| RayBlock 85 Kit 0102-A0 | 2               | 8.5 [0.335]    | 2.75 [0.108] | 8.50 [0.335]  | 12.0 [0.472]                 | 3.0 [0.118]                     | 40 [1.57]      |
| RayBlock 85 Kit 0203-A0 | 3               | 8.5 [0.335]    | 2.75 [0.108] | 12.25 [0.482] | 24.0 [0.945]                 | 6.0 [0.236]                     | 47 [1.85]      |
| RayBlock 85 Kit 0504-A0 | 4               | 8.5 [0.335]    | 2.75 [0.108] | 16.00 [0.630] | 16.0 [0.630]                 | 4.0 [0.158]                     | 40 [1.57]      |
| RayBlock 85 Kit 0405-A0 | 5               | 8.5 [0.335]    | 2.75 [0.108] | 19.75 [0.778] | 24.0 [0.945]                 | 6.0 [0.236]                     | 45 [1.77]      |
| RayBlock 85 Kit 0107-A0 | 7               | 8.5 [0.335]    | 2.75 [0.108] | 27.25 [1.070] | 24.0 [0.945]                 | 6.0 [0.236]                     | 65 [2.56]      |
| RayBlock 85 Kit 0510-A0 | 10              | 8.5 [0.335]    | 2.75 [0.108] | 38.50 [1.520] | 32.0 [1.260]                 | 8.0 [0.315]                     | 55 [2.17]      |

### Ordering Information

| Color              | Standard                                                                                                                                                                                                                                                         | Black (-0) |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Size selection     | For wire with an outside diameter smaller than 2.8 [0.110] , use a maximum of two wires per channel.<br>For wire with an outside diameter of 2.8–3.5 [0.110 to 0.138], use a maximum of one wire per channel.<br>Special order sizes are available upon request. |            |
| Standard packaging | One kit (contains 1000 pcs. of profile and 1000 pcs. of tubing).                                                                                                                                                                                                 |            |

## RayBlock 105

### Heat-Shrinkable Water-Blocking System

#### Product Facts

- Environmentally seals wire bundles of up to 20 wires
- Withstands temperature excursions to 120°C [248°F]
- Provides excellent strain relief and reduces noise
- Offers a low-profile installed product only marginally larger than the cable bundle itself
- RoHS compliant



#### Applications

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.

#### Installation

Minimum shrink temperature: 80°C [176°F]

Minimum full recovery temperature: 110°C [230°F]

#### Operating Temperature Range

-40°C to 105°C  
[-40°F to 221°F]

#### Specifications/Approvals

| Series       | Raychem                     |
|--------------|-----------------------------|
| RayBlock 105 | RayBlock 105 SCD<br>RW-2102 |

Available in:

Americas

Europe

Asia Pacific

## RayBlock 105 (Continued)

### Product Dimensions

| Part No.                 | No. of Channels | Profile        |              |               | Tubing Inside Diameter       |                                 |                |
|--------------------------|-----------------|----------------|--------------|---------------|------------------------------|---------------------------------|----------------|
|                          |                 | Outside Height | Length       | Width         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Length |
| RayBlock 105 Kit 0102-A0 | 2               | 8.5 [0.335]    | 2.75 [0.108] | 8.50 [0.335]  | 12.0 [0.472]                 | 3.0 [0.118]                     | 40 [1.57]      |
| RayBlock 105 Kit 0103-A0 | 3               | 8.5 [0.335]    | 2.75 [0.108] | 12.25 [0.482] | 16.0 [0.630]                 | 4.0 [0.158]                     | 40 [1.57]      |
| RayBlock 105 Kit 0504-A0 | 4               | 8.5 [0.335]    | 2.75 [0.108] | 16.00 [0.630] | 16.0 [0.630]                 | 4.0 [0.158]                     | 45 [1.77]      |
| RayBlock 105 Kit 0105-A0 | 5               | 8.5 [0.335]    | 2.75 [0.108] | 19.75 [0.778] | 24.0 [0.945]                 | 6.0 [0.236]                     | 45 [1.77]      |
| RayBlock 105 Kit 0107-A0 | 7               | 8.5 [0.335]    | 2.75 [0.108] | 27.20 [1.070] | 24.0 [0.945]                 | 6.0 [0.236]                     | 65 [2.56]      |
| RayBlock 105 Kit 0110-A0 | 10              | 8.5 [0.335]    | 2.75 [0.108] | 38.50 [1.520] | 32.0 [1.260]                 | 8.0 [0.315]                     | 65 [2.56]      |

### Ordering Information

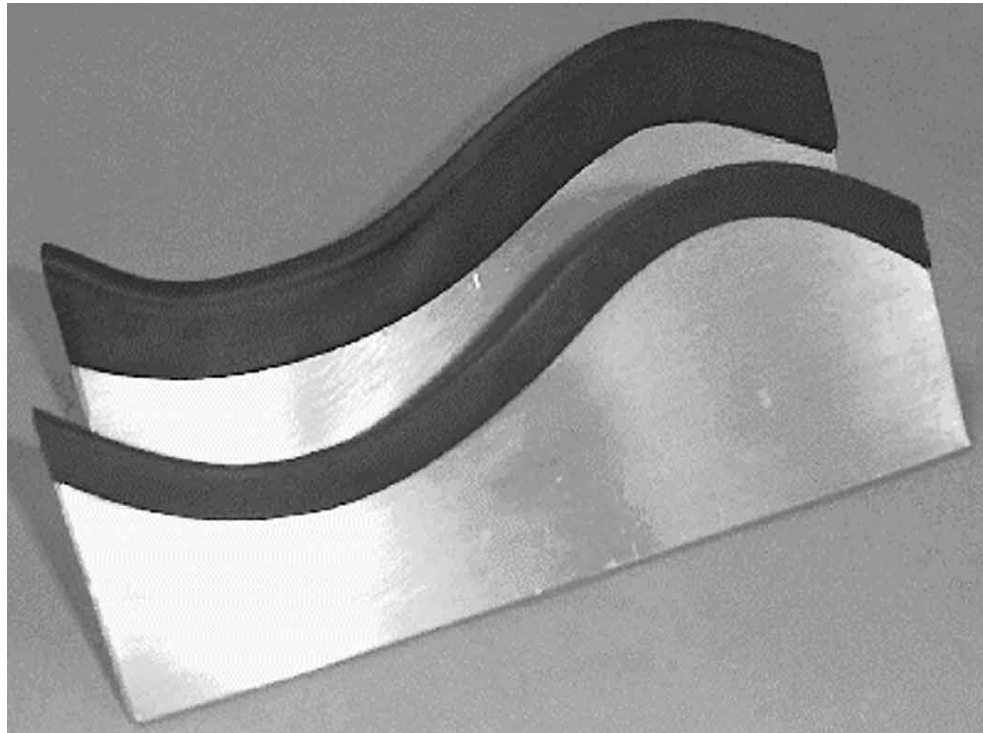
|                    |                                                                                                                                                                                                                                                              |            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color              | Standard                                                                                                                                                                                                                                                     | Black (-0) |
| Size selection     | For wire with an outside diameter smaller than 2.8 [0.110], use a maximum of two wires per channel.<br>For wire with an outside diameter of 2.8–3.5 [0.110–0.138], use a maximum of one wire per channel.<br>Special order sizes are available upon request. |            |
| Standard packaging | One kit (contains 1000 pcs. of profile and 1000 pcs. of tubing).                                                                                                                                                                                             |            |

## Rayrim Edging Material

**Commercial Protective, Self-Adhering, Edging Material**

### Product Facts

- Flexible to allow for protection of curved edges
- RoHS compliant



### Applications

Raychem Rayrim edging material is an extruded strip internally coated with a heat activated adhesive, so that on heating the profile changes from a “V” to a “U” section and the adhesive bonds to the substrate profile.

Manufactured from a Raychem radiation cross-linked polyolefin material, the profile offers a clean and rapid means of covering metal, wood and glass edges for all-round protection.

The flexible nature of the product allows application to both internal and external radii, as well as straight edges, and the continuous operating temperature of -55°C to +80°C [-67°F to 176°F] means that the product can give protection under the most testing circumstances.

### Installation

Minimum shrink temperature: 120°C [248°F]

Minimum full recovery temperature: 150°C [302°F]

### Operating Temperature Range

-55°C to 80°C  
[-67°F to 176°F]

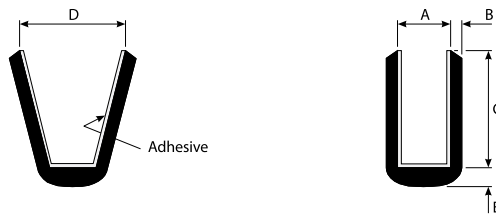
### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| Rayrim | RK-6182 |

Available in: Americas Europe Asia Pacific

## Edging Material (Continued)

### Product Dimensions



| Size | A (maximum) | B (minimum) | C (minimum)  | D (minimum) | E (typical)  |
|------|-------------|-------------|--------------|-------------|--------------|
| NR6  | 0.6 [0.024] | 0.5 [0.020] | 3.5 [0.138]  | 0.8 [0.032] | 1.25 [0.049] |
| NR7  | 1.0 [0.039] | 0.9 [0.035] | 4.8 [0.189]  | 1.6 [0.063] | 1.25 [0.049] |
| NR8  | 2.0 [0.079] | 0.9 [0.035] | 6.6 [0.260]  | 2.5 [0.098] | 2.25 [0.089] |
| NR9  | 4.2 [0.165] | 0.9 [0.035] | 13.5 [0.532] | 4.5 [0.177] | 2.20 [0.087] |

### Application Range

| Plate SWG | Thickness               | Recommended minimum bend radius |
|-----------|-------------------------|---------------------------------|
| 30-24     | 0.31-0.56 [0.012-0.022] | 10 [0.394]                      |
| 23-16     | 0.61-1.63 [0.026-0.064] | 15 [0.591]                      |
| 15-10     | 1.83-3.25 [0.072-0.128] | 20 [0.787]                      |
| 9-5       | 3.66-5.38 [0.144-0.212] | 25 [0.984]                      |

### Ordering Information

| Color                | Standard                                                                    | Black (-0) |
|----------------------|-----------------------------------------------------------------------------|------------|
| Size selection       | Always order the largest size that will shrink snugly on edge of the panel. |            |
| Standard packaging   | 1.2-meter [4-foot] lengths.                                                 |            |
| Ordering description | Specify product name, size number and color (for example, Rayrim-NR6-0).    |            |

**Convenient packaging and dispensing system for heat-shrinkable tubing**

#### Product Facts

- Easy to store
- Easy to dispense
- Well-suited for repairs
- Single wall and adhesive-lined tubings
- Wide variety of colors, sizes and kits available
- Also available are RaySpool kits comprised of 6 sizes and supplied with a mounting rack
- Stand alone racks and packaging sets also available
- RoHS compliant

## RaySpool



#### Applications

The RaySpool system offers a convenient packaging and dispensing option for a range of heat-shrinkable tubings. The tubing is supplied on small reels which are over-boxed and feature a dispensing window allowing the tubing to be easily and readily accessed. The RaySpool system is a suitable method of storing and for use in the workshop, service vehicle or laboratory. A varied selection of tubings is offered which will cover a diverse range of applications including elec-

trical insulation, strain relief, cable bundling and environmental protection. RaySpool packaging is available for CGPT, LSTT and CGAT.

#### Installation

See individual product pages.

#### Operating Temperature Range

See individual product pages.

#### Specifications/Approvals

See individual product pages.

#### Available in:

Americas

Europe

Asia Pacific

## RaySpool (Continued)

### CGPT 2:1 Product Dimensions

| Size                              | Inside Diameter              |                                 | Recovered Wall Thickness* |  | Spool Quantity - Black (meters) | Spool Quantity - Green/Yellow (meters) | Ordering Description |
|-----------------------------------|------------------------------|---------------------------------|---------------------------|--|---------------------------------|----------------------------------------|----------------------|
|                                   | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating             |  |                                 |                                        |                      |
| 1.6/0.8                           | 1.6 (0.062)                  | 0.8 (0.031)                     | 0.45 ± 0.12               |  | 10.0                            | -                                      | CGPT-R-1.6-col code  |
| 2.4/1.2†                          | 2.4 (0.093)                  | 1.2 (0.046)                     | 0.50 ± 0.12               |  | 10.0                            | -                                      | CGPT-R-2.4-col code  |
| 3.2/1.6†•                         | 3.2 (0.125)                  | 1.6 (0.062)                     | 0.50 ± 0.12               |  | 10.0                            | 5.0                                    | CGPT-R-3.2-col code  |
| 4.8/2.4†                          | 4.8 (0.187)                  | 2.4 (0.093)                     | 0.50 ± 0.12               |  | 9.0                             | -                                      | CGPT-R-4.8-col code  |
| 6.4/3.2†•                         | 6.4 (0.250)                  | 3.2 (0.125)                     | 0.65 ± 0.15               |  | 8.0                             | 3.5                                    | CGPT-R-6.4-col code  |
| 9.5/4.8•                          | 9.5 (0.375)                  | 4.8 (0.187)                     | 0.65 ± 0.15               |  | 6.0                             | 3.0                                    | CGPT-R-9.5-col code  |
| 12.7/6.4†•                        | 12.7 (0.500)                 | 6.4 (0.250)                     | 0.65 ± 0.15               |  | 6.0                             | 2.5                                    | CGPT-R-12.7-col code |
| 19/9.5•                           | 19.0 (0.748)                 | 9.5 (0.375)                     | 0.75 ± 0.15               |  | 5.0                             | 2.0                                    | CGPT-R-19.0-col code |
| 25.4/12.7†•                       | 25.4 (1.000)                 | 12.7 (0.500)                    | 0.90 ± 0.20               |  | 3.0                             | 1.5                                    | CGPT-R-25.4-col code |
| KIT CONTAINS SIZES INDICATED BY † |                              |                                 |                           |  | CGPT-R-KIT-2                    |                                        |                      |

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

### Ordering Information

|                      |                                                                                         |                                                                    |
|----------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Color                | Standard                                                                                | Black (-0)<br>Green/yellow (-45) available in sizes indicated by • |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                                                                    |
| Standard packaging   | On mini spools.                                                                         |                                                                    |
| Ordering description | See above for description.                                                              |                                                                    |

### CGPT 3:1 Product Dimensions

| Size                                           | Inside Diameter              |                                 | Recovered Wall Thickness* |  | Spool Quantity (meters) | Ordering Description |
|------------------------------------------------|------------------------------|---------------------------------|---------------------------|--|-------------------------|----------------------|
|                                                | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating             |  |                         |                      |
| 3/1†                                           | 3.0 (0.118)                  | 1.0 (0.040)                     | 0.55 ± 0.12               |  | 10.0                    | CGPT-R-3/1-col code  |
| 6/2†                                           | 6.0 (0.236)                  | 2.0 (0.079)                     | 0.65 ± 0.12               |  | 7.0                     | CGPT-R-6/2-col code  |
| 9/3†                                           | 9.0 (0.354)                  | 3.0 (0.118)                     | 0.75 ± 0.15               |  | 5.0                     | CGPT-R-9/3-col code  |
| 12/4†                                          | 12.0 (0.472)                 | 4.0 (0.157)                     | 0.75 ± 0.15               |  | 4.0                     | CGPT-R-12/4-col code |
| 18/6†                                          | 18.0 (0.709)                 | 6.0 (0.236)                     | 0.85 ± 0.15               |  | 3.0                     | CGPT-R-18/6-col code |
| 24/8†                                          | 24.0 (0.945)                 | 8.0 (0.315)                     | 1.00 ± 0.20               |  | 3.0                     | CGPT-R-24/8-col code |
| KIT CONTAINS SIZES INDICATED BY † (black only) |                              |                                 |                           |  | CGPT-R-KIT-1            |                      |

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

### Ordering Information

|                      |                                                                                         |                                           |
|----------------------|-----------------------------------------------------------------------------------------|-------------------------------------------|
| Color                | Standard                                                                                | Black (-0) Red (-2) Yellow (-4) Blue (-6) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                                           |
| Standard packaging   | On mini spools.                                                                         |                                           |
| Ordering description | See above for description                                                               |                                           |

## RaySpool (Continued)

### LSTT 2:1 Product Dimensions

| Size                                           | Inside Diameter              |                                 | Recovered Wall Thickness* | Spool Quantity - Black (meters) | Ordering Description |
|------------------------------------------------|------------------------------|---------------------------------|---------------------------|---------------------------------|----------------------|
|                                                | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating             |                                 |                      |
| 2.4/1.2†                                       | 2.4 (0.093)                  | 1.2 (0.046)                     | 0.55 ± 0.12               | 10.0                            | LSTT-R-2.4-0         |
| 3.2/1.6†                                       | 3.2 (0.125)                  | 1.6 (0.062)                     | 0.55 ± 0.12               | 10.0                            | LSTT-R-3.2-0         |
| 4.8/2.4†                                       | 4.8 (0.187)                  | 2.4 (0.093)                     | 0.55 ± 0.12               | 9.0                             | LSTT-R-4.8-0         |
| 6.4/3.2†                                       | 6.4 (0.250)                  | 3.2 (0.125)                     | 0.65 ± 0.15               | 8.0                             | LSTT-R-6.4-0         |
| 9.5/4.8                                        | 9.5 (0.375)                  | 4.8 (0.187)                     | 0.65 ± 0.15               | 6.0                             | LSTT-R-9.5-0         |
| 12.7/6.4†                                      | 12.7 (0.500)                 | 6.4 (0.250)                     | 0.65 ± 0.15               | 6.0                             | LSTT-R-12.7-0        |
| 19/9.5                                         | 19.0 (0.748)                 | 9.5 (0.375)                     | 0.80 ± 0.15               | 5.0                             | LSTT-R-19.0-0        |
| 25.4/12.7†                                     | 25.4 (1.000)                 | 12.7 (0.500)                    | 0.95 ± 0.18               | 3.0                             | LSTT-R-25.4-0        |
| KIT CONTAINS SIZES INDICATED BY † (black only) |                              |                                 |                           |                                 | LSTT-R-KIT-1         |

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On mini spools.                                                                         |            |
| Ordering description | See above for description                                                               |            |

### CGAT 3:1 Product Dimensions

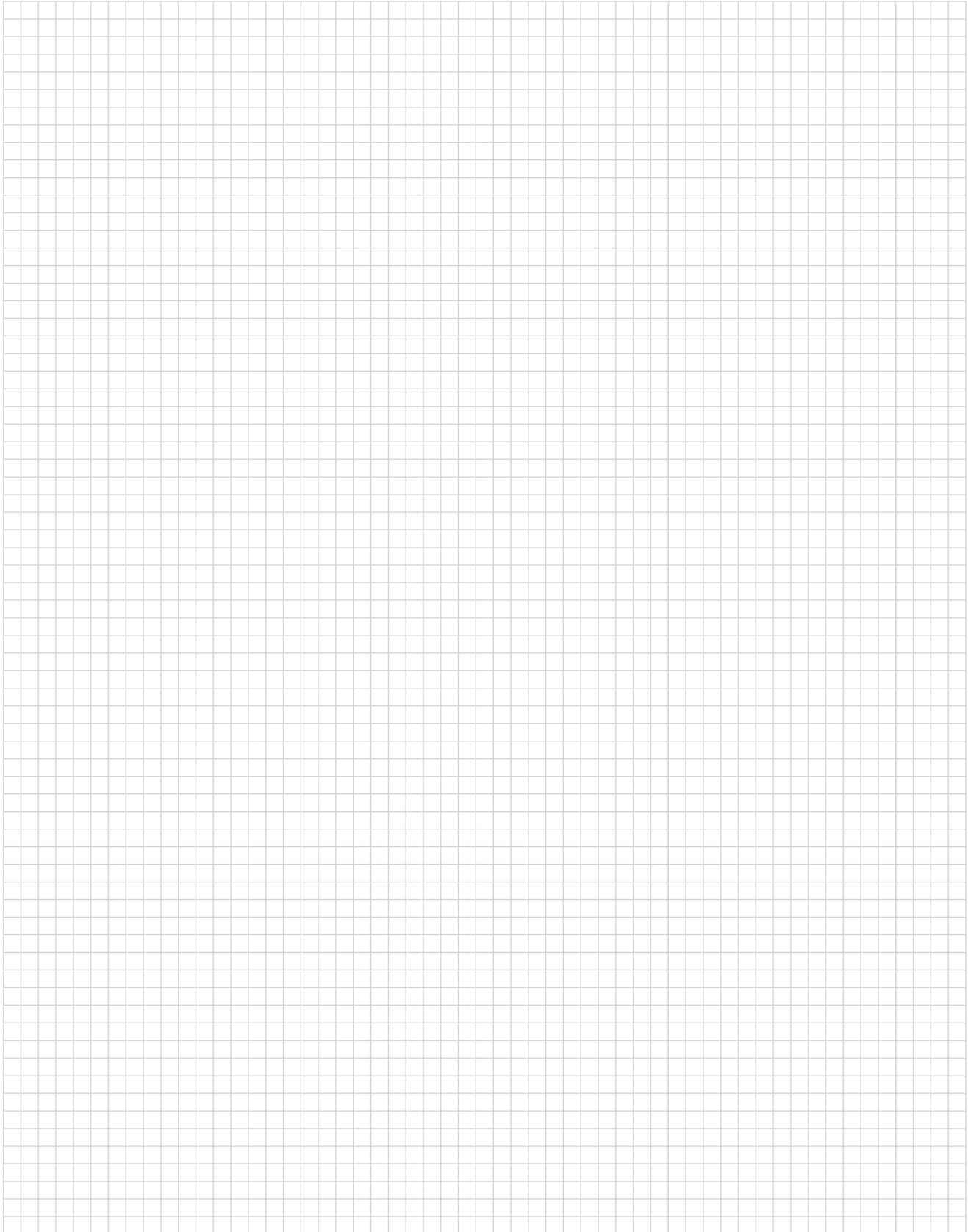
| Size                                           | Inside Diameter              |                                 | Recovered Wall Thickness* | Spool Quantity (meters) | Ordering Description |
|------------------------------------------------|------------------------------|---------------------------------|---------------------------|-------------------------|----------------------|
|                                                | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating             |                         |                      |
| 3/1†                                           | 3.0 (0.118)                  | 1.0 (0.040)                     | 1.00 ± 0.25               | 5.0                     | CGAT-R-3/1-0         |
| 6/2†                                           | 6.0 (0.236)                  | 2.0 (0.079)                     | 1.00 ± 0.25               | 3.5                     | CGAT-R-6/2-0         |
| 9/3†                                           | 9.0 (0.354)                  | 3.0 (0.118)                     | 1.35 ± 0.25               | 3.0                     | CGAT-R-9/3-0         |
| 12/4†                                          | 12.0 (0.472)                 | 4.0 (0.157)                     | 1.50 ± 0.25               | 2.5                     | CGAT-R-12/4-0        |
| 18/6†                                          | 18.0 (0.709)                 | 6.0 (0.236)                     | 1.70 ± 0.25               | 2.0                     | CGAT-R-18/6-0        |
| 24/8†                                          | 24.0 (0.945)                 | 8.0 (0.315)                     | 1.90 ± 0.25               | 1.5                     | CGAT-R-24/8-0        |
| KIT CONTAINS SIZES INDICATED BY † (black only) |                              |                                 |                           |                         | CGAT-R-KIT-1         |

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On mini spools.                                                                         |            |
| Ordering description | See above for description                                                               |            |





## RHW

### Rugged, Heavy Wall, Adhesive-Lined, Polyolefin Heat-Shrinkable Tubing

#### Product Facts

- Withstands mechanical abuse for increased product reliability
- Highly resistant to impact and abrasion
- Provides high level of strain relief when installed on splices and joints
- Resistant to chemicals, moisture and oils
- Provides a complete moisture-proof seal preventing corrosion of underlying components
- RoHS compliant



#### Applications

Rugged, heavy wall RHW tubing is specifically designed for insulating, protecting and sealing electrical connections and joints in low-voltage cables. The material used is both halogen-free and UV resistant. It provides splice insulation thickness equal to or greater than standard wire insulation manufactured to common industry standards.

RHW is a suitable choice for applications where maximum reliability, product performance and simplified insulation are required. Because RHW is heat-shrinkable, a minimum number of sizes are needed to cover a wide range of cables and splice diameters. This product is only available with a co-extruded layer of hot melt adhesive coating.

#### Installation

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 125°C [257°F]

#### Operating Temperature Range

-40°C to 110°C  
[-40°F to 230°F]

#### Specifications/Approvals

| Series | UL* c  us | Raychem |
|--------|----------------------------------------------------------------------------------------------|---------|
| RHW    | File E91151                                                                                  | RHW SCD |

\*Sizes 12/3 through 70/30 only.

Available in: Americas Europe Asia Pacific

**RHW** (Continued)

**Product Dimensions**

| Size    | Inside Diameter              |                                 | Recovered Wall Thickness** |
|---------|------------------------------|---------------------------------|----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Minimum Jacket Wall        |
| 12/3    | 12 [0.472]                   | 3 [0.118]                       | 2.0 [0.079]                |
| 16/4    | 16 [0.630]                   | 4 [0.158]                       | 2.4 [0.095]                |
| 24/6    | 24 [0.945]                   | 6 [0.236]                       | 2.7 [0.106]                |
| 34/8    | 33 [1.299]                   | 8 [0.315]                       | 4.0 [0.157]                |
| 48/12   | 48 [1.890]                   | 12 [0.472]                      | 4.5 [0.177]                |
| 56/16   | 56 [2.205]                   | 16 [0.630]                      | 4.4 [0.173]                |
| 70/20   | 70 [2.756]                   | 20 [0.787]                      | 4.4 [0.173]                |
| 90/25   | 90 [3.543]                   | 25 [0.984]                      | 4.3 [0.169]                |
| 110/30  | 110 [4.331]                  | 30 [1.181]                      | 4.3 [0.169]                |
| 130/55  | 130 [5.118]                  | 35 [1.378]                      | 4.3 [0.169]                |
| 160/50  | 160 [6.229]                  | 50 [1.968]                      | 4.3 [0.169]                |
| 180/50  | 180 [7.087]                  | 50 [1.968]                      | 4.3 [0.169]                |
| 200/50  | 200 [7.874]                  | 50 [1.968]                      | 4.3 [0.169]                |
| 250/65  | 250 [9.842]                  | 65 [2.559]                      | 4.3 [0.169]                |
| 320/95  | 320 [12.598]                 | 95 [3.740]                      | 4.3 [0.169]                |
| 390/110 | 390 [15.354]                 | 110 [4.331]                     | 4.3 [0.169]                |

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

**Ordering Information**

|                      |                                                                                                                                     |            |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                            | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes available upon request. |            |
| Standard packaging   | 1200mm lengths.                                                                                                                     |            |
| Marking              | Tubing will be marked with product name, size and batch number.                                                                     |            |
| Ordering description | Specify product name, size, cut length (for example, RHW-12/3-1200/ADH-0).                                                          |            |

## Medium Wall, Polyolefin Heat-Shrinkable Tubing

### Product Facts

- Withstands mechanical abuse for increased product reliability
- Highly resistant to impact and abrasion
- Installation is fast and easy
- Resistant to chemicals and moisture
- Adhesive-lined version provides a complete moisture-proof seal preventing corrosion of underlying components
- RoHS compliant

## RMW



### Applications

Medium wall, general purpose RMW tubing is specifically designed for use in a broad range of low-voltage applications. RMW is tough and flexible, making it particularly suited for the insulation and protection of cable joints as well as for cable repair. The outside jacket material used is both halogen-free and UV resistant. Uncoated RMW provides insulation and strain relief.

Adhesive-lined RMW also provides an environmental seal. RMW is a suitable choice for applications where maximum reliability and product performance, and simplified installation are required. Because RMW is heat-shrinkable, a minimum number of sizes are needed to cover a wide range of cables and splice diameters.

### Installation

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 125°C [257°F]

### Operating Temperature Range

-40°C to 110°C  
[-40°F to 230°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| RMW    | RMW SCD |

Available in:

Americas

Europe

Asia Pacific

**RMW** (Continued)

**Product Dimensions**

| Size    | Inside Diameter              |                                 | Recovered Wall Thickness** |
|---------|------------------------------|---------------------------------|----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Minimum Jacket Wall        |
| 10/3    | 10 [0.394]                   | 3 [0.118]                       | 1.0 [0.039]                |
| 16/5    | 16 [0.630]                   | 5 [0.197]                       | 1.4 [0.055]                |
| 25/8    | 25 [0.984]                   | 8 [0.315]                       | 2.0 [0.079]                |
| 35/12   | 35 [1.378]                   | 12 [0.472]                      | 2.0 [0.079]                |
| 50/16   | 50 [1.968]                   | 16 [0.630]                      | 2.0 [0.079]                |
| 63/19   | 63 [2.480]                   | 19 [0.748]                      | 2.4 [0.095]                |
| 75/22   | 75 [2.953]                   | 22 [0.866]                      | 2.7 [0.106]                |
| 85/25   | 85 [3.346]                   | 25 [0.984]                      | 2.8 [0.110]                |
| 95/29   | 95 [3.740]                   | 29 [1.142]                      | 3.1 [0.122]                |
| 115/34  | 115 [4.528]                  | 34 [1.339]                      | 3.1 [0.122]                |
| 140/42  | 140 [5.112]                  | 42 [1.654]                      | 3.1 [0.122]                |
| 160/50  | 160 [6.299]                  | 50 [1.968]                      | 3.2 [0.126]                |
| 180/60  | 180 [7.087]                  | 60 [2.362]                      | 3.2 [0.126]                |
| 245/80* | 245 [9.646]                  | 80 [3.150]                      | 2.4 [0.095]                |
| 285/135 | 285 [11.220]                 | 135 [5.315]                     | 1.4 [0.055]                |

\*Uncoated only

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

**Ordering Information**

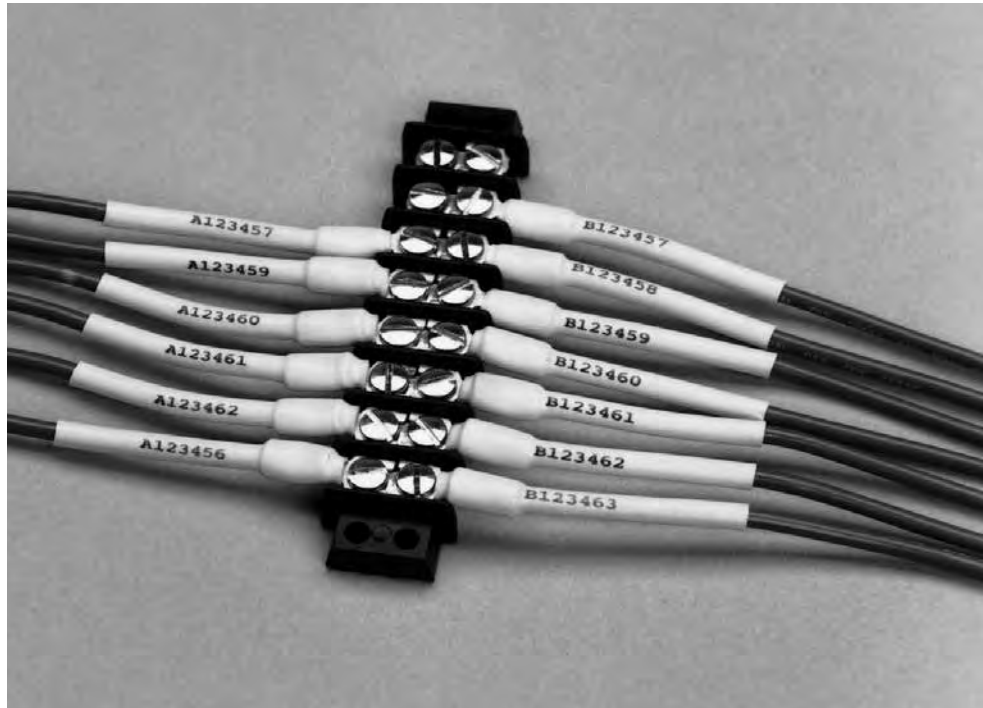
|                      |                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Standard      Black (-0)                                                                                                            |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes available upon request. |
| Standard packaging   | 1200mm lengths.                                                                                                                     |
| Marking              | Tubing will be marked with product name, size and batch number.                                                                     |
| Ordering description | Specify product name, size, cut length, coating option (for example, RMW-10/3-1200/U-0; ADH = Adhesive-lined, U = Uncoated).        |

## RNF-100

**Flexible, Flame-Retardant,  
General Purpose, Polyolefin  
Tubing**

### Product Facts

- 2:1 shrink ratio
- Superior abrasion and solvent resistance when compared with that of many flexible, general purpose polyolefin tubings
- Excellent physical, chemical, and electrical properties that meet or exceed industrial and military standards for highly reliable, general purpose tubing
- Flexible; conforms to irregular shapes
- Flame-retardant (colors only)
- Wide range of sizes and colors
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Designed to provide superior mechanical (abrasion, cut-through, and strain relief), thermal, and fluid-resistance performance in demanding environments. Widely used to provide insulation and strain relief of wire terminations and connections. Used for jacketing wire bundles and light-duty harnesses where superior abrasion resistance is a plus. Also used to identify and color-code electrical connections and wire bundles.

### Installation

Minimum shrink temperature: 95°C [203°F]  
Minimum full recovery temperature: 121°C [250°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series                  | UL  | CSA  | Military                                                 | Industry                         | Raychem                   |
|-------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------|---------------------------|
| RNF-100 Type 1 (colors) | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                 | AMS-DTL-23053/5*,<br>Class 1<br>Def. Stan. 59-97 Type 2B | VDE 0341 Pt 9005<br>Type A and B | RT-350, Type 1<br>RK-6001 |
| RNF-100 Type 2 (clear)  | —                                                                                      | —                                                                                       | AMS-DTL-23053/5*,<br>Class 2<br>VG 95343 Pt 5 Type B     | —                                | RT-350, Type 2<br>RK-6001 |

\*Formerly MIL-I-23053/5 and MIL-DTL-23053/5.

Available in:

Americas

Europe

Asia Pacific

**RNF-100** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64  | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.40 ± 0.08 [0.016 ± 0.003] |
| 1/16  | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 3/32  | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/4   | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.89 ± 0.12 [0.035 ± 0.005] |
| 1 1/4 | 31.8 [1.250]                 | 15.9 [0.625]                    | 1.02 ± 0.15 [0.040 ± 0.006] |
| 1 1/2 | 38.1 [1.500]                 | 19.1 [0.750]                    | 1.02 ± 0.15 [0.040 ± 0.006] |
| 2     | 50.8 [2.000]                 | 25.4 [1.000]                    | 1.14 ± 0.16 [0.045 ± 0.007] |
| 3     | 76.2 [3.000]                 | 38.1 [1.500]                    | 1.27 ± 0.20 [0.050 ± 0.008] |
| 4     | 101.6 [4.000]                | 50.8 [2.000]                    | 1.40 ± 0.23 [0.055 ± 0.009] |
| 5     | 127.0 [5.000]                | 63.5 [2.500]                    | 1.52 ± 0.23 [0.060 ± 0.009] |

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

**Ordering Information**

|                          |                                                                                                                                         |                                                                                              |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Color                    | Standard                                                                                                                                | Black (-0, BK), white (-9, WH), red (-2, RD), blue (-6, BU), yellow (-4, YO), clear (-X, CL) |
|                          | Nonstandard                                                                                                                             | Brown (-1, BN), orange (-3, OR), green (-5, GN), violet (-7, VT), gray (-8, GY)              |
| Size selection           | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                              |
| Standard packaging***    | On spools or in 1.2-meter [4-foot] lengths.                                                                                             |                                                                                              |
| Ordering description**** | Specify product name, size and color (for example, RNF-100 1/4-0 [Europe] or RNF-100 1/4-BK [Americas]).                                |                                                                                              |

\*\*\*Available in the convenient Mini-Spool packaging/dispensing system, for sizes 3/64" up to 1".

\*\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## RNF-150

**High-Performance,  
Flame-Resistant, Flexible,  
Fluoropolymer Tubing**

### Product Facts

- 2:1 shrink ratio
- Approximately 40 percent 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 [122°F] (but not recommended for use in direct contact with ketones)
- Recommended maximum temperature for use as a primary insulator: 135°C [275°F]
- RoHS compliant



Heat-shrinkable Tubing

### Applications

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.

### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 150°C [302°F]

### Operating Temperature Range

-55°C to 150°C  
[-67°F to 302°F]

### Specifications/Approvals

| Series  | UL  | Military                      | Raychem |
|---------|----------------------------------------------------------------------------------------|-------------------------------|---------|
| RNF-150 | E35586 VW-1<br>600 V, 150°C                                                            | AMS-DTL-23053/18*,<br>Class 2 | RT-370  |

\*Formerly MIL-I-23053/18 and MIL-DTL-23053/18.

Available in:

Americas

Europe

Asia Pacific



**RNF-150** (Continued)

**Product Dimensions**

| Size | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|------|------------------------------|---------------------------------|-----------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64 | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/16 | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/32 | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/8  | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/16 | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/4  | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 3/8  | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 1/2  | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 3/4  | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 1    | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.48 ± 0.08 [0.019 ± 0.003] |

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

**Ordering Information**

|                         |                                                                                                                                         |            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                   | Standard                                                                                                                                | Black (-0) |
|                         | Nonstandard                                                                                                                             | White (-9) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging      | On spools.                                                                                                                              |            |
| Ordering description*** | Specify product name, size and color (for example, RNF-150 1/4-0).                                                                      |            |

\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## RNF-3000

**Flexible, High-Shrink-Ratio, Flame-Retardant, General Purpose, Polyolefin Tubing**

### Product Facts

- 3:1 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
- Flame-retardant (colors only)
- RoHS compliant



### Applications

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.

### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 120°C [248°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series   | UL  | CSA  | Military                                                                                 | Industry                         | Raychem |
|----------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------|---------|
| RNF-3000 | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                 | Def. Stan. 59-97 Type 2B<br>VG 95343 Pt 5 Type A (color)<br>VG 95343 Pt 5 Type B (clear) | VDE 0341 Pt 9005<br>Type A and B | RW-2053 |

Available in:

Americas

Europe

Asia Pacific

**RNF-3000** (Continued)

**Product Dimensions**

| Size    | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|---------|------------------------------|---------------------------------|-----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1.5/0.5 | 1.5 [0.060]                  | 0.5 [0.019]                     | 0.45 ± 0.10 [0.018 ± 0.003] |
| 3/1     | 3 [0.118]                    | 1 [0.039]                       | 0.55 ± 0.10 [0.022 ± 0.003] |
| 4.5/1.5 | 4.5 [0.177]                  | 1.5 [0.059]                     | 0.55 ± 0.10 [0.022 ± 0.003] |
| 6/2     | 6 [0.236]                    | 2 [0.079]                       | 0.65 ± 0.10 [0.026 ± 0.003] |
| 9/3     | 9 [0.354]                    | 3 [0.118]                       | 0.75 ± 0.12 [0.030 ± 0.004] |
| 12/4    | 12 [0.472]                   | 4 [0.157]                       | 0.75 ± 0.12 [0.030 ± 0.004] |
| 18/6    | 18 [0.709]                   | 6 [0.236]                       | 0.85 ± 0.12 [0.033 ± 0.004] |
| 24/8    | 24 [0.944]                   | 8 [0.315]                       | 1.00 ± 0.18 [0.039 ± 0.007] |
| 39/13   | 39 [1.534]                   | 13 [0.512]                      | 1.15 ± 0.20 [0.045 ± 0.008] |

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

**Ordering Information**

|                          |                                                                                                                                         |                                                                      |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Color                    | Standard**                                                                                                                              | Black (-0), white (-9), red (-2), blue (-6), yellow (-4), clear (-X) |
|                          | Nonstandard                                                                                                                             | Brown (-1), orange (-3), green (-5), violet (-7), gray (-8)          |
| Size selection           | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                      |
| Standard packaging***    | On spools or in 1.2-meter [4-foot] lengths.                                                                                             |                                                                      |
| Ordering description**** | Specify product name, size and color (for example, RNF-3000 6/2-0).                                                                     |                                                                      |

\*\*Black is the only standard color in the Americas. All other colors are nonstandard.

\*\*\*Only spools are standard in the Americas. 1.2 meter [4-foot] lengths are nonstandard.

\*\*\*\*Europe only. For supply to Def Stan and BS add -DS or -BS to ordering description.

## RP-4800

**High-Shrink-Ratio,  
Flame-Retardant, Polyolefin  
Tubing**

### Product Facts

- 4:1 shrink ratio
- Conforms well to highly variable substrate dimensions
- Has excellent physical, chemical, and electrical properties that meet or exceed industrial and military standards
- Shows no significant degradation when exposed to common solvents and chemicals, including aviation fuel and hydraulic fluid
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Well-suited for repairing harnesses or cables; will pass over a large-diameter connector or transition, and then shrink down onto a smaller-diameter jacket. Can insulate or protect a substrate of varying dimensions. Also provides the abrasion and fluid resistance required in harnessing applications.

### Installation

Minimum shrink temperature: 95°C [203°F]  
Minimum full recovery temperature: 121°C [250°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series  | UL  | Military                                                          | Industry                | Raychem |
|---------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------|---------|
| RP-4800 | E35586<br>600V, 125°C<br>(black only)                                                  | AMS-DTL-23053/5*,<br>Class 1 Overexpanded<br>VG 95343 Pt 5 Type A | VDE 0341 Pt 9005 Type A | RT-1122 |

\*Formerly MIL-I-23053/5 and MIL-DTL-23053/5.

Available in:

Americas

Europe

Asia Pacific

**RP-4800** (Continued)

**Product Dimensions**

| Size   | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|--------|------------------------------|---------------------------------|-----------------------------|
|        | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| No. 1  | 25.4 [1.000]                 | 7.0 [0.275]                     | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 2  | 50.8 [2.000]                 | 14.0 [0.550]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 3  | 76.2 [3.000]                 | 20.6 [0.810]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 4  | 101.6 [4.000]                | 26.7 [1.050]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 5  | 25.4 [1.000]                 | 11.7 [0.462]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 6  | 60.3 [2.375]                 | 17.3 [0.680]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 7  | 76.2 [3.000]                 | 21.3 [0.840]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 8  | 95.3 [3.750]                 | 23.6 [0.930]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 9  | 114.3 [4.500]                | 36.8 [1.450]                    | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 10 | 38.1 [1.500]                 | 9.5 [0.375]                     | 1.14 ± 0.18 [0.045 ± 0.007] |
| No. 11 | 19.1 [0.750]                 | 4.6 [0.180]                     | 1.14 ± 0.18 [0.045 ± 0.007] |

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

**Ordering Information**

|                         |                                                                                                                                         |                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Color                   | Standard                                                                                                                                | Black (-0)                                                                                                |
|                         | Nonstandard                                                                                                                             | White (-9), red (-2), blue (-6), yellow (-4), green (-5), brown (-1), orange (-3), violet (-7), gray (-8) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                                           |
| Standard packaging      | On spools or in 1.2-meter [4-foot] lengths.                                                                                             |                                                                                                           |
| Ordering description*** | Specify product name, size and color (for example, RP-4800 NO.1-0).                                                                     |                                                                                                           |

\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## RPPM

**Flexible, Dual Wall,  
Moisture-Proof,  
Heat-Shrinkable Tubing**

### Product Facts

- Environmental sealing
- Excellent mechanical strength
- Abrasion resistance
- 4:1 shrink ratio
- RoHS compliant



### Applications

RPPM is a flexible, heat-shrinkable, dual wall tubing with an integrally bonded meltable adhesive liner. Available in clear and black, the tough outer jacket 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.

### Installation

Minimum shrink temperature: 60°C [140°F]

Minimum full recovery temperature: 80°C [176°F]

### Operating Temperature Range

-40°C to 85°C  
[-40°F to 185°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| RPPM   | RK-6214 |

Available in: Americas Europe Asia Pacific

**RPPM** (Continued)

**Product Dimensions**

| Size | Inside Diameter              |                                 | Recovered Wall Thickness*        |                                     |
|------|------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Total Wall After Heating | Nominal Adhesive Wall After Heating |
| 4/1  | 4.0 [0.158]                  | 1.0 [0.039]                     | 0.8 [0.032]                      | 0.3 [0.012]                         |
| 8/2  | 8.0 [0.315]                  | 2.0 [0.079]                     | 0.9 [0.035]                      | 0.3 [0.012]                         |
| 12/3 | 12.0 [0.472]                 | 3.0 [0.118]                     | 1.2 [0.047]                      | 0.4 [0.016]                         |
| 16/4 | 16.0 [0.630]                 | 4.0 [0.158]                     | 1.5 [0.059]                      | 0.5 [0.020]                         |

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

**Ordering Information**

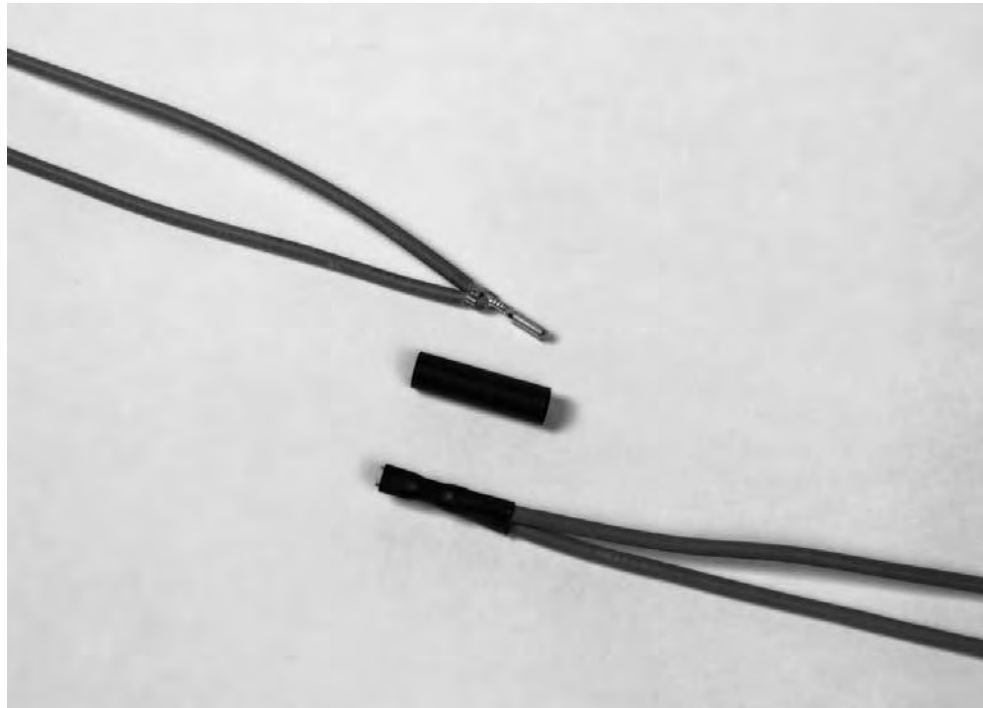
|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Clear (-X) |
|                      | Nonstandard                                                                                                                             | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools, in 1.2 meter [4-foot] lengths or cut pieces.                                                                                 |            |
| Ordering description | Specify product name, size and color (for example, RPPM 4/1-X).                                                                         |            |

## RT-3

### Semirigid, Flame-Retardant, Polyolefin Tubing

#### Product Facts

- 2.5:1 shrink ratio
- Tightly controlled expanded diameters
- High abrasion resistance
- Semirigidity that transfers flex stress away from typically weak points such as solder and crimp joints, helping to ensure a reliable connection
- Excellent chemical and solvent resistance
- Outstanding physical and electrical performance
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Suitable for wire strain-relief applications — soldered or crimped connections, wire splices, terminations. Well-suited for use with semiautomated production equipment requiring tubing with a tightly controlled expanded diameter. Acts as a tough covering for delicate components; provides mechanical protection.

#### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

#### Specifications/Approvals

| Series | UL  | CSA  | Raychem |
|--------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------|
| RT-3   | E35586<br>600 V, 125°C                                                                 | LR31929 (black only)<br>600 V, 125°C                                                      | RT-360* |

\*Except dimensions and longitudinal change.

Available in:

Americas

Europe

Asia Pacific



**RT-3** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| No. 1 | 6.1 ± 0.4 [0.240 ± 0.015]    | 2.4 [0.095]                     | 0.79 ± 0.08 [0.031 ± 0.003] |
| No. 2 | 8.1 ± 0.4 [0.320 ± 0.015]    | 3.2 [0.125]                     | 0.79 ± 0.08 [0.031 ± 0.003] |
| No. 3 | 9.5 ± 0.5 [0.375 ± 0.020]    | 3.8 [0.150]                     | 0.79 ± 0.08 [0.031 ± 0.003] |
| No. 4 | 12.3 ± 0.5 [0.485 ± 0.020]   | 5.1 [0.200]                     | 0.79 ± 0.08 [0.031 ± 0.003] |

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

**Ordering Information**

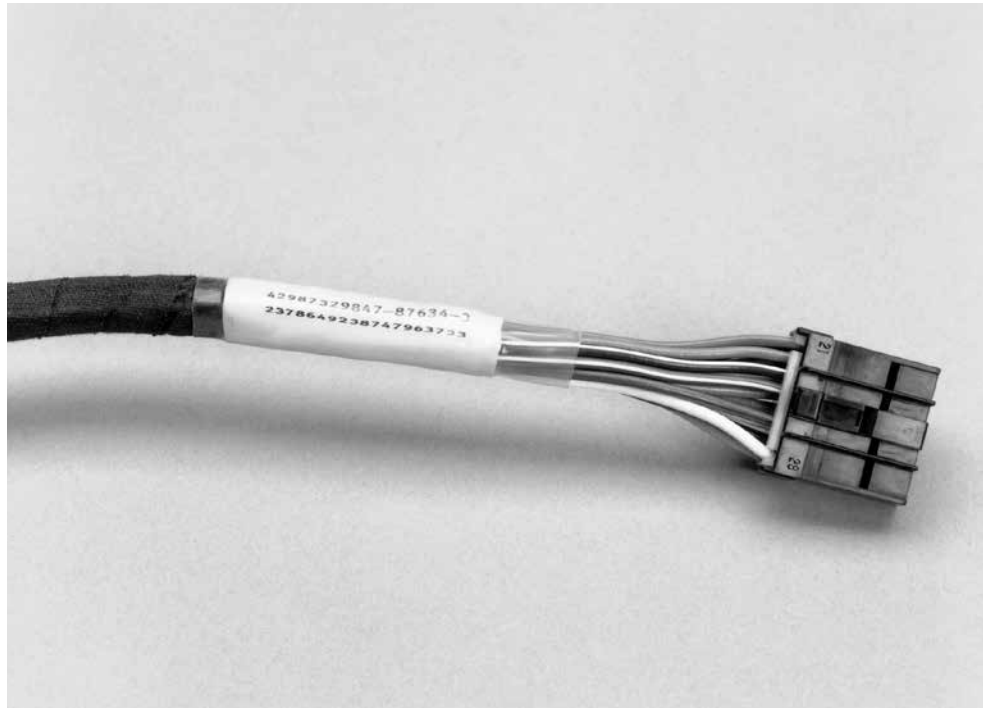
|                      |                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Black (-0) only                                                                                                                         |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |
| Standard packaging   | In 1-inch cut pieces or in 1.2-meter [4-foot] lengths.                                                                                  |
| Ordering description | Specify product name, size and color (for example, RT-3 No. 1-0).                                                                       |

## RT-375

**Clear, Flame-Resistant,  
Flexible, Fluoropolymer  
Tubing**

### Product Facts

- 2:1 shrink ratio
- Exceptional clarity and clarity stability
- Toughness, chemical resistance, and high-temperature performance
- High flame-resistance
- Approximately 40 percent thinner walls than most general purpose polyolefin tubings
- Recommended maximum temperature for use as a primary insulator: 135°C [275°F]
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Protects wire and cable markers subject to extreme abuse, while permitting full inspectability of each item covered. Provides bundling and jacketing of wires and cables, protecting them from mechanical and chemical abuse. Protects electronic components while permitting their identification and inspection.

### Installation

Minimum shrink temperature: 125°C [257°F]  
Minimum full recovery temperature: 150°C [302°F]

### Operating Temperature Range

-55°C to 150°C  
[-67°F to 302°F]

### Specifications/Approvals

| Series | UL  | CSA  | Military                   | Raychem |
|--------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------|---------|
| RT-375 | E35586 VW-1<br>600 V, 150°C                                                            | LR31929 VW-1<br>600 V, 150°C                                                            | AMS-DTL-23053/18*, Class 2 | RT-375  |

\*Formerly MIL-I-23053/18 and MIL-DTL-23053/18.

Available in:

Americas

Europe

Asia Pacific

**RT-375** (Continued)

**Product Dimensions**

| Size | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|------|------------------------------|---------------------------------|-----------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64 | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/16 | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/32 | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/8  | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/16 | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/4  | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 3/8  | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 1/2  | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.30 ± 0.08 [0.012 ± 0.003] |
| 3/4  | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 1    | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.48 ± 0.08 [0.019 ± 0.003] |

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

**Ordering Information**

|                         |                                                                                                                                         |            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                   | Standard                                                                                                                                | Clear (-X) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging      | On spools.                                                                                                                              |            |
| Ordering description*** | Specify product name, size and color (for example, RT-375 1/4-X).                                                                       |            |

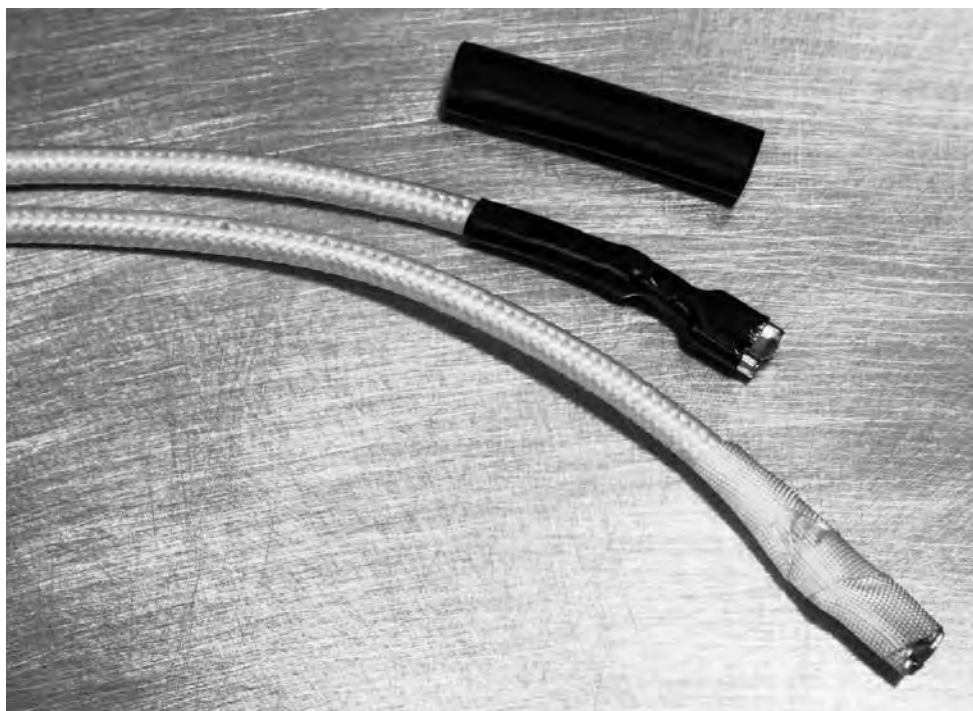
\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## RT555

**Fluid-Resistant, Chemical-Resistant, Crosslinked Fluoropolymer Tubing with Extended Temperature Range**

### Product Facts

- Resistance to high temperatures, solvents, corrosive chemicals, and radiation
- Extreme resistance to hydrocarbons
- Low outgassing (successfully tested for NASA outgassing requirements)
- Highly flame-retardant
- 40 percent lighter weight than tubing made with Viton® fluoroelastomer
- System 300 tubing
- RoHS compliant



### Applications

Suitable for commercial applications requiring heat resistance (electrical and hydraulic systems near aircraft or automotive engines or in fuel tanks), applications in chemically exposed environments (industrial process equipment in the pulp and paper, steel, and chemical industries), and equipment for handling caustic or dangerous chemicals or inks.

Use for insulation and strain relief on appliances (electric ranges, microwave ovens, gas grills, and industrial paint-drying equipment) and for protection of delicate electronic instruments in down-hole applications.

### Installation

Minimum shrink temperature: 150°C [302°F]

Minimum full recovery temperature: 220°C [428°F]

### Operating Temperature Range

-65°C to 200°C  
[-85°F to 392°F]

### Specifications/Approvals

| Series | UL                                           | Raychem |
|--------|---------------------------------------------------------------------------------------------------------------------------------|---------|
| RT555  | Listed for 185°C for 100,000-hr continuous use (File E85381)<br>Listed for 200°C for 40,000-hr cumulative intermittent exposure | RT-555  |

Viton is a trademark of Dupont Performance Elastomers LLC.

Available in: Americas Europe Asia Pacific

**RT555** (Continued)

**Product Dimensions**

| Size  | Inside diameter                 |                                    | Recovered wall thickness*<br>After heating |              |              |
|-------|---------------------------------|------------------------------------|--------------------------------------------|--------------|--------------|
|       | Minimum expanded<br>as supplied | Maximum recovered<br>after heating | Minimum                                    | Maximum      | Nominal      |
| 1/8   | 3.18 [0.125]                    | 1.57 [0.062]                       | 0.25 [0.010]                               | 0.41 [0.016] | 0.30 [0.012] |
| 3/16  | 4.75 [0.187]                    | 2.36 [0.093]                       | 0.28 [0.011]                               | 0.46 [0.018] | 0.36 [0.014] |
| 1/4   | 6.35 [0.250]                    | 3.18 [0.125]                       | 0.33 [0.013]                               | 0.51 [0.020] | 0.41 [0.016] |
| 3/8   | 9.53 [0.375]                    | 4.75 [0.187]                       | 0.41 [0.016]                               | 0.58 [0.023] | 0.48 [0.019] |
| 1/2   | 12.70 [0.500]                   | 6.35 [0.250]                       | 0.41 [0.016]                               | 0.58 [0.023] | 0.48 [0.019] |
| 5/8   | 15.88 [0.625]                   | 7.95 [0.313]                       | 0.48 [0.019]                               | 0.66 [0.026] | 0.56 [0.022] |
| 3/4   | 19.05 [0.750]                   | 9.53 [0.375]                       | 0.61 [0.024]                               | 0.79 [0.031] | 0.69 [0.027] |
| 1     | 25.40 [1.000]                   | 12.70 [0.500]                      | 0.71 [0.028]                               | 0.89 [0.035] | 0.79 [0.031] |
| 1 1/4 | 31.75 [1.250]                   | 15.88 [0.625]                      | 0.76 [0.030]                               | 0.94 [0.037] | 0.84 [0.033] |
| 1 1/2 | 38.10 [1.500]                   | 19.05 [0.750]                      | 0.86 [0.034]                               | 1.04 [0.041] | 0.94 [0.037] |
| 2     | 50.80 [2.000]                   | 25.40 [1.000]                      | 0.94 [0.037]                               | 1.12 [0.044] | 1.02 [0.040] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, RT555 1/8-0).                                                                        |            |

## RW-175 / RW-175-E

**High-temperature,  
Chemical-Resistant,  
Polyvinylidene Fluoride  
Tubing**

### Product Facts

- 2:1 shrink ratio
- Tough, semirigid, very-thin-wall insulation
- High flame-resistance
- Meets the requirements of AMS-DTL-23053\*, Test C (RW-175 version only), with UL and CSA VW-1 rating
- High-temperature performance that meets or exceeds military and industrial standards
- Protection from most industrial solvents, fuels, and chemicals
- Recommended maximum temperature for use as a primary insulator: 135°C [275°F]
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Especially suitable for applications requiring high-temperature performance, outstanding abrasion resistance and cut-through resistance, or superior chemical and solvent properties. Provides electrical insulation and strain relief of multipin connectors and solder joints. Well-suited for applications that require dense packing of components or visual inspection of covered components.

### Installation

Minimum shrink temperature: 155°C [311°F]  
Minimum full recovery temperature: 175°C [347°F]

### Operating Temperature Range

-55°C to 175°C  
[-67°F to 347°F]

### Specifications/Approvals

| Series   | UL  | CSA  | Military             | Industry         | Raychem   |
|----------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|------------------|-----------|
| RW-175   | E35586 VW-1<br>600 V, 150°C                                                            | LR31929 VW-1<br>600 V, 150°C                                                            | AMS-DTL-23053/8*     | –                | RW-3029/2 |
| RW-175-E | E35586 VW-1<br>600 V, 150°C                                                            | LR31929 VW-1<br>600 V, 150°C                                                            | VG 95343 Pt 5 Type F | VDE 0341 Pt 9005 | RW-3029/1 |

\*Formerly MIL-I-23053 and MIL-DTL-23053/8.

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
| RW-175        | ■        |        | ■            |
| Available in: | Americas | Europe | Asia Pacific |
| RW-175-E      |          | ■      |              |

**RW-175 / RW-175-E** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64  | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/16  | 1.6 [0.063]                  | 0.8 [0.031]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/32  | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.25 ± 0.05 [0.010 ± 0.002] |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.33 ± 0.05 [0.013 ± 0.002] |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.33 ± 0.05 [0.013 ± 0.002] |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.33 ± 0.05 [0.013 ± 0.002] |
| 3/4   | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.48 ± 0.08 [0.019 ± 0.003] |
| 1 1/2 | 38.1 [1.500]                 | 19.1 [0.750]                    | 0.51 ± 0.08 [0.020 ± 0.003] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Clear (-X) |
|                      | Nonstandard                                                                                                                             | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | In 1.2-meter [4-foot] lengths.                                                                                                          |            |
| Ordering description | Specify product name, size and color (for example, RW-175-3/64-X).                                                                      |            |

## RW-200 / RW-200-E

**Heat-Shrinkable,  
Chemical-Resistant,  
High-Temperature Tubing**

### Product Facts

- 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 compliant



Heat-shrinkable Tubing

### Applications

Raychem premium heat-shrinkable tubing is fabricated from Viton® fluoroelastomers – a cross-linked 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].

### Installation

Minimum shrink temperature: 100°C [212°F]

Minimum full recovery temperature: 175°C [347°F]

### 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]

### Specifications/Approvals

| Series   | Military                                                                                                                                  | Raychem |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------|---------|
| RW-200   | AMS-DTL 23053/13*                                                                                                                         | RW-3037 |
| RW-200-E | MIL-PRF-46846, Type III, Class 1<br>Def. Stan. 59-97 Issue 3 Type 4A<br>VG 95343 Part 5 Type E<br>VDE 0341/Pt9005<br>BS 4G-198 Part 3 12A | RW-3037 |

\*Formerly MIL-I-23053/13 and MIL-DTL-23053/13.

Viton is a trademark of Dupont Performance Elastomers LLC.

Available in: Americas Europe Asia Pacific



**RW-200/RW-200-E** (Continued)

**Product Dimensions**

| Size  | Inside Diameter                 |                                    | Recovered Wall Thickness** |              |
|-------|---------------------------------|------------------------------------|----------------------------|--------------|
|       | Minimum Expanded<br>as Supplied | Maximum Recovered<br>After Heating | After Heating (Nominal)    |              |
|       |                                 |                                    | 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**

|                         |                                                                                                                                         |            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                   | Standard                                                                                                                                | Black (-0) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging      | On spools.                                                                                                                              |            |
| Ordering description*** | Specify product name, size and color (for example, Viton 1/4-0).                                                                        |            |

\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## SCL

### Semirigid, Encapsulant-Lined, Polyolefin Tubing

#### Product Facts

- 3:1 shrink ratio
- Splash-resistant, moisture-resistant covering; not intended for use where immersion in fluids is required
- Rugged protection against abrasion, vibration, and flexing
- Excellent strain relief and insulation of weak points
- RoHS compliant



#### Applications

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.

#### Installation

Minimum shrink temperature: 125°C [257°F]  
Minimum full recovery temperature: 135°C [275°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series | UL  | Military                  | Raychem |
|--------|----------------------------------------------------------------------------------------|---------------------------|---------|
| SCL    | E85381<br>600 V, 125°C                                                                 | AMS-DTL-23053/4*, Class 1 | RT-1301 |

\*Formerly MIL-I-23053/4 and MIL-DTL-23053/4.

Available in:

Americas

Europe

Asia Pacific

## SCL (Continued)

### Product Dimensions

| Size | Additional Standard Color | Inside Diameter              |                                 | Recovered Wall Thickness**  |                                       |
|------|---------------------------|------------------------------|---------------------------------|-----------------------------|---------------------------------------|
|      |                           | Minimum Expanded as Supplied | Maximum Recovered After Heating | Total Wall After Heating    | Meltable Wall After Heating (Nominal) |
| 1/8  | Brown                     | 3.2 [0.125]                  | 0.6 [0.023]                     | 0.96 ± 0.15 [0.038 ± 0.006] | 0.51 [0.020]                          |
| 3/16 | Gray                      | 4.8 [0.187]                  | 1.5 [0.060]                     | 1.09 ± 0.15 [0.043 ± 0.006] | 0.64 [0.025]                          |
| 1/4  | White                     | 6.4 [0.250]                  | 2.0 [0.080]                     | 1.19 ± 0.15 [0.047 ± 0.006] | 0.69 [0.027]                          |
| 3/8  | Red                       | 9.5 [0.375]                  | 3.4 [0.135]                     | 1.27 ± 0.18 [0.050 ± 0.007] | 0.76 [0.030]                          |
| 1/2  | Blue                      | 12.7 [0.500]                 | 5.0 [0.195]                     | 1.39 ± 0.18 [0.055 ± 0.007] | 0.89 [0.035]                          |
| 3/4  | Yellow                    | 19.1 [0.750]                 | 8.0 [0.313]                     | 1.65 ± 0.18 [0.065 ± 0.007] | 1.02 [0.040]                          |
| 1    | N/A                       | 25.4 [1.000]                 | 10.2 [0.400]                    | 1.90 ± 0.18 [0.075 ± 0.007] | 1.02 [0.040]                          |

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

### Ordering Information

|                         |                                                                                                                                         |                                                                                            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Color                   | Standard                                                                                                                                | Black (-0) for all sizes, plus one additional color per size per Product Dimensions table. |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                            |
| Standard packaging      | In 1.2-meter [4-foot] lengths.                                                                                                          |                                                                                            |
| Ordering description*** | Specify product name, size and color (for example, SCL 1/4-0).                                                                          |                                                                                            |

\*\*\*Europe only. For supply to MIL spec., Def Stan and BS add -MS, -DS or -BS to ordering description.

## SCT

**Flame-Retardant, Adhesive-Lined, Semirigid Polyolefin Tubing (Extended Temperature Range)**

### Product Facts

- 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 compliant



Heat-shrinkable Tubing

### Applications

Specially designed to insulate and seal automotive wire splices and components in an under-the-hood automotive environment. Specially formulated to function at an extended temperature range.

### Installation

Minimum shrink temperature: 110°C [230°F]  
Minimum full recovery temperature: 135°C [266°F]

### Operating Temperature Range

-40°C to 150°C  
[-40°F to 302°F]

### Specifications/Approvals

| Series | Raychem |
|--------|---------|
| SCT    | SCT SCD |

Available in: Americas Europe Asia Pacific

## SCT (Continued)

### Product Dimensions

| Part Number | Inside Diameter              |                                 | Recovered Wall Thickness*   |                                        |
|-------------|------------------------------|---------------------------------|-----------------------------|----------------------------------------|
|             | Minimum Expanded as Supplied | Maximum Recovered After Heating | Total Wall After Heating    | Melttable Wall After Heating (Nominal) |
| SCT No. 1   | 7.6 [0.300]                  | 1.7 [0.065]                     | 1.52 ± 0.30 [0.060 ± 0.012] | 0.76 [0.030]                           |
| SCT No. 2   | 9.0 [0.355]                  | 2.3 [0.090]                     | 1.52 ± 0.30 [0.060 ± 0.012] | 0.76 [0.030]                           |
| SCT No. 3   | 11.6 [0.455]                 | 2.5 [0.100]                     | 2.29 ± 0.30 [0.090 ± 0.012] | 1.40 [0.055]                           |
| SCT No. 4   | 17.8 [0.700]                 | 4.4 [0.175]                     | 2.54 ± 0.30 [0.100 ± 0.012] | 1.52 [0.060]                           |

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

### Ordering Information

|                      |                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Black                                                                                                                                   |
| Size selection       | Always order the largest size that will shrink snugly over the component being covered. Special order sizes are available upon request. |
| Standard packaging   | Cut pieces.                                                                                                                             |
| Marking              | Tubing will be printed with its numbered size (such as SCT-1, SCT-2, SCT-3, SCT-4).                                                     |
| Ordering description | Specify product name, numbered size, color and cut length (for example, SCT-NO.3-E3-0-75MM).                                            |

## SFR

**Very Flexible,  
Flame-Retardant,  
Silicone Elastomer  
Tubing**

### Product Facts

- Outstanding low-temperature flexibility
- Resistance to hydraulic fluids, fuel, and lubricating oil
- Very good ablative characteristics: when exposed to flame, surface turns to insulative char or "ablates"
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Provides cable jacketing, harness protection, and strain relief for electronic components, semi-conductor leads, and wire splices. Suitable for applications that require flexibility over a wide range of operating temperatures.

### Installation

Minimum shrink temperature: 135°C [285°F]  
Minimum full recovery temperature: 175°C [347°F]

### Operating Temperature Range

-75°C to 180°C  
[-103°F to 356°F]

### Specifications/Approvals

| Series | Military                                             | Raychem |
|--------|------------------------------------------------------|---------|
| SFR    | AMS-DTL-23053/10*<br>MIL-PRF-46846, Type II, Class 1 | RT-1140 |

\*Formerly MIL-I-23053/10 and MIL-DTL-23053/10.

Available in: Americas Europe Asia Pacific

**SFR** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/4   | 6.4 [0.250]                  | 3.6 [0.143]                     | 0.88 ± 0.25 [0.035 ± 0.010] |
| 3/8   | 9.5 [0.375]                  | 5.4 [0.214]                     | 1.02 ± 0.25 [0.040 ± 0.010] |
| 1/2   | 12.7 [0.500]                 | 7.3 [0.286]                     | 1.21 ± 0.38 [0.048 ± 0.015] |
| 5/8   | 15.9 [0.625]                 | 9.1 [0.357]                     | 1.32 ± 0.38 [0.052 ± 0.015] |
| 3/4   | 19.1 [0.750]                 | 10.9 [0.428]                    | 1.44 ± 0.38 [0.057 ± 0.015] |
| 7/8   | 22.2 [0.875]                 | 12.7 [0.500]                    | 1.65 ± 0.38 [0.065 ± 0.015] |
| 1     | 25.4 [1.000]                 | 14.5 [0.570]                    | 1.77 ± 0.51 [0.070 ± 0.020] |
| 1 1/4 | 31.8 [1.250]                 | 18.1 [0.714]                    | 2.21 ± 0.51 [0.087 ± 0.020] |
| 1 1/2 | 38.1 [1.500]                 | 21.8 [0.857]                    | 2.41 ± 0.51 [0.095 ± 0.020] |
| 1 3/4 | 44.5 [1.750]                 | 25.4 [1.000]                    | 2.71 ± 0.51 [0.107 ± 0.020] |
| 2     | 50.8 [2.000]                 | 29.0 [1.140]                    | 2.79 ± 0.51 [0.110 ± 0.020] |

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

**Ordering Information**

|                         |                                                                                                                                         |            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                   | Standard                                                                                                                                | Black (-0) |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging      | On spools.                                                                                                                              |            |
| Ordering description*** | Specify product name, size and color (for example, SFR 1/4-0).                                                                          |            |

\*\*\*Europe only. For supply to MIL spec., Def Stan and BS add -MS, -DS or -BS to ordering description.

## SRFR

### Highly Flexible, Silicone Rubber Tubing

#### Product Facts

- Highly flame-retardant
- Extremely flexible at high and low temperatures
- Shrink ratio 1.5:1 minimum except sizes 4/2.9 and 29/20
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Highly flexible and resistant to high and low temperatures. Unlike other silicone materials, SRFR displays outstanding physical strength. It resists extreme heat shocks, and exhibits good thermal insulation. SRFR is non-burning and has outstanding ablative properties as well as excellent physical and electrical properties. SRFR is

used in medical equipment where its key properties are outstanding flexibility and ability to withstand exposure to sterilization conditions. Other applications include thyristor power cable insulation, heating element and bus bar insulation, fiber optic bundle sheathing, and rocketry support cable protection.

#### Installation

Minimum shrink temperature: 135°C [275°F]

Minimum full recovery temperature: 175°C [347°F]

#### Operating Temperature Range

-75°C to 200°C  
[-103°F to 392°F]

#### Specifications/Approvals

| Series | UL  | Raychem            |
|--------|----------------------------------------------------------------------------------------|--------------------|
| SRFR   | E85381 VW-1<br>600V, 200°C                                                             | RT-1142<br>RW-2057 |

Available in:

Americas

Europe

Asia Pacific



**SRFR** (Continued)

**Product Dimensions**

| Size    | Inside Diameter              |                                 | Recovered Wall Thickness*  |
|---------|------------------------------|---------------------------------|----------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating              |
| 2.9/1.7 | 2.9 [0.114]                  | 1.7 [0.067]                     | 1.0 ± 0.50 [0.039 ± 0.020] |
| 4/2.9   | 4.0 [0.158]                  | 2.9 [0.114]                     | 1.0 ± 0.50 [0.039 ± 0.020] |
| 7.8/4.6 | 7.8 [0.307]                  | 4.6 [0.181]                     | 1.0 ± 0.50 [0.039 ± 0.020] |
| 10/6.5  | 10.0 [0.394]                 | 6.5 [0.256]                     | 1.5 ± 0.50 [0.059 ± 0.020] |
| 15/9.6  | 15.0 [0.591]                 | 9.6 [0.378]                     | 1.5 ± 0.50 [0.059 ± 0.020] |
| 21/13   | 21.0 [0.827]                 | 13.0 [0.512]                    | 2.0 ± 0.75 [0.079 ± 0.030] |
| 29/20   | 29.0 [1.142]                 | 20.0 [0.787]                    | 2.0 ± 0.75 [0.079 ± 0.030] |
| 41/27   | 41.0 [1.614]                 | 27.0 [1.063]                    | 3.0 ± 1.00 [0.118 ± 0.039] |
| 51/33   | 51.0 [2.008]                 | 33.0 [1.299]                    | 3.0 ± 1.00 [0.118 ± 0.039] |

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

**Ordering Information**

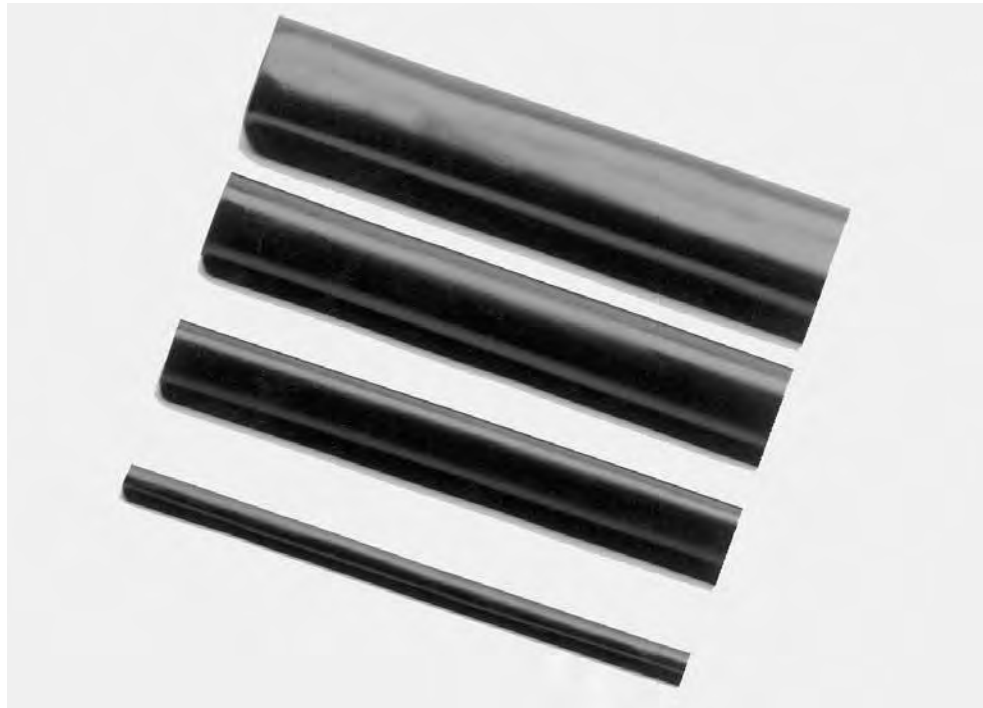
|                      |                                                                                         |           |
|----------------------|-----------------------------------------------------------------------------------------|-----------|
| Color                | Standard                                                                                | Gray (-8) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |           |
| Standard packaging   | On spools.                                                                              |           |
| Ordering description | Specify product name, size and color (for example, SRFR 2.9/1.7-8).                     |           |

## SST/SST-FR

### Self-Sealing, Heat-Shrinkable Tubing

#### Product Facts

- Thick adhesive liner forms an effective barrier against fluids and moisture
- Thick-wall insulation, strain relief and abrasion protection
- No need for greases, tape, or epoxy
- Expansion ratios as high as 3:1
- Available in flame-retardant material
- SST has the following agency approvals:
  - ABS (American Bureau of Shipping)
  - Lloyd's (Lloyd's Register of Shipping)
- RoHS compliant



#### Applications

SST provides a simple, positive splice-sealing method that offers protection under adverse environmental conditions. Tubing supplied with standard sealant provides water sealing and environmental protection in wet or underground applications. The thermoplastic adhesive not only seals, but also provides mechanical strain

relief. The polymer tubing has excellent insulating, abrasion-resistance, and strain-relief properties.

#### Installation

Minimum shrink temperature: 90°C [195°F]

Minimum full recovery temperature: 121°C [250°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series | Military                              | Industry               | Agency       | Raychem |
|--------|---------------------------------------|------------------------|--------------|---------|
| SST    | —                                     | —                      |              | RW-2011 |
| SST-FR | AMS-DTL-23053/15*,<br>Classes 1 and 2 | ASTM D 685, nonburning | ABS, Lloyd's | RW-2011 |

\*Formerly MIL-I-23053/15 and MIL-DTL-23053/15.

## SST/SST-FR (Continued)

### Product Dimensions

| Size†   | Standard Nominal Length | Inside Diameter              |                                 | Wall Thickness |                              | Recommended Cable Range for 600-Volt Cable |
|---------|-------------------------|------------------------------|---------------------------------|----------------|------------------------------|--------------------------------------------|
|         |                         | Minimum Expanded as Supplied | Maximum Recovered After Heating | Expanded       | Nominal Wall After Heating†† |                                            |
| SST*-03 | 30**, 48                | 0.300                        | 0.100                           | 0.025          | 0.070                        | 18 through 14 AWG                          |
| SST*-04 | 30**, 48                | 0.400                        | 0.150                           | 0.025          | 0.070                        | 14 through 10 AWG                          |
| SST*-07 | 48                      | 0.750                        | 0.220                           | 0.030          | 0.095                        | 8 through 1 AWG                            |
| SST*-11 | 48                      | 1.100                        | 0.375                           | 0.040          | 0.120                        | 2 through 4/0 AWG                          |
| SST*-13 | 48                      | 1.300                        | 0.375                           | 0.035          | 0.120                        | 2 through 4/0 AWG                          |
| SST*-15 | 48                      | 1.500                        | 0.500                           | 0.050          | 0.140                        | 2/0 AWG through 500 MCM                    |
| SST*-17 | 48                      | 1.700                        | 0.500                           | 0.045          | 0.140                        | 2/0 AWG through 500 MCM                    |
| SST*-20 | 48                      | 2.000                        | 0.750                           | 0.050          | 0.160                        | 350 MCM through 1000 MCM                   |
| SST*-27 | 48                      | 2.700                        | 0.900                           | 0.050          | 0.160                        | 500 MCM through 1250 MCM                   |
| SST*-30 | 48                      | 3.000                        | 1.250                           | 0.050          | 0.160                        | 900 MCM through 1500 MCM                   |
| SST*-40 | 48                      | 4.000                        | 1.750                           | 0.050          | 0.160                        | 1500 MCM through 2500 MCM                  |
| SST*-45 | 48                      | 4.500                        | 1.750                           | 0.050          | 0.160                        | 1500 MCM through 2500 MCM                  |

†In place of asterisk\* substitute length of tubing to be ordered. For example, SST\*-11, as the second column indicates, comes in 48-inch lengths, so a 48-inch cut piece of SST tubing would be SST 48-11.

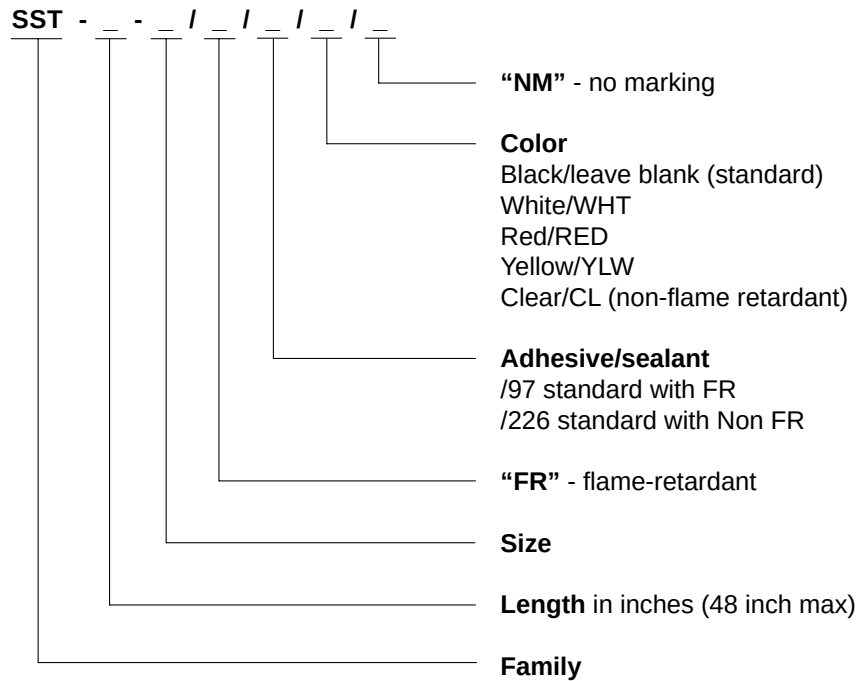
††Wall thickness will be less if tubing recovery is restricted during shrinkage.

\*\*30-inch length standard for /226 coating only.

### Ordering Information

|                      |                                                                                                                                         |                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black                                                       |
|                      | Nonstandard                                                                                                                             | White, Red, Yellow and Clear (Clear is non-flame-retardant) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                             |
| Standard packaging   | See Product Dimensions table.                                                                                                           |                                                             |
| Ordering description | Specify product name, cut length, size and color (for example, SST 48-07/FR/97).                                                        |                                                             |

### Part Numbering System



**Example: SST-48-07/FR/97/NM**

## TAT-125

### Adhesive-Lined, Flexible, Polyolefin Tubing

#### Product Facts

- 2:1 shrink ratio
- Thin adhesive lining that bonds to outer tubing and surface below, forming a positive environmental seal
- Flexibility of both tubing and adhesive
- Moisture seal that is resistant to bending of the substrate
- Good mechanical strength and cut-through resistance
- Adhesive that bonds to a wide variety of plastics, rubbers, and metals, including polyethylene, neoprene, lead, and steel
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

Seals and protects simple in-line splices, bimetallic joints, and components from fluids, moisture, and corrosion. Repairs damaged wire insulation, especially where flexibility is required. Provides one-step electrical insulation and moisture sealing.

#### Installation

Minimum shrink temperature: 95°C [203°F]  
Minimum full recovery temperature: 121°C [250°F]

#### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

#### Specifications/Approvals

| Series                  | UL  | Military                  | Raychem |
|-------------------------|----------------------------------------------------------------------------------------|---------------------------|---------|
| TAT-125 Type 1 (colors) | E85381<br>600 V, 125°C                                                                 | AMS-DTL-23053/4*, Class 2 | RW-3032 |
| TAT-125 Type 2 (clear)  | —                                                                                      | —                         | RW-3032 |

\*Formerly MIL-I-23053/4 and MIL-DTL-23053/4. Sizes 1/4" through 1 1/2" only.

Available in: Americas Europe Asia Pacific

**TAT-125** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness**         |                                       |
|-------|------------------------------|---------------------------------|------------------------------------|---------------------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | Total Wall After Heating (Nominal) | Adhesive Wall After Heating (Nominal) |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.69 [0.027]                       | 0.23 [0.009]                          |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.71 [0.028]                       | 0.25 [0.010]                          |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.74 [0.029]                       | 0.13 [0.005]                          |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.74 [0.029]                       | 0.13 [0.005]                          |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.76 [0.030]                       | 0.15 [0.006]                          |
| 3/4   | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.89 [0.035]                       | 0.15 [0.006]                          |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 1.07 [0.042]                       | 0.20 [0.008]                          |
| 1 1/2 | 38.1 [1.500]                 | 19.1 [0.750]                    | 1.19 [0.047]                       | 0.28 [0.011]                          |

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

**Ordering Information**

|                      |                                                                                                                                         |                                                                                                                                            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0)                                                                                                                                 |
|                      | Nonstandard                                                                                                                             | White (-9), red (-2), blue (-6), yellow (-4), green (-5), brown (-1), orange (-3), violet (-7), gray (-8), clear (-X, not flame-retardant) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                                                                            |
| Standard packaging   | In 1.2-meter [4-foot] lengths.                                                                                                          |                                                                                                                                            |
| Ordering description | Specify product name, size and color (for example, TAT-125 1/4-0).                                                                      |                                                                                                                                            |

## Semirigid, Flame-Retardant Polyolefin Caps

### Product Facts

- 2.5:1 shrink ratio
- Flame-retardant
- Permanent or temporary method to terminate wires
- Rapid, simple installation
- Rugged protection against abrasion, vibration, and flexing
- RoHS compliant

## TC Caps



### Applications

Widely used for wire terminations because of their light weight, small size and durability. Vibration-proof caps are used to insulate and terminate dead-end electrical cables, fixtures, connectors, and other electrical equipment. Also used to protect the ends of wire during storage.

### Installation

Minimum shrink temperature: 110°C [230°F]

Minimum full recovery temperature: 135°C [275°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series  | UL  | Raychem     |
|---------|----------------------------------------------------------------------------------------|-------------|
| TC Caps | E85381<br>600 V, 125°C                                                                 | TC Caps SCD |

Available in:

Americas

Europe

Asia Pacific

## TC Caps (Continued)

### Product Dimensions

| Size    | Color      | Length                      |                                     | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|---------|------------|-----------------------------|-------------------------------------|------------------------------|---------------------------------|-----------------------------|
|         |            | Nominal Overall as Supplied | Minimum Open Barrel after Recovery* | Minimum Expanded as Supplied | Maximum Recovered After Heating |                             |
| TC 4001 | White (-9) | 19.1 (0.750)                | 10.2 (0.400)                        | 1.6 (0.063)                  | 0.8 (0.030)                     | 0.51 ± 0.12 (0.020 ± 0.005) |
| TC 4003 | Red (-2)   | 25.4 (1.000)                | 14.0 (0.550)                        | 3.2 (0.125)                  | 1.3 (0.050)                     | 0.64 ± 0.12 (0.025 ± 0.005) |
| TC 4005 | Gray (-8)  | 28.6 (1.125)                | 14.0 (0.550)                        | 6.4 (0.250)                  | 2.5 (0.100)                     | 0.69 ± 0.12 (0.027 ± 0.005) |

\*See glossary for definition of "barrel".

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

### Ordering Information

|                      |                                                                                         |                                                      |
|----------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------|
| Color                | Standard                                                                                | One color per size per the Product Dimensions table. |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                                                      |
| Standard packaging   | In pieces.                                                                              |                                                      |
| Ordering description | Specify product name, size and color (for example, TC-CAPS-4003-2).                     |                                                      |

## TFE and TFER

**High-Temperature,  
Chemically Inert, Modified  
Tubing made of PTFE**

### Product Facts

- Shrink ratio: 1.8:1 (TFE)  
3.2:1 (TFER)
- High flame-resistance
- Excellent chemical resistance
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Designed to provide insulation and mechanical protection in severe chemical and thermal environments. Used to cover hydraulic hose and couplings to prevent contamination and corrosion. The high mechanical strength and extremely low coefficient of friction make it good for reducing damage to bearing shafts and similar applications.

### Installation

Minimum shrink temperature: 330°C [625°F]  
Minimum full recovery temperature: 340°C [644°F]

### Operating Temperature Range

-67°C to 250°C  
[-88.6°F to 482°F]

### Specifications/Approvals

| Series    | Military                                                                                                | Raychem                         |
|-----------|---------------------------------------------------------------------------------------------------------|---------------------------------|
| TFE, TFER | AMS-DTL-23053/12*, Classes 3 and 5<br>Def. Stan. 59-97 Type 5A (TFE)<br>Def. Stan. 59-97 Type 5B (TFER) | RW-2055 (TFE)<br>RW-2054 (TFER) |

\*Formerly MIL-I-23053/12 and MIL-DTL-23053/12.

Available in:

Americas

Europe

Asia Pacific



## TFE and TFER (Continued)

### Product Dimensions

#### TFE

| Size | Inside Diameter              |                                 | Wall Thickness**                |
|------|------------------------------|---------------------------------|---------------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating |
| 30   | 0.8 [0.032]                  | 0.38 [0.015]                    | 0.23 [0.009]                    |
| 28   | 0.9 [0.035]                  | 0.46 [0.018]                    | 0.23 [0.009]                    |
| 26   | 1.1 [0.043]                  | 0.56 [0.022]                    | 0.25 [0.010]                    |
| 24   | 1.2 [0.047]                  | 0.68 [0.027]                    | 0.25 [0.010]                    |
| 22   | 1.4 [0.055]                  | 0.81 [0.032]                    | 0.30 [0.012]                    |
| 20   | 1.5 [0.059]                  | 0.99 [0.039]                    | 0.30 [0.012]                    |
| 18   | 1.9 [0.075]                  | 1.24 [0.049]                    | 0.30 [0.012]                    |
| 16   | 2.3 [0.091]                  | 1.55 [0.061]                    | 0.30 [0.012]                    |
| 14   | 3.0 [0.118]                  | 1.83 [0.072]                    | 0.30 [0.012]                    |
| 12   | 3.8 [0.150]                  | 2.26 [0.089]                    | 0.30 [0.012]                    |
| 10   | 4.8 [0.189]                  | 2.84 [0.112]                    | 0.30 [0.012]                    |
| 8    | 6.1 [0.240]                  | 3.58 [0.141]                    | 0.38 [0.015]                    |
| 6    | 7.6 [0.299]                  | 4.52 [0.178]                    | 0.38 [0.015]                    |
| 4    | 9.4 [0.370]                  | 5.69 [0.224]                    | 0.38 [0.015]                    |
| 2    | 10.9 [0.429]                 | 7.06 [0.278]                    | 0.38 [0.015]                    |
| 0    | 11.9 [0.469]                 | 8.81 [0.347]                    | 0.38 [0.015]                    |

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

#### TFER

| Size  | Inside Diameter              |                                 | Wall Thickness**                |
|-------|------------------------------|---------------------------------|---------------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating |
| 5/64  | 2.0 [0.079]                  | 0.6 [0.024]                     | 0.23 [0.009]                    |
| 1/8   | 3.2 [0.126]                  | 1.0 [0.039]                     | 0.25 [0.010]                    |
| 1/4   | 6.4 [0.252]                  | 1.6 [0.063]                     | 0.30 [0.012]                    |
| 3/8   | 9.5 [0.374]                  | 2.4 [0.095]                     | 0.30 [0.012]                    |
| 1/2   | 12.7 [0.500]                 | 3.7 [0.146]                     | 0.38 [0.015]                    |
| 5/8   | 15.9 [0.626]                 | 4.5 [0.177]                     | 0.38 [0.015]                    |
| 3/4   | 19.0 [0.748]                 | 5.7 [0.224]                     | 0.38 [0.015]                    |
| 1     | 25.4 [1.000]                 | 7.1 [0.230]                     | 0.38 [0.015]                    |
| 1-1/4 | 32.0 [1.260]                 | 8.8 [0.347]                     | 0.38 [0.015]                    |

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

### Ordering Information

|                         |                                                                                                                                         |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Color                   | Standard      Clear (-X)                                                                                                                |
| Size selection          | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |
| Standard packaging      | In 1.2-meter [4-foot] lengths.                                                                                                          |
| Ordering description*** | Specify product name, size and color (for example, TFE 22-X).                                                                           |

\*\*\*Europe only. For supply to MIL spec., Def Stan and BS add -MS, -DS or -BS to ordering description.

## Tubing Kits and Mini-Spools

### Smaller Packaging Options for Single Wall and Adhesive-Lined Tubing Products

#### Product Facts

- VERSAFIT and RNF-100 tubing: 2:1 shrink ratio
- DWP-125: 3:1 shrink ratio
- ES1000: 4:1 shrink ratio
- VERSAFIT tubing's low full recovery temperature reduces installation time and the risk of damage to temperature-sensitive components
- RNF-100 offers excellent physical, chemical, and electrical properties that meet or exceed commercial, industrial and military standards for highly reliable, general purpose tubing
- DWP-125 and ES1000 have high-shrink-ratios to allow for insulation and sealing of irregular shapes; few sizes cover a wide range of diameters
- RoHS compliant



#### Applications

Single wall VERSAFIT and RNF-100 tubing provide electrical insulation and strain relief of in-line components, electrical connections, wire terminations, and splices. They can be used to bundle wires for flexible light duty harnesses. Also to identify or color code wires, cables, terminals and electronic components.

Adhesive-lined DWP-125 and ES1000 environmentally seal and protect a wide variety of electrical applications,

including wire splices, terminations, breakouts and connector-to-cable transitions.

#### Installation

Minimum full recovery temperature:

VERSAFIT: 90°C [194°F]

RNF-100: 121°C [250°F]

DWP-125: 125°C [257°F]

ES1000: 135°C [275°F]

#### Operating Temperature Range

VERSAFIT and RNF-100:  
-55°C to 135°C  
[-67°F to 275°F]

DWP-125:  
-40°C to 110°C  
[-40°F to 230°F]

ES1000:  
-40°C to 130°C  
[-40°F to 266°F]

#### Specifications/Approvals

| Series   | UL  | CSA  | Raychem     |
|----------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------|
| VERSAFIT | E35586 VW-1<br>600 V, 125°C                                                            | LR31929 VW-1<br>600 V, 125°C                                                              | RW-3009     |
| RNF-100  | E35586<br>600 V, 125°C                                                                 | LR31929<br>600 V, 125°C                                                                   | RT-350      |
| DWP-125  | E35586<br>600 V, 125°C                                                                 | —                                                                                         | DWP-125 SCD |
| ES1000   | E85381<br>600 V, 125°C                                                                 | —                                                                                         | RT-1113     |

Available in:

Americas

Europe

Asia Pacific

## Tubing Kits and Mini-Spools (Continued)

### Single Wall Tubing

**KIT 1 – 2 to 1 Shrink Ratio • Black • 600V, 125°C, UL/CSA VW-1 (KIT 1 PN: A55251-000)**

| Expanded I.D.  | Quantity (6 Inch Pieces) | Fits Wire Gauge Size | Refill Part Number |
|----------------|--------------------------|----------------------|--------------------|
| VERSAFIT-3/16" | 30                       | 18 – 14 AWG          | D76139-000         |
| VERSAFIT-1/4"  | 28                       | 12 – 10 AWG          | F37063-000         |
| VERSAFIT-3/8"  | 24                       | 8 AWG                | D27573-000         |
| VERSAFIT-1/2"  | 20                       | 6 – 3 AWG            | C02462-000         |
| VERSAFIT-3/4"  | 14                       | 2 – 1/0 AWG          | A92664-000         |
| VERSAFIT-1"    | 10                       | 2/0 – 4/0 AWG        | C21270-000         |

**KIT 2 – 2 to 1 Shrink Ratio • 7 Colors\*\* • 600V, 125°C, UL/CSA VW-1 (except clear) (KIT 2 PN: D54859-000)**

| Expanded I.D.  | Quantity (6 Inch Pieces) | Fits Wire Gauge Size | Refill Part Number |
|----------------|--------------------------|----------------------|--------------------|
| VERSAFIT-3/32" | 35                       | 18 AWG               | E31091-000         |
| VERSAFIT-1/8"  | 28                       | 16 AWG               | 349256-000         |
| VERSAFIT-3/16" | 21                       | 14 AWG               | C53800-000         |
| VERSAFIT-1/4"  | 21                       | 12 – 10 AWG          | C87605-000         |
| VERSAFIT-3/8"  | 14                       | 8 AWG                | A82691-000         |
| VERSAFIT-1/2"  | 14                       | 6 – 3 AWG            | E10896-000         |

\*\*Clear tubing in Kit 2 and Kit 2 Refills is RNF-100.

### Adhesive-Lined Tubing

**KIT 3 – Black/White/Red/Clear • 600V, 125°C, UL (KIT 3 PN: E42160-000)**

| Expanded I.D. | Quantity (6 Inch Pieces) | Fits Wire Gauge Size                | Refill Part Number |
|---------------|--------------------------|-------------------------------------|--------------------|
| DWP-125-1/8"  | 25                       | 20 – 16 AWG (3 to 1 Shrink Ratio)   | D14889-000         |
| DWP-125-3/16" | 25                       | 14 – 10 AWG (3 to 1 Shrink Ratio)   | E87367-000         |
| DWP-125-1/4"  | 24                       | 12 – 10 AWG (3 to 1 Shrink Ratio)   | F91864-000         |
| DWP-125-1/2"  | 10                       | 6 – 3 AWG (3 to 1 Shrink Ratio)     | F41454-000         |
| DWP-125-3/4"  | 5                        | 2 – 1/0 AWG (3 to 1 Shrink Ratio)   | C67617-000         |
| DWP-125-1"    | 3                        | 2/0 – 4/0 AWG (3 to 1 Shrink Ratio) | F66623-000         |
| ES1000-NO.1   | 6                        | 16 – 12 AWG (4 to 1 Shrink Ratio)   |                    |
| ES1000-NO.2   | 5                        | 12 – 10 AWG (4 to 1 Shrink Ratio)   |                    |
| ES1000-NO.3   | 5                        | 10 – 8 AWG (4 to 1 Shrink Ratio)    |                    |
| ES1000-NO.4   | 3                        | 6 – 3 AWG (4 to 1 Shrink Ratio)     |                    |

KITS 1, 2 and 3 are comprised of a durable six section plastic box with hinged lid. Inside the lid are product selection guidelines. Ask your Sales Representative about KIT 4 and KIT 6, our Economy Tubing Kits in a reclosable plastic bag, also used on "point of sale" racks. Here are Part Numbers for those Kits and their content:

KIT 4: E32151-000 (Three pieces each of 3/16", 1/4", 3/8", 1/2", 3/4" and 1" Black tubing in 6 inch pieces)  
KIT 6: C72402-000 (Three pieces each of 3/64", 1/16", 3/32" and 1/8" Black tubing in 6 inch pieces)

### VERSAFIT MINI-SPOOLS

**2 to 1 Shrink Ratio • Black • 600V, 125°C, UL/CSA VW-1**

| Expanded I.D.  | Quantity (Feet) | Part Number |
|----------------|-----------------|-------------|
| VERSAFIT-3/64" | 100             | C16404-000  |
| VERSAFIT-1/16" | 75              | E40870-000  |
| VERSAFIT-3/32" | 65              | D70981-000  |
| VERSAFIT-1/8"  | 60              | C17600-000  |
| VERSAFIT-3/16" | 50              | F27135-000  |
| VERSAFIT-1/4"  | 40              | F64479-000  |
| VERSAFIT-3/8"  | 35              | D57591-000  |
| VERSAFIT-1/2"  | 30              | E37316-000  |
| VERSAFIT-3/4"  | 25              | 449582-000  |
| VERSAFIT-1"    | 15              | F27156-000  |

VERSAFIT is a very flexible, highly flame-retardant polyolefin tubing, 90°C full recovery temperature, good fluid resistance with a UL 224/CSA VW-1 flammability rating.

### RNF-100 MINI-SPOOLS

**2 to 1 Shrink Ratio • Black • 600V, 125°C, UL/CSA**

| Expanded I.D. | Quantity (Feet) | Part Number |
|---------------|-----------------|-------------|
| RNF-100-3/64" | 100             | D00409-000  |
| RNF-100-1/16" | 75              | A66551-000  |
| RNF-100-3/32" | 65              | D42391-000  |
| RNF-100-1/8"  | 60              | F56629-000  |
| RNF-100-3/16" | 50              | E77288-000  |
| RNF-100-1/4"  | 40              | F75818-000  |
| RNF-100-3/8"  | 35              | D12330-000  |
| RNF-100-1/2"  | 30              | A81736-000  |
| RNF-100-3/4"  | 25              | E40866-000  |
| RNF-100-1"    | 15              | E62131-000  |

RNF-100 is a flexible, flame-retardant polyolefin tubing, 121°C full recovery temperature, excellent fluid resistance with a UL 224/CSA All Tubing flammability rating.

## TUGA-GP

### Shiny, Non-Flame-Retardant, Polyolefin Tubing

#### Product Facts

- 2:1 shrink ratio
- Can be easily hot-stamped
- Bright, shiny surface
- Semiflexible, non-flame-retardant, halogen-free
- Conforms to substrates more uniformly and with less longitudinal change than most PVC-based materials
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

TUGA-GP is a commercial grade tubing for general applications where a flame-retardant product is not needed but where electrical insulation and mechanical performance are important. TUGA-GP makes an attractive covering for many automotive, appliance, and consumer-goods applications.

#### Installation

Minimum shrink temperature: 85°C [85°F]  
Minimum full recovery temperature: 110°C [230°F]

#### Operating Temperature Range

-55°C to 125°C  
[-67°F to 257°F]

#### Specifications/Approvals

| Series  | Raychem |
|---------|---------|
| TUGA-GP | RW-2201 |

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               |          |        |              |

**TUGA-GP** (Continued)

**Product Dimensions**

| Size      | Inside Diameter              |                                 | Wall Thickness*       |
|-----------|------------------------------|---------------------------------|-----------------------|
|           | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal After Heating |
| 1.2/0.6   | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.4 [0.016]           |
| 1.6/0.8   | 1.6 [0.062]                  | 0.8 [0.031]                     | 0.4 [0.016]           |
| 2.4/1.2   | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.5 [0.019]           |
| 3/1.5     | 3.0 [0.118]                  | 1.5 [0.059]                     | 0.5 [0.019]           |
| 5/2.5     | 5.0 [0.197]                  | 2.5 [0.098]                     | 0.5 [0.019]           |
| 6.4/32    | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.6 [0.024]           |
| 8/4       | 8.0 [0.315]                  | 4.0 [0.157]                     | 0.6 [0.024]           |
| 9.5/4.8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.6 [0.024]           |
| 11/5.5    | 11.0 [0.433]                 | 5.5 [0.217]                     | 0.6 [0.024]           |
| 12.7/6.4  | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.6 [0.024]           |
| 15/7.5    | 15.0 [0.591]                 | 7.5 [0.295]                     | 0.8 [0.031]           |
| 20/10     | 20.0 [0.787]                 | 10.0 [0.394]                    | 0.8 [0.031]           |
| 25.4/12.7 | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.9 [0.035]           |
| 38/19     | 38.0 [1.496]                 | 19.0 [0.748]                    | 1.0 [0.039]           |

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

**Ordering Information**

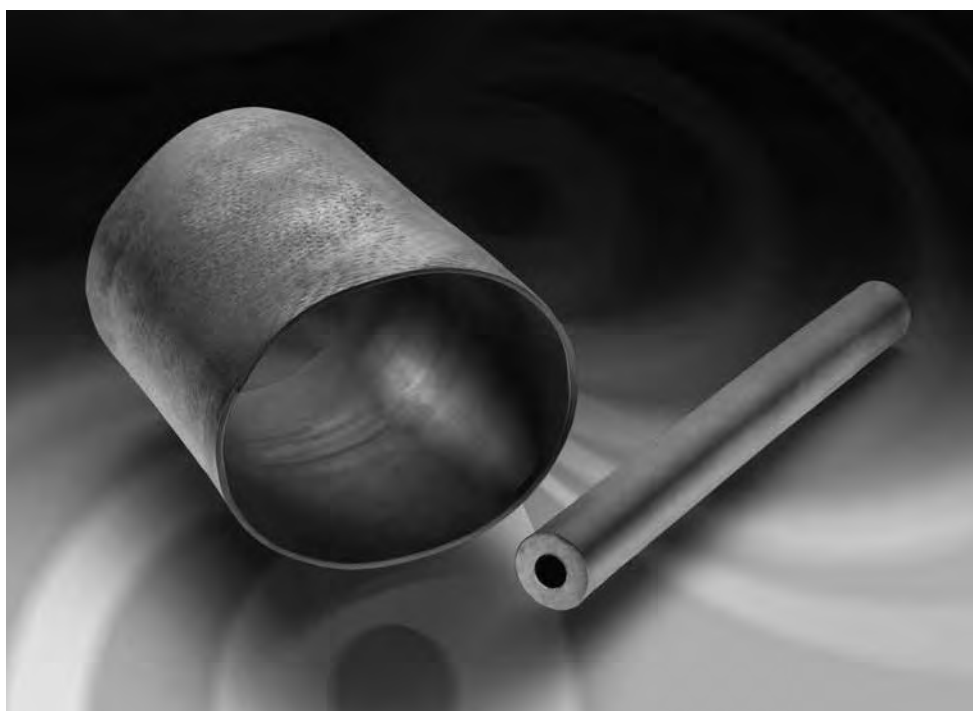
|                      |                                                                                                                                     |            |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                            | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes available upon request. |            |
| Standard packaging   | On spools.                                                                                                                          |            |
| Ordering description | Specify product name, size and color (for example, TUGA 3/1.5-0).                                                                   |            |

## URHT

### Ultra-High-Ratio, Flame-Retardant, Polyolefin Heat-Shrinkable Tubing

#### Product Facts

- Shrink ratios as high as 8:1
- Specially formulated for thick wall insulation, strain relief and abrasion protection
- Flame-retardant passing ASTM D 635
- Excellent performance in both hot and cold environments
- Optional factory applied adhesive provides watertight environmental sealing in wet and corrosive locations
- RoHS compliant



#### Applications

Ultra-high-shrink-ratio, heat-shrinkable tubing, with expansion ratios as high as 8-to-1, is designed to conform to odd shapes and shrink over large transitions, allowing for the repair and sealing of cable connectors and equipment. Cable harnesses can be repaired and released without disassembly. This product can be used to seal the back end of a connector or simply

repair a damaged outer insulation of a cable or wire.

URHT tubing is available with or without a hot melt adhesive lining.

#### Installation

Minimum shrink temperature: 135°C [275°F]

Minimum full recovery temperature: 150°C [302°F]

#### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

#### Specifications/Approvals

| Series | Military                | Raychem  |
|--------|-------------------------|----------|
| URHT   | SAE-AS81765/1, Type II* | URHT SCD |

\*heat-shrinkable, crosslinked, flexible polyolefin

Available in: Americas Europe Asia Pacific

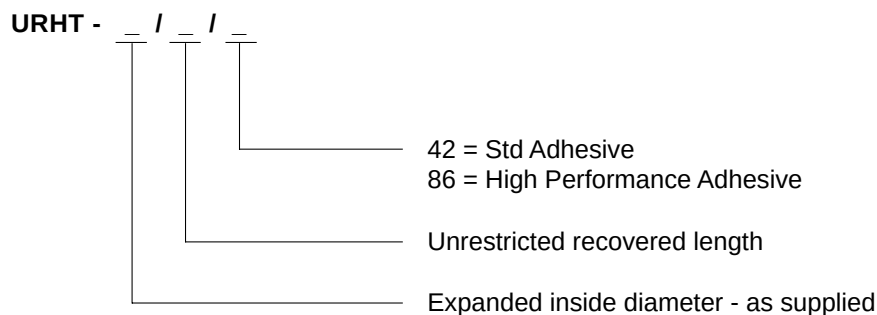
**URHT** (Continued)

**Product Dimensions**

| Size     | Inside Diameter              |                                 | Wall Thickness                  |                                                      |
|----------|------------------------------|---------------------------------|---------------------------------|------------------------------------------------------|
|          | Minimum Expanded as Supplied | Maximum Recovered After Heating | Nominal Recovered After Heating | Unrestricted Full Recovered Length $\pm 6.35 (.250)$ |
| URHT-200 | 50.80 (2.000)                | 5.84 (0.230)                    | 3.56 (0.140)                    | 7.62, 101.60, 152.40, 254.00 (3, 4, 6, 10)           |
| URHT-300 | 76.20 (3.000)                | 8.64 (0.340)                    | 3.56 (0.140)                    | 7.62, 101.60, 152.40, 254.00 (3, 4, 6, 10)           |

**Ordering Information**

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | In pieces.                                                                              |            |
| Ordering description | Specify product name, size, cut length and color (for example, URHT-200-10-0).          |            |

**Part Numbering System**




## Versafit

**Highly Flame-Retardant,  
Very Flexible, Low-Shrink-  
Temperature, Polyolefin  
Tubing**

### Product Facts

- 2:1 shrink ratio
- Low shrink temperature reduces installation time and the risk of damage to temperature-sensitive components
- Very flexible; doesn't easily wrinkle when bent
- Highly flame-retardant
- Hot stamps extremely well
- Higher temperature rating, better thermal stability, and higher resistance to physical abuse than noncrosslinked materials
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs), which are classified as environmentally hazardous substances
- RoHS compliant



### Applications

Cost-effective choice for many commercial and military applications; electrically insulates and protects in-line components, disconnect terminals, and splices. Bundles wires for very flexible light-duty harnesses. Strain-relieves electrical wire connections for commercial applications. Identifies or color-codes wires, cables, terminals, and components.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series   | UL  | CSA  | Military                          | Raychem |
|----------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------|---------|
| Versafit | E35586 VW-1<br>600 V, 125°C                                                            | LR31929 VW-1<br>600 V, 125°C                                                            | AMS-DTL-23053/5*<br>Classes 1 & 3 | RW-3009 |

\*Formerly MIL-I-23053/5 and MIL-DTL-23053/5.

Available in:

Americas

Europe

Asia Pacific



## Versafit (Continued)

### Product Dimensions

| Size     | Inside Diameter              |                                 | Recovered Wall Thickness**  |
|----------|------------------------------|---------------------------------|-----------------------------|
|          | Expanded as Supplied         | Maximum Recovered After Heating | After Heating               |
| 3/64     | 1.63 ± 0.2 [0.064 ± 0.008]   | 0.6 [0.023]                     | 0.40 ± 0.08 [0.016 ± 0.003] |
| 1/16     | 1.85 ± 0.2 [0.073 ± 0.008]   | 0.8 [0.031]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 3/32     | 2.79 ± 0.2 [0.110 ± 0.008]   | 1.2 [0.046]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/8      | 3.43 ± 0.2 [0.135 ± 0.008]   | 1.6 [0.062]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 3/16     | 5.21 ± 0.3 [0.205 ± 0.010]   | 2.4 [0.093]                     | 0.51 ± 0.08 [0.020 ± 0.003] |
| 1/4      | 7.11 ± 0.3 [0.280 ± 0.010]   | 3.2 [0.125]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 3/8      | 10.16 ± 0.4 [0.400 ± 0.015]  | 4.8 [0.187]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 1/2      | 13.72 ± 0.4 [0.540 ± 0.015]  | 6.4 [0.250]                     | 0.64 ± 0.08 [0.025 ± 0.003] |
| 5/8***   | 16.90 ± 0.4 [0.665 ± 0.015]  | 8.0 [0.315]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 3/4      | 20.45 ± 0.4 [0.805 ± 0.015]  | 9.5 [0.375]                     | 0.76 ± 0.08 [0.030 ± 0.003] |
| 1        | 26.80 ± 0.4 [1.055 ± 0.015]  | 12.7 [0.500]                    | 0.89 ± 0.12 [0.035 ± 0.005] |
| 1 1/4*** | 33.40 ± 0.7 [1.315 ± 0.025]  | 15.9 [0.625]                    | 1.02 ± 0.15 [0.040 ± 0.006] |
| 1 1/2    | 39.88 ± 0.8 [1.570 ± 0.030]  | 19.1 [0.750]                    | 1.02 ± 0.15 [0.040 ± 0.006] |
| 2        | 52.83 ± 1.0 [2.080 ± 0.040]  | 25.4 [1.000]                    | 1.14 ± 0.16 [0.045 ± 0.007] |
| 3        | 78.49 ± 1.0 [3.090 ± 0.040]  | 38.1 [1.500]                    | 1.27 ± 0.20 [0.050 ± 0.008] |
| 4        | 104.14 ± 1.3 [4.100 ± 0.050] | 50.8 [2.000]                    | 1.40 ± 0.23 [0.055 ± 0.009] |

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

\*\*\*Nonstandard size; available by special order only.

### Ordering Information

|                           |                                                                                                                                         |                                                             |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Color                     | Standard                                                                                                                                | Black (-0), white (-9), red (-2), blue (-6), yellow (-4)    |
|                           | Nonstandard                                                                                                                             | Brown (-1), orange (-3), green (-5), violet (-7), gray (-8) |
| Size selection            | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                             |
| Standard packaging****    | On spools.                                                                                                                              |                                                             |
| Ordering description***** | Specify product name, size and color (for example, Versafit 1/4-0).                                                                     |                                                             |

\*\*\*\*Available in the convenient Mini-Spool packaging/dispensing system, for sizes 3/64" up to 1" (black only).

\*\*\*\*\*Europe only. For supply to MIL, Def Stan and BS add -MS, -DS or -BS to ordering description.

## Versafit-3X

**Very Flexible, High-Shrink-Ratio, Highly Flame-Retardant, Low-Shrink-Temperature, Polyolefin Tubing**

### Product Facts

- Highly flame-retardant
- 3:1 shrink ratio easily accommodates irregular shapes; few sizes cover a wide range of diameters
- Low shrink temperature reduces installation time and the risk of damage to temperature-sensitive components
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs) which are classified as environmentally hazardous substances
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Provides electrical insulation and strain relief of in-line components, electrical connections, wire terminations, and splices. Bundles wires for flexible light duty harnesses. Identifies or color codes wires, cables, terminals and electrical and electronic components.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-55°C to 135°C  
[-67°F to 275°F]

### Specifications/Approvals

| Series      | UL  | CSA  | Raychem |
|-------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| Versafit-3X | E35586 VW-1<br>600 V, 125°C                                                            | LR31929 VW-1<br>600 V, 125°C                                                             | RW-3009 |

Available in:

Americas

Europe

Asia Pacific

## Versafit-3X (Continued)

### Product Dimensions

| Size | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|------|------------------------------|---------------------------------|-----------------------------|
|      | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8  | 3.2 (0.125)                  | 1.1 (0.042)                     | 0.58 ± 0.08 (0.023 ± 0.003) |
| 1/4  | 6.4 (0.250)                  | 2.2 (0.083)                     | 0.58 ± 0.08 (0.023 ± 0.003) |
| 3/8  | 9.5 (0.375)                  | 3.2 (0.125)                     | 0.61 ± 0.08 (0.024 ± 0.003) |
| 1/2  | 12.7 (0.500)                 | 4.3 (0.166)                     | 0.61 ± 0.08 (0.024 ± 0.003) |
| 3/4  | 19.1 (0.750)                 | 6.4 (0.250)                     | 0.61 ± 0.08 (0.024 ± 0.003) |
| 1    | 25.4 (1.000)                 | 8.5 (0.333)                     | 0.64 ± 0.08 (0.025 ± 0.003) |

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

### Ordering Information

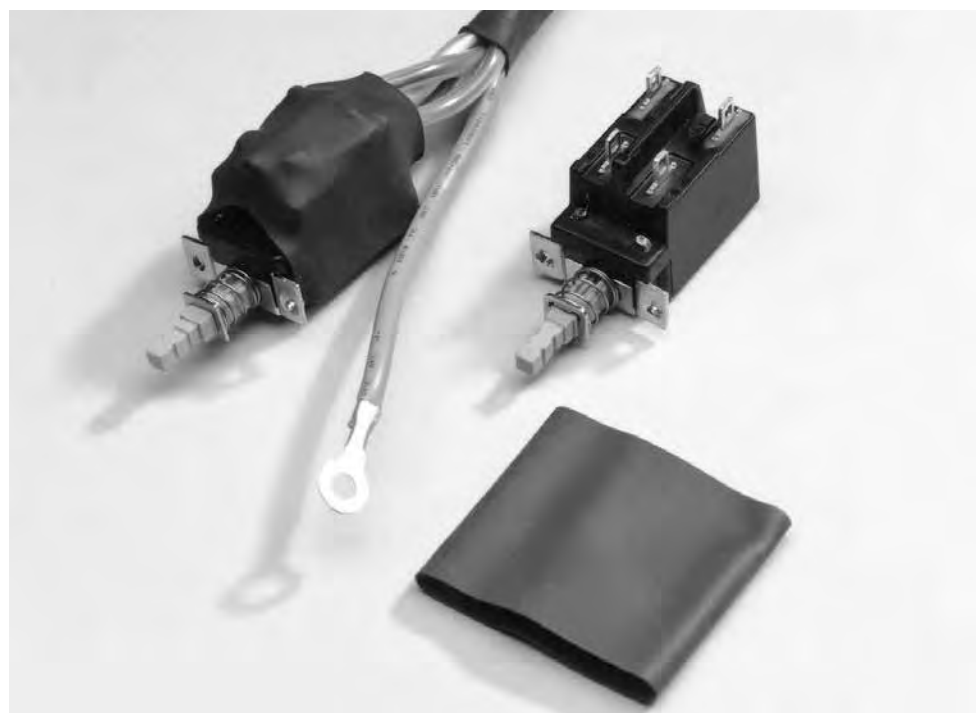
|                      |                                                                                         |                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Color                | Standard                                                                                | Black (-0)                                                                                                |
|                      | Nonstandard                                                                             | White (-9), red (-2), blue (-6), yellow (-4), green (-5), brown (-1), orange (-3), violet (-7), gray (-8) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |                                                                                                           |
| Standard packaging   | On spools.                                                                              |                                                                                                           |
| Ordering description | Specify product name, size and color (for example, Versafit-3X-1/4-0).                  |                                                                                                           |

## Versafit V2

**Highly Flame-Retardant,  
Very Flexible, Low-Shrink-  
Temperature, Polyolefin  
Tubing**

### Product Facts

- 2:1 shrink ratio
- Low shrink temperature reduces installation time and the risk of damage to temperature-sensitive components
- Very flexible; doesn't easily wrinkle when bent
- Highly flame-retardant
- Hot stamps extremely well
- Higher temperature rating, better thermal stability, and higher resistance to physical abuse than noncrosslinked materials
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs), which are classified as environmentally hazardous substances
- RoHS compliant



### Applications

Cost-effective choice for many commercial applications; electrically insulates and protects in-line components, disconnect terminals, and splices. Bundles wires for very flexible light-duty harnesses. Strain-relieves electrical wire connections. Identifies or color-codes wires, cables, terminals, and components.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-30°C to 125°C  
[-22°F to 257°F]

### Specifications/Approvals

| Series      | UL  | CSA  | Raychem |
|-------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| Versafit V2 | E35586 VW-1<br>600 V, 125°C                                                            | LR31929 VW-1<br>600 V, 125°C                                                             | RW-3023 |

Available in:

Americas

Europe

Asia Pacific

## Versafit V2 (Continued)

### Product Dimensions

| Size | Inside Diameter            |                                 | Wall Thickness                 |                                    |
|------|----------------------------|---------------------------------|--------------------------------|------------------------------------|
|      | Expanded as Supplied       | Maximum Recovered After Heating | Expanded as Supplied (Nominal) | Recovered* After Heating (Minimum) |
| 1.0  | 1.5 ± 0.2 [0.059 ± 0.008]  | 0.50 [0.020]                    | 0.20 [0.008]                   | 0.33 [0.013]                       |
| 1.5  | 2.1 ± 0.2 [0.083 ± 0.008]  | 0.75 [0.030]                    | 0.20 [0.008]                   | 0.35 [0.014]                       |
| 2.0  | 2.6 ± 0.2 [0.102 ± 0.008]  | 1.00 [0.039]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 2.5  | 3.1 ± 0.2 [0.122 ± 0.008]  | 1.25 [0.049]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 3.0  | 3.6 ± 0.2 [0.142 ± 0.008]  | 1.50 [0.059]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 3.5  | 4.1 ± 0.3 [0.161 ± 0.012]  | 1.75 [0.069]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 4.0  | 4.6 ± 0.3 [0.181 ± 0.012]  | 2.00 [0.079]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 5.0  | 5.6 ± 0.3 [0.221 ± 0.012]  | 2.50 [0.098]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 6.0  | 6.6 ± 0.3 [0.260 ± 0.012]  | 3.00 [0.118]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 7.0  | 7.6 ± 0.3 [0.299 ± 0.012]  | 3.50 [0.138]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 8.0  | 8.6 ± 0.3 [0.339 ± 0.012]  | 4.00 [0.158]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 9.0  | 9.6 ± 0.3 [0.378 ± 0.012]  | 4.50 [0.177]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 10.0 | 10.4 ± 0.3 [0.409 ± 0.012] | 5.00 [0.197]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 11.0 | 11.4 ± 0.3 [0.449 ± 0.012] | 5.50 [0.217]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 12.0 | 12.7 ± 0.3 [0.500 ± 0.012] | 6.00 [0.236]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 13.0 | 13.5 ± 0.3 [0.532 ± 0.012] | 6.50 [0.256]                    | 0.35 [0.014]                   | 0.66 [0.026]                       |
| 14.0 | 14.4 ± 0.4 [0.567 ± 0.016] | 7.00 [0.276]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 15.0 | 15.7 ± 0.4 [0.618 ± 0.016] | 7.50 [0.295]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 16.0 | 16.9 ± 0.4 [0.665 ± 0.016] | 8.00 [0.315]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 18.0 | 19.0 ± 0.4 [0.748 ± 0.016] | 9.00 [0.354]                    | 0.40 [0.016]                   | 0.76 [0.030]                       |
| 20.0 | 21.4 ± 0.4 [0.843 ± 0.016] | 10.00 [0.394]                   | 0.40 [0.016]                   | 0.76 [0.030]                       |
| 22.0 | 23.2 ± 0.4 [0.913 ± 0.016] | 11.00 [0.433]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 25.0 | 26.8 ± 0.4 [1.055 ± 0.016] | 12.50 [0.492]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 27.0 | 28.2 ± 0.5 [1.110 ± 0.020] | 12.50 [0.492]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 28.0 | 30.0 ± 0.5 [1.181 ± 0.020] | 14.00 [0.551]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 30.0 | 32.1 ± 0.5 [1.264 ± 0.020] | 15.00 [0.591]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |

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

### Ordering Information

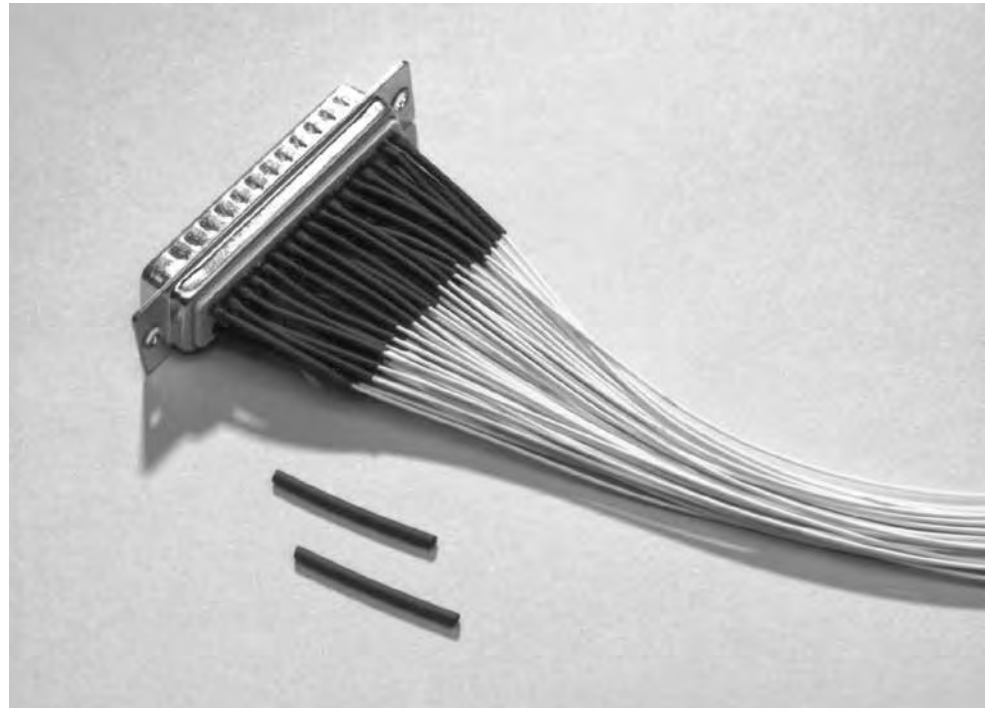
|                      |                                                                                                                                         |                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0)                                                                                                |
|                      | Nonstandard                                                                                                                             | White (-9), red (-2), blue (-6), yellow (-4), green (-5), orange (-3), violet (-7), brown (-1), gray (-8) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                                                                                           |
| Standard packaging   | On spools.                                                                                                                              |                                                                                                           |
| Ordering description | Specify product name, size and color (for example, V2-3.0-0).                                                                           |                                                                                                           |

## Versafit V4

**Very-Thin-Wall, Very Flexible, Highly Flame-Retardant, Polyolefin Tubing**

### Product Facts

- 2:1 shrink ratio
- Very thin wall provides space savings and rapid shrinking
- Low shrink temperature further reduces installation time and risk of damage to temperature-sensitive components
- Very flexible; doesn't easily wrinkle when bent
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs), which are classified as environmentally hazardous substances
- RoHS compliant



### Applications

Typically used where space saving is important. Offers the ability to pack components more closely than is possible with standard tubings. Cost-effective choice for many commercial applications; electrically insulates and protects in-line components, disconnect terminals, and splices. Used for strain relief on high-density connectors.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-30°C to 125°C  
[-22°F to 257°F]

### Specifications/Approvals

| Series      | UL  | CSA  | Raychem |
|-------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| Versafit V4 | E85381 VW-1<br>300 V, 125°C                                                            | LR31929 VW-1<br>150 V, 125°C                                                             | RW-3023 |

Available in:

Americas

Europe

Asia Pacific

## Versafit V4 (Continued)

### Product Dimensions

| Size | Inside Diameter              |                                 | Wall Thickness                 |                                    |
|------|------------------------------|---------------------------------|--------------------------------|------------------------------------|
|      | Expanded as Supplied         | Maximum Recovered After Heating | Expanded as Supplied (Nominal) | Recovered* After Heating (Minimum) |
| 0.6  | 0.95 ± 0.25 [0.037 ± 0.010]  | 0.30 [0.012]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 0.8  | 1.20 ± 0.25 [0.047 ± 0.010]  | 0.40 [0.016]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 1.0  | 1.40 ± 0.25 [0.055 ± 0.010]  | 0.50 [0.020]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 1.5  | 1.90 ± 0.25 [0.075 ± 0.010]  | 0.75 [0.030]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 2.0  | 2.30 ± 0.25 [0.091 ± 0.010]  | 1.00 [0.039]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 2.5  | 2.80 ± 0.25 [0.110 ± 0.010]  | 1.25 [0.049]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 3.0  | 3.30 ± 0.25 [0.130 ± 0.010]  | 1.50 [0.059]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 3.5  | 3.80 ± 0.25 [0.150 ± 0.010]  | 1.75 [0.069]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 4.0  | 4.40 ± 0.25 [0.173 ± 0.010]  | 2.00 [0.079]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 5.0  | 5.50 ± 0.25 [0.217 ± 0.010]  | 2.50 [0.098]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 6.0  | 6.50 ± 0.40 [0.256 ± 0.016]  | 3.00 [0.118]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 7.0  | 7.50 ± 0.40 [0.295 ± 0.016]  | 3.50 [0.138]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 8.0  | 8.50 ± 0.40 [0.335 ± 0.016]  | 4.00 [0.158]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 9.0  | 9.50 ± 0.40 [0.374 ± 0.016]  | 4.50 [0.177]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 10.0 | 10.50 ± 0.50 [0.413 ± 0.020] | 5.00 [0.197]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |

| Inch Size | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|-----------|------------------------------|---------------------------------|-----------------------------|
|           | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/64      | 1.2 [0.046]                  | 0.6 [0.023]                     | 0.30 ± 0.05 [0.012 ± 0.002] |
| 1/16      | 1.6 [0.062]                  | 0.8 [0.031]                     | 0.30 ± 0.05 [0.012 ± 0.002] |
| 3/32      | 2.4 [0.093]                  | 1.2 [0.046]                     | 0.30 ± 0.05 [0.012 ± 0.002] |
| 1/8       | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.33 ± 0.05 [0.013 ± 0.002] |
| 3/16      | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.33 ± 0.05 [0.013 ± 0.002] |
| 1/4       | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.36 ± 0.08 [0.014 ± 0.003] |
| 3/8       | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.36 ± 0.08 [0.014 ± 0.003] |
| 1/2       | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.36 ± 0.08 [0.014 ± 0.003] |
| 3/4       | 19.1 [0.750]                 | 9.5 [0.375]                     | 0.43 ± 0.08 [0.017 ± 0.003] |
| 1         | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.51 ± 0.08 [0.020 ± 0.003] |

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

### Ordering Information

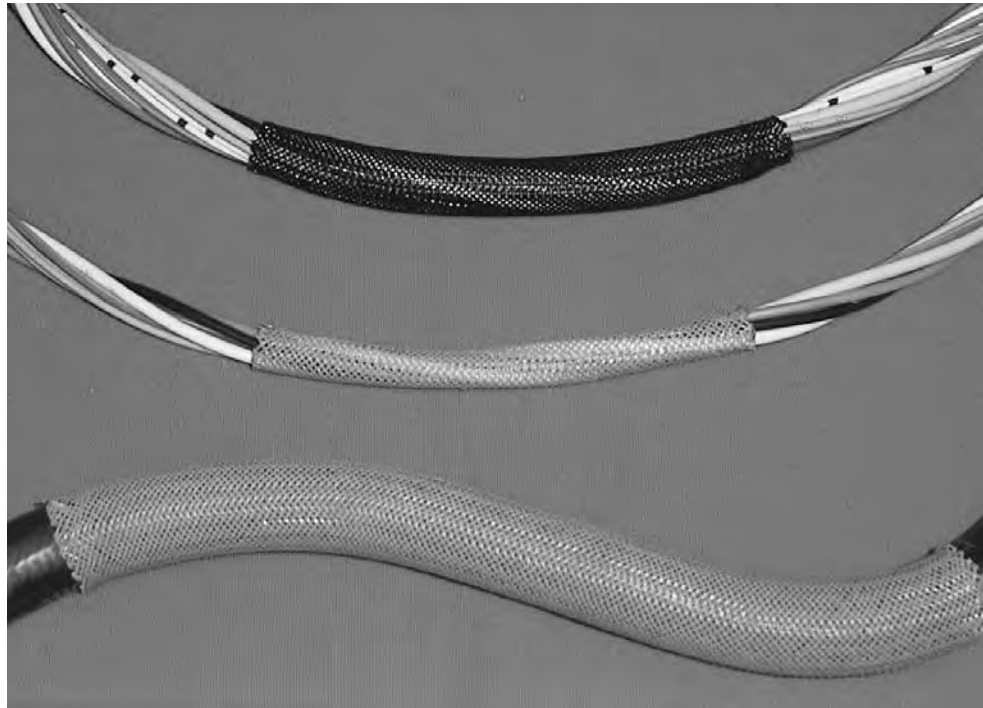
|                      |                                                                                                                                         |                                      |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Color                | Standard                                                                                                                                | Black (-0)                           |
|                      | Nonstandard                                                                                                                             | Other colors available upon request. |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |                                      |
| Standard packaging   | On spools.                                                                                                                              |                                      |
| Marking              | Marked with UL/CSA/-F- legends (metric sizes) or unmarked (inch sizes).                                                                 |                                      |
| Ordering description | Specify product name, size (mm or in.) and color (for example, V4-1.0-0).                                                               |                                      |

## Versaflex

### Expandable, Braided, Polyester Sleevings

#### Product Facts

- Excellent abrasion and cut-through resistance
- Lightweight
- Flexible (even at low temperatures)
- Fungus proof
- Not affected by most chemical and solvents, non-hygroscopic
- Wide range of sizes available
- RoHS compliant



#### Applications

Versaflex sleeving is suited for the mechanical protection of wire harnesses, hoses, and all other applications where exceptional flexibility combined with superior abrasion/cut resistance is required. It also serves as an economical means for wire

bundling that will not trap heat or moisture; expanding easily to fit over irregular shapes, then contracting to conform and grip. To prevent fraying, these products should be cut to length using a hot knife.

#### Installation

This product is cold applied.

#### Operating Temperature Range

-50°C to 150°C  
[-58°F to 302°F]  
(220°C [-58°F to 302°F] for short periods)

#### Specifications/Approvals

| Series       | Raychem |
|--------------|---------|
| Versaflex-FR |         |
| Versaflex    | RK-6772 |

Available in: Americas Europe Asia Pacific



## Versaflex (Continued)

### Product Dimensions

| Versaflex (metric) |            |            |
|--------------------|------------|------------|
| Nominal Size       | Size Range |            |
|                    | Minimum    | Maximum    |
| 3 (0.118)          | 1 (0.039)  | 5 (0.197)  |
| 4 (0.158)          | 2 (0.079)  | 7 (0.276)  |
| 5 (0.197)          | 3 (0.118)  | 9 (0.354)  |
| 6 (0.236)          | 4 (0.158)  | 12 (0.472) |
| 8 (0.315)          | 5 (0.197)  | 12 (0.472) |
| 10 (0.394)         | 7 (0.276)  | 15 (0.591) |
| 12 (0.472)         | 8 (0.315)  | 17 (0.669) |
| 15 (0.591)         | 10 (0.394) | 20 (0.787) |
| 20 (0.787)         | 14 (0.551) | 26 (1.024) |
| 25 (0.984)         | 18 (0.709) | 34 (1.339) |
| 30 (1.181)         | 20 (0.787) | 40 (1.575) |
| 40 (1.575)         | 30 (1.181) | 50 (1.969) |
| 50 (1.969)         | 40 (1.575) | 60 (2.362) |

| Versaflex (Imperial) |              |                           |
|----------------------|--------------|---------------------------|
| Size                 | Nominal Size | Size Range                |
| 1/8                  | 3 (0.118)    | 2.4 – 6.4 (0.094 – 0.252) |
| 1/4                  | 6 (0.236)    | 3.2 – 9.5 (0.125 – 0.375) |
| 3/8                  | 10 (0.394)   | 4.7 – 16 (0.185 – 0.630)  |
| 1/2                  | 13 (0.512)   | 6.4 – 19 (0.252 – 0.748)  |
| 3/4                  | 19 (0.748)   | 13 – 32 (0.512 – 1.260)   |
| 1-1/4                | 32 (1.256)   | 19 – 45 (0.748 – 1.772)   |
| 1-3/4                | 45 (1.772)   | 32 – 70 (1.260 – 2.756)   |
| 2                    | 51 (2.008)   | 38 – 76 (1.496 – 2.992)   |

| Versaflex-FR flame retardant, expandable polyester braid |              |                           |
|----------------------------------------------------------|--------------|---------------------------|
| Size                                                     | Nominal Size | Size Range                |
| 1/8                                                      | 3 (0.118)    | 2.4 – 6.4 (0.094 – 0.252) |
| 1/4                                                      | 6 (0.236)    | 3.2 – 9.5 (0.125 – 0.375) |
| 3/8                                                      | 10 (0.394)   | 4.7 – 16 (0.185 – 0.630)  |
| 1/2                                                      | 13 (0.512)   | 6.4 – 19 (0.252 – 0.748)  |
| 3/4                                                      | 19 (0.748)   | 13 – 32 (0.512 – 1.260)   |
| 1-1/4                                                    | 32 (1.256)   | 19 – 45 (0.748 – 1.772)   |
| 1-3/4                                                    | 45 (1.772)   | 32 – 70 (1.260 – 2.756)   |
| 2                                                        | 51 (2.008)   | 38 – 76 (1.496 – 2.992)   |

### Ordering Information

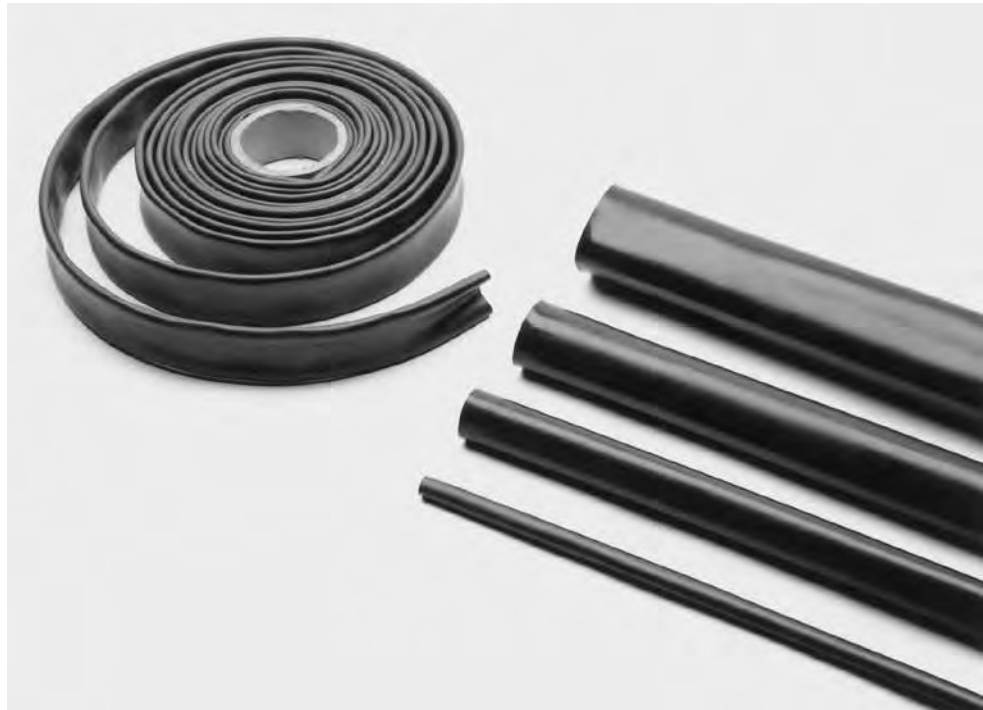
|                      |                                                                            |                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Color                | Standard                                                                   | Versaflex (metric) : Black (-0) Grey (-8)<br>Versaflex (imperial) : Black (-0)<br>Versaflex-FR : Black with a white X tracer (-09) |
| Standard packaging   | On spools.                                                                 |                                                                                                                                    |
| Ordering description | Specify product name, size and color (for example, VERSAFLEX-FR-1/4-09-SP) |                                                                                                                                    |

## XFFR

**Halogen-Free,  
Flame-Retardant,  
Heat-Shrinkable Tubing**

### Product Facts

- Emits minimal amounts of toxic or acid gasses during combustion
- Meets performance requirements of MIL-C-24640 and MIL-C-24643 cable jackets
- Resists moisture, fungus, and weathering
- Available in expansion ratios as high as 3:1
- XFFR has the following approvals:
  - ABS (American Bureau of Shipping)
  - Lloyd's (Lloyd's Register of Shipping)
- RoHS compliant



Heat-shrinkable Tubing

### Applications

XFFR halogen-free tubing can be used for re-jacketing and repairing halogen-free cables in any enclosed area where a flame-retardant, halogen-free environment is required. These environments include tunnels, buildings, mass transit vehicles, and ships. When installed with S-1305 tape, the tubing can also be used in applications requiring water sealing and protection from abrasion and corrosion.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 121°C [250°F]

### Operating Temperature Range

-55°C to 110°C  
[-67°F to 230°F]

### Specifications/Approvals

| Series | Military                   | Industry           | Raychem |
|--------|----------------------------|--------------------|---------|
| XFFR   | MIL-C-24640<br>MIL-C-24643 | NES 713<br>NES 711 | RW-2016 |

Available in:

Americas

Europe

Asia Pacific

## XFFR (Continued)

### Product Dimensions

| Size    | Inside Diameter              |                                 | Recovered Wall Thickness* |
|---------|------------------------------|---------------------------------|---------------------------|
|         | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating (Nominal)   |
| XFFR-03 | 7.62 [0.300]                 | 2.54 [0.100]                    | 2.03 [0.080]              |
| XFFR-04 | 10.16 [0.400]                | 3.81 [0.150]                    | 2.03 [0.080]              |
| XFFR-07 | 19.05 [0.750]                | 5.59 [0.220]                    | 2.03 [0.080]              |
| XFFR-11 | 27.94 [1.100]                | 9.52 [0.375]                    | 2.67 [0.105]              |
| XFFR-15 | 38.10 [1.500]                | 12.70 [0.500]                   | 3.05 [0.120]              |
| XFFR-20 | 50.80 [2.000]                | 19.05 [0.750]                   | 3.05 [0.120]              |
| XFFR-30 | 76.20 [3.000]                | 31.75 [1.250]                   | 4.06 [0.160]              |

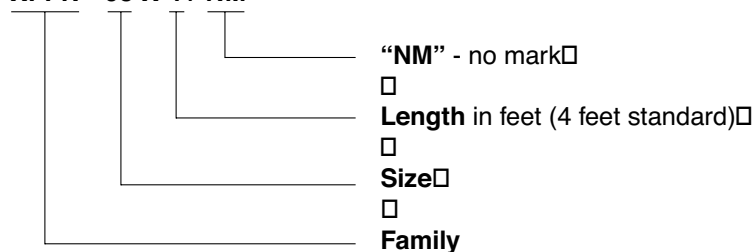
\*Wall thickness will be less if tubing recovery is restricted during shrinkage.

### Ordering Information

|                    |                                                                                         |            |
|--------------------|-----------------------------------------------------------------------------------------|------------|
| Color              | Standard                                                                                | Black (-0) |
| Size selection     | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging | 1.2-meter [4-foot] or 7.5-meter [25-foot] lengths.                                      |            |

### Part Numbering System

**XFFR - 03 X 4 / NM**



## ZH2

**Flexible, Highly Flame-Retardant, Low Recovery Temperature, ZEROHAL Polyolefin Tubing**

### Product Facts

- 2:1 shrink ratio
- Highly flame-retardant; UL/CSA VW-1 flammability rating
- Environmentally friendly tubing essentially free of halogens
- Emits minimal amounts of toxic or acid gasses when burned
- RoHS compliant



Heat-shrinkable Tubing

### Applications

Electrical insulation and strain relief of connections and terminations in computers, appliances, and other commercial electronic products. Jacketing and bundling of light duty harnesses in rail and mass transit vehicles, buildings, and other enclosed areas where emission of toxic gases from burning materials containing halogens is very undesirable.

### Installation

Minimum shrink temperature: 70°C [158°F]  
Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-30°C to 125°C  
[-22°F to 257°F]

### Specifications/Approvals

| Series | UL  | CSA  | Raychem |
|--------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| ZH2    | E35586 VW-1<br>600 V, 125°C                                                            | LR31929 VW-1<br>600 V, 125°C                                                             | RW-3036 |

Available in:

Americas

Europe

Asia Pacific

## ZH2 (Continued)

### Product Dimensions

| Size | Inside Diameter            |                                 | Wall Thickness                 |                                    |
|------|----------------------------|---------------------------------|--------------------------------|------------------------------------|
|      | Expanded as Supplied       | Maximum Recovered After Heating | Expanded as Supplied (Nominal) | Recovered* After Heating (Minimum) |
| 0.8  | 1.2 ± 0.2 [0.047 ± 0.008]  | 0.40 [0.016]                    | 0.20 [0.008]                   | 0.33 [0.013]                       |
| 1.0  | 1.5 ± 0.2 [0.059 ± 0.008]  | 0.50 [0.020]                    | 0.20 [0.008]                   | 0.33 [0.013]                       |
| 1.5  | 2.1 ± 0.2 [0.083 ± 0.008]  | 0.75 [0.030]                    | 0.20 [0.008]                   | 0.34 [0.013]                       |
| 2.0  | 2.6 ± 0.2 [0.102 ± 0.008]  | 1.00 [0.039]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 2.5  | 3.1 ± 0.2 [0.122 ± 0.008]  | 1.25 [0.049]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 3.0  | 3.6 ± 0.2 [0.142 ± 0.008]  | 1.50 [0.059]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 3.5  | 4.1 ± 0.3 [0.161 ± 0.012]  | 1.75 [0.069]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 4.0  | 4.6 ± 0.3 [0.181 ± 0.012]  | 2.00 [0.079]                    | 0.25 [0.010]                   | 0.43 [0.017]                       |
| 5.0  | 5.6 ± 0.3 [0.221 ± 0.012]  | 2.50 [0.098]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 6.0  | 6.6 ± 0.3 [0.260 ± 0.012]  | 3.00 [0.118]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 7.0  | 7.6 ± 0.3 [0.299 ± 0.012]  | 3.50 [0.138]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 8.0  | 8.6 ± 0.3 [0.339 ± 0.012]  | 4.00 [0.158]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 9.0  | 9.6 ± 0.3 [0.378 ± 0.012]  | 4.50 [0.177]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 10.0 | 10.4 ± 0.3 [0.409 ± 0.012] | 5.00 [0.197]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 11.0 | 11.4 ± 0.3 [0.449 ± 0.012] | 5.50 [0.217]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 12.0 | 12.7 ± 0.3 [0.500 ± 0.012] | 6.00 [0.236]                    | 0.30 [0.012]                   | 0.56 [0.022]                       |
| 13.0 | 13.5 ± 0.3 [0.532 ± 0.012] | 6.50 [0.256]                    | 0.35 [0.014]                   | 0.66 [0.026]                       |
| 14.0 | 14.4 ± 0.4 [0.567 ± 0.016] | 7.00 [0.276]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 15.0 | 15.7 ± 0.4 [0.618 ± 0.016] | 7.50 [0.295]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 16.0 | 16.9 ± 0.4 [0.665 ± 0.016] | 8.00 [0.315]                    | 0.35 [0.014]                   | 0.68 [0.027]                       |
| 18.0 | 19.0 ± 0.4 [0.748 ± 0.016] | 9.00 [0.354]                    | 0.40 [0.016]                   | 0.76 [0.030]                       |
| 20.0 | 21.4 ± 0.4 [0.843 ± 0.016] | 10.00 [0.394]                   | 0.40 [0.016]                   | 0.76 [0.030]                       |
| 22.0 | 23.2 ± 0.4 [0.913 ± 0.016] | 11.00 [0.433]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 25.0 | 26.8 ± 0.4 [1.055 ± 0.016] | 12.50 [0.452]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 27.0 | 28.2 ± 0.5 [1.110 ± 0.020] | 12.50 [0.452]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 28.0 | 30.0 ± 0.5 [1.181 ± 0.020] | 14.00 [0.551]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |
| 30.0 | 32.1 ± 0.5 [1.264 ± 0.020] | 15.00 [0.591]                   | 0.45 [0.018]                   | 0.89 [0.035]                       |

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools.                                                                              |            |
| Ordering description | Specify product name, size and color (for example, ZH2-6.0-0).                          |            |

## ZH4

**Very-Thin-Wall, Very Flexible, Highly Flame-Retardant, Low Recovery Temperature, ZEROHAL Polyolefin Tubing**

### Product Facts

- 2:1 shrink ratio
- Highly flame-retardant; UL/CSA VW-1 flammability rating
- Very thin wall provides space savings and rapid shrinking
- Low shrink temperature further reduces installation time and risk of damage to temperature-sensitive components
- Environmentally friendly tubing essentially free of halogens
- Emits minimal amounts of toxic or acid gasses when burned
- RoHS compliant



### Applications

Electrical insulation and protection of in-line components, disconnect terminals, and splices in computers, appliances, and other commercial electronic products. Typically used where space saving is important. Offers the ability to pack components more closely than is possible with standard tubings. Used for strain relief on high-density connectors. Suitable for use in rail and

mass transit vehicles, buildings, and other enclosed areas where emission of toxic gasses from burning materials containing halogens is very undesirable.

### Installation

Minimum shrink temperature: 70°C [158°F]

Minimum full recovery temperature: 90°C [194°F]

### Operating Temperature Range

-30°C to 125°C  
[-22°F to 257°F]

### Specifications/Approvals

| Series | UL  | CSA  | Raychem |
|--------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------|
| ZH4    | E85381 VW-1<br>300 V, 125°C                                                            | LR31929 VW-1<br>150 V, 125°C                                                             | RW-3036 |

Available in:

Americas

Europe

Asia Pacific

## ZH4 (Continued)

### Product Dimensions

| Size | Inside Diameter              |                                 | Wall Thickness                 |                                    |
|------|------------------------------|---------------------------------|--------------------------------|------------------------------------|
|      | Expanded as Supplied         | Maximum Recovered After Heating | Expanded as Supplied (Nominal) | Recovered* After Heating (Minimum) |
| 0.6  | 0.95 ± 0.25 [0.037 ± 0.010]  | 0.30 [0.012]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 0.8  | 1.20 ± 0.25 [0.047 ± 0.010]  | 0.40 [0.016]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 1.0  | 1.40 ± 0.25 [0.055 ± 0.010]  | 0.50 [0.020]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 1.5  | 1.90 ± 0.25 [0.075 ± 0.010]  | 0.75 [0.030]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 2.0  | 2.30 ± 0.25 [0.091 ± 0.010]  | 1.00 [0.039]                    | 0.10 [0.004]                   | 0.25 [0.010]                       |
| 2.5  | 2.80 ± 0.25 [0.110 ± 0.010]  | 1.25 [0.049]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 3.0  | 3.30 ± 0.25 [0.130 ± 0.010]  | 1.50 [0.059]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 3.5  | 3.80 ± 0.25 [0.150 ± 0.010]  | 1.75 [0.069]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 4.0  | 4.40 ± 0.25 [0.173 ± 0.010]  | 2.00 [0.079]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 5.0  | 5.50 ± 0.25 [0.217 ± 0.010]  | 2.50 [0.098]                    | 0.15 [0.006]                   | 0.25 [0.010]                       |
| 6.0  | 6.50 ± 0.40 [0.256 ± 0.016]  | 3.00 [0.118]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 7.0  | 7.50 ± 0.40 [0.295 ± 0.016]  | 3.50 [0.138]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 8.0  | 8.50 ± 0.40 [0.335 ± 0.016]  | 4.00 [0.158]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 9.0  | 9.50 ± 0.40 [0.374 ± 0.016]  | 4.50 [0.177]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |
| 10.0 | 10.50 ± 0.50 [0.413 ± 0.020] | 5.00 [0.197]                    | 0.15 [0.006]                   | 0.28 [0.011]                       |

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

### Ordering Information

|                      |                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. |            |
| Standard packaging   | On spools.                                                                              |            |
| Ordering description | Specify product name, size and color (for example, ZH4-2.0-0).                          |            |

## ZH-100

**Flexible, Thin-Wall, Low-Fire-Hazard Tubing**

### Product Facts

- 2:1 shrink ratio
- Low smoke emissions
- Flexible, flame-retardant
- No added halogens
- Low evolution of acid gases
- RoHS compliant



1

Heat-shrinkable Tubing

### Applications

ZH-100 is a flexible, thin-wall, heat-shrinkable tubing designed for low-fire-hazard applications. ZH-100 contains no added halogens, and exhibits excellent fire safety characteristics combined with low evolution of acid gases, while retaining good mechanical and fluid resistance properties.

### Installation

Minimum shrink temperature: 80°C [176°F]  
Minimum full recovery temperature: 120°C [248°F]

### Operating Temperature Range

-30°C to 105°C  
[-22°F to 221°F]

### Specifications/Approvals

| Series | Industry | Raychem |
|--------|----------|---------|
| ZH-100 | BR 1326A | RW-2031 |

Available in:

Americas

Europe

Asia Pacific



**ZH-100** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 1/8   | 3.2 [0.125]                  | 1.6 [0.062]                     | 0.50 ± 0.10 [0.019 ± 0.004] |
| 3/16  | 4.8 [0.187]                  | 2.4 [0.093]                     | 0.50 ± 0.10 [0.019 ± 0.004] |
| 1/4   | 6.4 [0.250]                  | 3.2 [0.125]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 3/8   | 9.5 [0.375]                  | 4.8 [0.187]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 1/2   | 12.7 [0.500]                 | 6.4 [0.250]                     | 0.65 ± 0.15 [0.026 ± 0.006] |
| 3/4   | 19.0 [0.750]                 | 9.5 [0.375]                     | 0.75 ± 0.15 [0.030 ± 0.006] |
| 1     | 25.4 [1.000]                 | 12.7 [0.500]                    | 0.90 ± 0.15 [0.035 ± 0.006] |
| 1 1/2 | 38.0 [1.500]                 | 19.0 [0.750]                    | 1.00 ± 0.20 [0.039 ± 0.008] |
| 2     | 51.0 [2.000]                 | 25.4 [1.000]                    | 1.15 ± 0.25 [0.045 ± 0.010] |

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

**Ordering Information**

|                      |                                                                                                                                         |            |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                | Standard                                                                                                                                | Black (-0) |
| Size selection       | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging   | On spools.                                                                                                                              |            |
| Ordering description | Specify product name, size and color (for example, ZH-100 1/8-0).                                                                       |            |

## ZHTM

### Heat-Shrinkable, Flexible Tubing with Low Toxicity for Fire Safety Applications

#### Product Facts

- 2:1 shrink ratio
- Low smoke emission
- System 100 tubing
- RoHS compliant



Heat-shrinkable Tubing

#### Applications

A flexible, thick-wall, heat-shrinkable tubing to be used in conjunction with -100 molded parts and Zerohal cable to form Raychem System 100. This material exhibits excellent fire safety characteristics combined with low smoke emission and low evolution of acid gases while retaining good mechanical and fluid-resistance

properties. Used for insulation and protection of cables, harnesses, and electrical and electronic components in enclosed spaces, such as in marine applications, mass transit systems, and offshore installations, to reduce toxicity risks, or where equipment would be irreparably damaged by corrosive products of combustion.

#### Installation

Minimum shrink temperature: 80°C [176°F]

Minimum full recovery temperature: 121°C [250°F]

#### Operating Temperature Range

-30°C to 105°C  
[-22°F to 221°F]

#### Specifications/Approvals

| Series | Military                           | Agency                                                                 | Industry | Raychem |
|--------|------------------------------------|------------------------------------------------------------------------|----------|---------|
| ZHTM   | Def. Stan. 59-97<br>Issue 3 Type 8 | BS 4G-198 Part 3 Type 15<br>VG 95343 Part 5 Type L<br>VDE 0341/Pt 9005 | BR 1326A | RW-2058 |

Available in:

Americas

Europe

Asia Pacific

**ZHTM** (Continued)

**Product Dimensions**

| Size  | Inside Diameter              |                                 | Recovered Wall Thickness*   |
|-------|------------------------------|---------------------------------|-----------------------------|
|       | Minimum Expanded as Supplied | Maximum Recovered After Heating | After Heating               |
| 3/1.5 | 3.0 [0.118]                  | 1.5 [0.059]                     | 0.70 ± 0.10 [0.028 ± 0.004] |
| 5/2.5 | 5.0 [0.197]                  | 2.5 [0.098]                     | 0.75 ± 0.12 [0.030 ± 0.005] |
| 8/4   | 8.0 [0.315]                  | 4.0 [0.157]                     | 0.80 ± 0.15 [0.031 ± 0.006] |
| 12/6  | 12.0 [0.472]                 | 6.0 [0.236]                     | 0.90 ± 0.15 [0.035 ± 0.006] |
| 18/9  | 18.0 [0.709]                 | 9.0 [0.354]                     | 1.00 ± 0.18 [0.039 ± 0.007] |
| 24/12 | 24.0 [0.945]                 | 12.0 [0.472]                    | 1.10 ± 0.20 [0.043 ± 0.008] |
| 40/20 | 40.0 [1.575]                 | 20.0 [0.789]                    | 1.30 ± 0.23 [0.051 ± 0.009] |
| 50/30 | 50.0 [1.969]                 | 30.0 [1.181]                    | 1.50 ± 0.28 [0.059 ± 0.011] |

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

**Ordering Information**

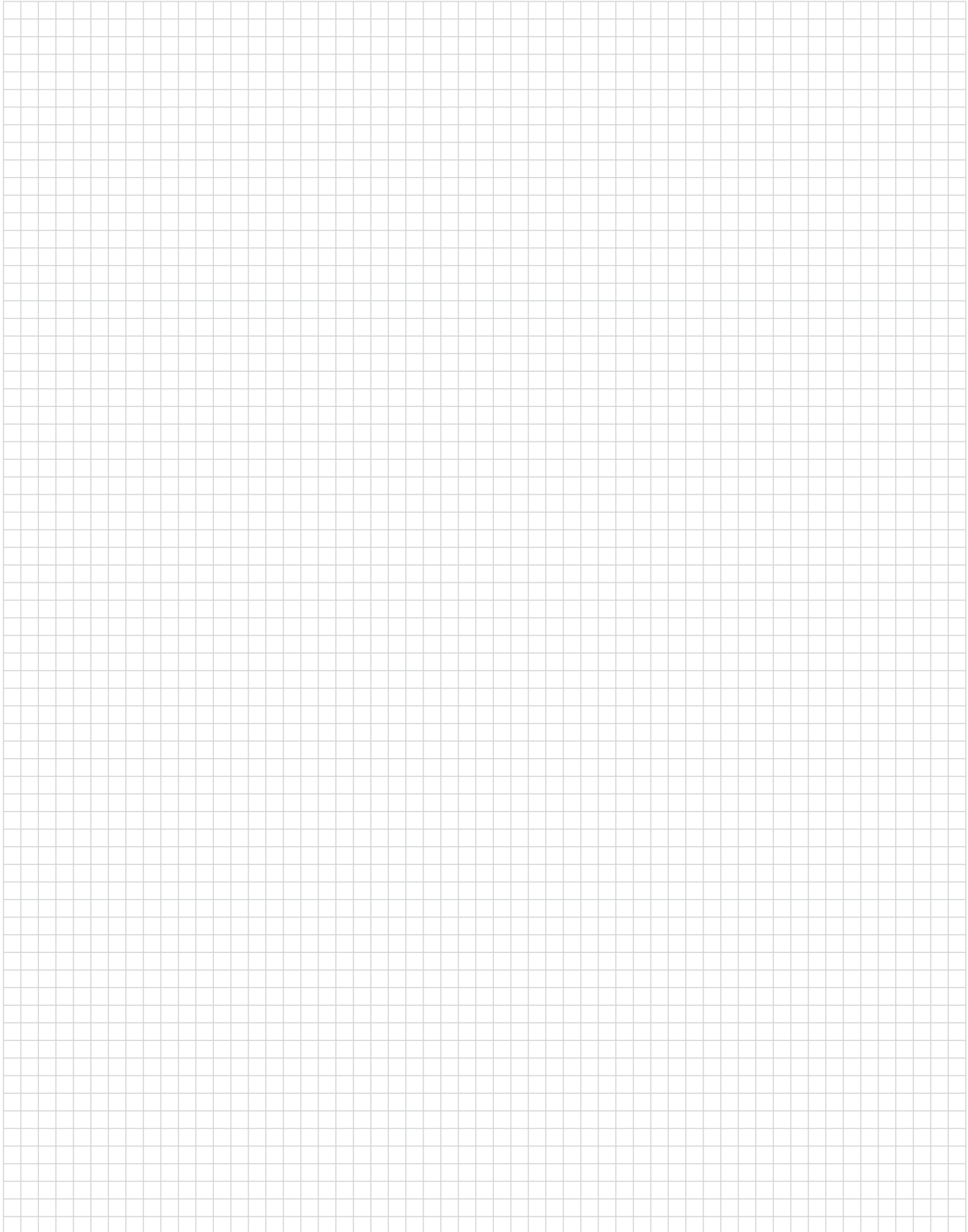
|                        |                                                                                                                                         |            |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| Color                  | Standard                                                                                                                                | Black (-0) |
| Size selection         | Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request. |            |
| Standard packaging     | On spools.                                                                                                                              |            |
| Ordering description** | Specify product name, size and color (for example, ZHTM 8/4-0).                                                                         |            |

\*\*Europe only. For supply to Def Stan and BS add -DS or -BS to ordering description.

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## HL1910E/HL2010E

### Light Duty Heating Tool

#### Product Facts

- Light duty, portable hot air heater



The HL2010E and HL1910E hot air heat guns are designed to work with a standard line voltage (120V) on a wide variety of Raychem heat-shrinkable products. These tools are suitable for occasional use and are not recommended for applications requiring high duty cycles. Both tools supply forced hot air with an adjustable heat setting to meet the requirements of many different installation situations. A three position switch controls the air flow (150/300/500 l/min)

The HL2010E tool is switched on and off at the three-stage switch and the temperature can be continuously adjusted over a range of 50°C-630°C by the push-buttons. The temperature can be increased or reduced by 10°C steps. An LCD display shows the actual temperature.

The HL1910E tool is switched on and off at the two-stage switch and the temperature can be continuously adjusted over a range of 50°C-600°C at the thumbwheel (the numbers on it serve as guide only, 1 means 50°C and max. temperature of 600°C is attained at 9).

A bench stand allowing use of both the HL2010E and the HL1910E as a bench tool is available as an option. Only two reflectors are required to cover most applications of heat-shrinkable tubing and SolderSleeve terminations.

There is an adaptor available, which allows the use of PR type reflectors.

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |

**HL1910E/HL2010E** (Continued)

**Technical Specifications**

|          |                 |
|----------|-----------------|
| Voltage  | 120V AC         |
| Power    | 2000W           |
| Air flow | 150 - 500 l/min |
| Weight   | 920g            |
| Length   | 280 mm          |
| Noise    | <70dB           |

**Ordering Information**

|                              | Description                                         | Part Number |
|------------------------------|-----------------------------------------------------|-------------|
| HL2010E-120V tool:           | HL2010E-KIT-120V                                    | CJ2087-000  |
| HL1910E-120V tool:           | HL1910E-KIT-120V                                    | CJ2086-000  |
| HL2010E/HL1910E Accessories: | HL1802E-074616 - SolderSleeve Terminators Reflector | 832011-000  |
|                              | HL1802E-070519 - Heat-Shrinkable Tubings Reflector  | 022611-000  |
|                              | HL1802E-ADAPT-PR Adaptor for PR Series Reflector    | 444817-000  |
|                              | PR-13C-REFLECTOR                                    | 991974-000  |
|                              | PR-25D-REFLECTOR                                    | 989523-000  |
|                              | HL2010E-BENCH-STD                                   | CJ2085-000  |

## ThermoGun HG

### Medium Duty Heating Tool

#### Product Facts

- Stand-mounted or handheld, rugged unit for heavy-duty use
- Built-in stand and turbo-fan-driven blower
- Adjustable side vents
- Adjustable temperature
- 1680 to 2160 watts
- Large reflector size
- High heat output for fast installation



#### Applications

Used for installing molded parts onto adapters or harnesses and installing a broad range of heat-shrinkable products, including boots and tubing up to three inches in diameter.

#### Specifications

| Model     | Power Requirements   | Input Watts | Temperature Range          | CFM* | RPM** |
|-----------|----------------------|-------------|----------------------------|------|-------|
| HG-501A   | 120 V, 60 Hz, 14 A   | 1680        | 260°C–399°C [500°F–750°F]  | 23   | 1700  |
| HG-502A   | 230 V, 50/60 Hz, 7 A | 1680        | 260°C–399°C [500°F–750°F]  | 23   | 1700  |
| HG-751A-C | 120 V, 60 Hz, 18 A   | 2160        | 399°C–538°C [750°F–1000°F] | 23   | 1700  |
| HG-752A   | 230 V, 50/60 Hz, 9 A | 1740        | 399°C–538°C [750°F–1000°F] | 23   | 1700  |

\*CFM = Cubic feet per minute.

\*\*RPM = Revolutions per minute.

Available in:

Americas

Europe

Asia Pacific



## ThermoGun HG (Continued)

### Accessories



**A-160-HG reflector (P/N 991017)** for short lengths of tubing up to 19.05 [.75] in diameter.  
Must be ordered separately.



**A-170-HG reflector (P/N 991018)** for short lengths of tubing 19.05–50.8 [.75–2] in diameter.  
Must be ordered separately.



**TG-23 reflector (P/N 991026)** for boots up to 44.45 [1.75] in diameter.  
Must be ordered separately.

### Ordering Information

| Model*    | Housing Color | Part No.   |
|-----------|---------------|------------|
| HG-501A   | Red           | 462047-000 |
| HG-502A   | Red           | 389363-000 |
| HG-751A-C | Red           | 926935-000 |
| HG-752A   | Red           | 026239-000 |

| Accessories                     | Tubing Application               | Part No.   |
|---------------------------------|----------------------------------|------------|
| A-160-HG standard reflector     | Diameters up to 19.05 [0.75]     | 991017-000 |
| A-170-HG large tubing reflector | Diameters of 19.05–50.8 [0.75–2] | 991018-000 |
| TG-23 small boot reflector      | Diameters up to 44.5 [1.75]      | 991026-000 |
| TG-24 large boot reflector      | —                                | 991027-000 |

\*Complete with bench stand.

## CV-1981 and CV-1983

### Heavy Duty Hot-Air Heating Tool

#### Product Facts

- Robust, double-insulated, heavy-duty unit
- Highest-wattage unit (1600–2260 watts)
- Integral stand that allows use as bench tool
- Safe, quiet operation
- Precisely variable temperature
- Variety of reflectors available
- Easy fixturing for dual opposing heating



#### Applications

Used for installing dual wall or single wall tubing up to three inches in diameter and for installing SolderSleeve devices. Closed loop version (PID) also available.

#### Specifications

| Electrical Supply                                    |                  |
|------------------------------------------------------|------------------|
| CV-1981-MK2                                          | 120 V and 230 V  |
| CV-1983                                              | 120 V and 230 V  |
| CV-1981 PID                                          | 120 V and 230 V  |
| Power Consumption                                    |                  |
| CV-1981-MK2                                          | 1600 W           |
| CV-1983                                              | 2260 W/3060 W    |
| CV-1981 PID                                          | 1600 W           |
| Total System Noise                                   |                  |
| CV-1981-MK2                                          | 65dB             |
| CV-1983                                              | 65dB             |
| CV-1981 PID                                          | >70dB            |
| Length                                               |                  |
| CV-1981-MK2                                          | 340 mm [13.4 in] |
| CV-1983                                              | 320 mm [12.6 in] |
| CV-1981 PID                                          | 350 mm [13.8 in] |
| Weight                                               |                  |
| CV-1981-MK2                                          | 1.3 Kg [2.90 lb] |
| CV-1983                                              | 1.5 Kg [3.30 lb] |
| CV-1981 PID                                          | 1.4 Kg [3.10 lb] |
| Air Flow                                             |                  |
| CV-1981-MK2                                          | Max 230 l/min    |
| CV-1983                                              | Max 500 l/min    |
| CV-1981 PID                                          | 230 l/min        |
| Product Range                                        |                  |
| All dual wall, single wall and molded part products. |                  |
| Various devices products.                            |                  |
| For other Raychem products , contact TE.             |                  |

Available in:

Americas

Europe

Asia Pacific

**CV-1981 and CV-1983 (Continued)**
**Ordering Information**

| Equipment              | Description                | Part No.    | Voltage | Hz       |
|------------------------|----------------------------|-------------|---------|----------|
| CV-1981-MK2            | CV-1981-120V1600W-CANMK2   | A42716-000* | 120V    | 50/60 Hz |
|                        | CV-1981-120V1600W-UKMK2    | E95798-000  | 120V    | 50/60 Hz |
|                        | CV-1981-230V1600WMK2       | 813914-000  | 230V    | 50/60 Hz |
|                        | CV-1981-230V1600W-SEVMK2   | F25836-000  | 230V    | 50/60 Hz |
|                        | CV-1981-230V1600-UKMK2     | 340970-000* | 230V    | 50/60 Hz |
| CV-1983                | CV-1983-110V-2260W-UK      | 441753-000  | 120V    | 50/60 Hz |
|                        | CV-1983-220V-2260W         | 773898-000  | 230V    | 50/60 Hz |
|                        | CV-1983-220V-2260W-UK      | 985426-000  | 230V    | 50/60 Hz |
|                        | CV-1983-220V-3060W         | 538361-000  | 230V    | 50/60 Hz |
|                        | CV-1983-220V-3060W-UK      | 231866-000  | 230V    | 50/60 Hz |
| CV-1981-PID            | CV-1981-120V-1600W-CANPIDF | 839218-000  | 120V    | 50/60 Hz |
|                        | CV-1981-120V-1600W-UKPID   | 928826-000  | 120V    | 50/60 Hz |
|                        | CV-1981-230V-1600WPID      | 958770-000  | 230V    | 50/60 Hz |
|                        | CV-1981-230V-1600W-SEVPIDF | 434366-000  | 230V    | 50/60 Hz |
|                        | CV-1981-230V-1600W-UKPIDF  | 385828-000  | 230V    | 50/60 Hz |
| CV-1983 Barrel Adapter | AD-1962                    | 989172-000  | —       | —        |

**Accessories**

|                                           | Application                                                                                   | Part No.   |
|-------------------------------------------|-----------------------------------------------------------------------------------------------|------------|
| PR-12 reflector                           | Tubing: 6.3–25.4 mm [0.25 in–1 in]                                                            | 991973-000 |
| PR-13 reflector                           | Tubing: Up to 6 mm [0.25 in]                                                                  | 991963-000 |
| PR-13C reflector                          | Large SolderSleeve products                                                                   | 991974-000 |
| PR-21 reflector                           | Tubing: Up to 25.4 mm [1 in]                                                                  | 991984-000 |
| PR-24 reflector                           | Tubing/molded parts: 25.4–34.93 mm [1 in–1.38 in]                                             | 991964-000 |
| PR-24A reflector                          | Tubing/molded parts: 34.93–60.33 mm [1.38 in–2.38 in]                                         | 991989-000 |
| PR-25 reflector                           | SolderSleeve products: Up to 7 mm [0.28 in]                                                   | 991965-000 |
| PR-25D reflector                          | SolderSleeve products: 6.3–12.7 mm [0.25 in–0.50 in]                                          | 989523-000 |
| PR-26 reflector                           | Small SolderSleeve products                                                                   | 991967-000 |
| PR-33 reflector                           | SolderSleeve products: 19.05–25.4 mm [0.75 in–1 in]                                           | 997768-000 |
| AD-1962 adapter for larger-barrel CV-1983 | —                                                                                             | 989172-000 |
| PR-34 reflector                           | SolderSleeve products: 12.0–20.0 mm [0.47 in–0.79 in]                                         | 989111-000 |
| PR-51                                     | Special narrow reflector for molded part transitions [21.5 x 3.5 mm nozzle] [.85 in x .14 in] | 113069-000 |

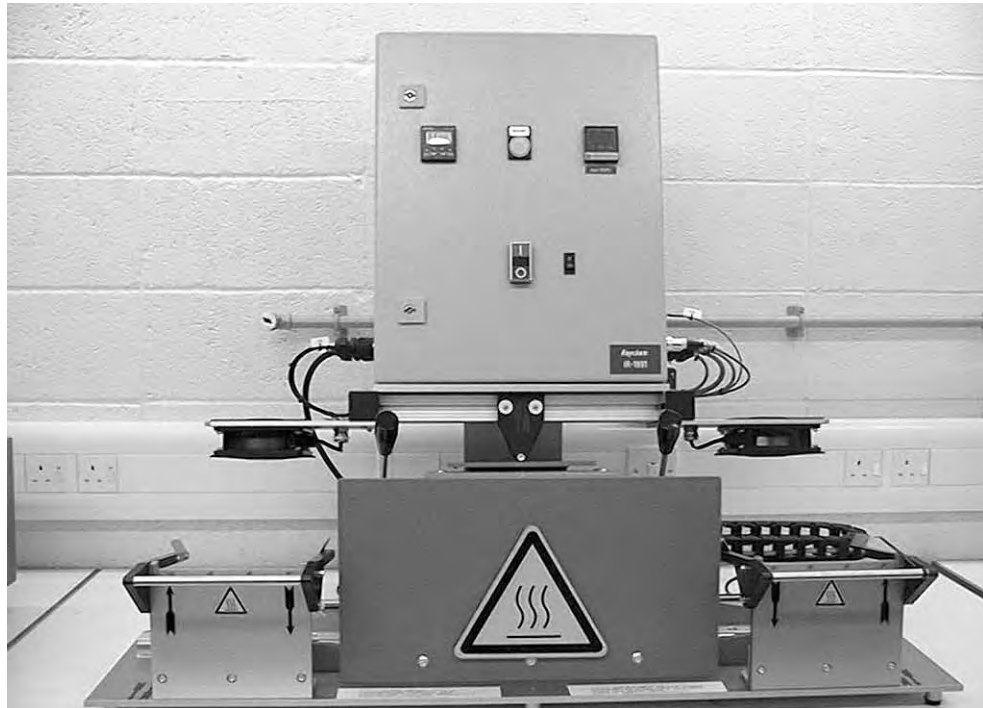
\*Note: A42716 supersedes and replaces 538005  
340970 supersedes and replaces 923002

## IR-1891

### Heating Work Station for Short Length Tubing

#### Product Facts

- Automatic cycle start once heater is manually 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 cycle prevents damage to components
- Multiple product fixture assemblies give increased process rates
- Cooling fan above each fixture assembly maintains holding fixture at an acceptable temperature



#### Applications

The IR-1891 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 etc. The machine is provided with two work stations and a moveable heating head.

Each workstation is provided with supports for tooling fixtures (which must 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, ensures that the tubing product is correctly positioned and then slides the heat head into position before initiating the heating cycle. The

operator then continues with loading/ unloading the other work station whilst the heating cycle is taking place.

The IR-1891-220V-Shuttle-Retn is provided with closed loop temperature control and in addition the heat head is 'locked' into position by use of an electromagnet during the heating cycle.

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 1200 pieces/hour can be achieved depending on the heating time and the time taken by the operator to load and unload the workpieces.

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

The heating elements, which are continuously energized, are of the infra-red medium wave length type and consist of a coiled resistance wire contained in quartz glass tubes. The closed loop temperature control uses similar elements but having integral thermo-couple sensors.

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               |          |        |              |

## IR-1891 (Continued)

### Technical Specifications

|                                                   |                                                           |
|---------------------------------------------------|-----------------------------------------------------------|
| Electrical Supply                                 | 230 V Single Phase                                        |
| Power Consumption                                 | 1600 W                                                    |
| Operating Temperature                             | 650°C max                                                 |
| Process Rate<br>operator                          | 1200 / hour maximum depending on application and operator |
| Heating Times                                     | 3 to 30 seconds depending on application                  |
| System Noise                                      | < 70 dB                                                   |
| Dimensions – 508636-000                           | L1100 x H650 x D500 mm [L43 x H25 x D20 in]               |
| Dimensions – 613148-000 / 167309-000 / 289588-000 | L1100 x H900 x D500 mm [L43 x H35 x D20 in]               |
| Base Plate Dimensions 289588-000 / 167309-000     | L1040 x D450 mm [L41 x D18 in]                            |
| Base Plate Dimensions 613148-000                  | L1040 x D397 mm [L41 x D16 in]                            |

### Product Range

Wide range of Raychem tubing products in particular LSTT, RNF-3000, RNF-100, HTAT, ATUM.  
Maximum diameter 20 mm [0.8 in] and maximum length 60 mm [2.0 in]

### Ordering Information

| Description                 | Part No.   |
|-----------------------------|------------|
| *IR-1891-220V-Shuttle-Retrn | 289588-000 |
| *IR-1891-220V-Retrn-Syl     | 613148-000 |

**\*Note:** The descriptions given here DO NOT include the supply of the necessary tooling fixtures. These are designed for each individual application.

### Accessories

| Description               | Part No.                                  |
|---------------------------|-------------------------------------------|
| <b>Grippers:</b>          |                                           |
| IR-1891-SI-GRP-165-RD-1mm | Red Gripper with 1mm hole<br>629602-000   |
| IR-1891-SI-GRP-165-CL-2mm | Clear Gripper with 2mm hole<br>112676-000 |
| IR-1891-SI-GRP-165-BK-3mm | Black Gripper with 3mm hole<br>F83221-000 |
| IR-1891-SI-GRP-165-WT-6mm | White Gripper with 6mm hole<br>629602-000 |
| <b>Fixtures:</b>          |                                           |
| IR-1891-Quick-Rel-ESS-6/1 | ESS Cap (6/1) Fixture<br>096735-000       |
| IR-1891-Quick-Rel-ESS-8/2 | ESS Cap (8/2) Fixture<br>148597-000       |
| IR-1891-Tool-Fixt-Bas-ESS | Base Unit for Fixtures<br>760221-000      |

**Note:** A wider range of tooling fixtures and grippers designed for previous applications are available. Please contact TE for details.

## Model 81CE

### Discrete Heater for Heat-Shrinkable Tubing Products

#### Product Facts

- Closed-loop time and temperature control
- Controlled process
- Adaptable for different applications
- Bench top design
- CE approved for worldwide use
- Heater operation and over temperature alarm lights



#### Applications

The Model 81CE is a CE Certified discrete-type table top heater which provides a controlled process for recovering a wide variety of Raychem heat-shrinkable products onto wire assemblies or other suitable substrates.

Assemblies are loaded into spring loaded jaws on either side of the heating chamber which takes the assemblies into the oven for a pre-set number of seconds, then returns them to the home position for removal.

#### Controlled Heating Zone

The Model 81 CE processor has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures 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.

#### Controlled Oven Dwell Time

The oven dwell time is selected using a 3-digit thumb wheel digital timer. The time can be set between 1 and 999 seconds for precise heating ensuring each assembly being processed sees the same precise amount of heat.

#### Minimal Skill Requirements

There are clearly marked guides for aligning the assembly as well as the tubing or device being processed. The operator only has to center the assembly, then the tubing, and load it into the spring loaded jaws on either side of the heating

chamber. The jaws grip and carry the assembly into the heating chamber and back to the home position when the time has expired. A protection circuit prevents the cycle from being initiated if the oven is not at the desired set point, preventing assemblies from being processed incorrectly. The small footprint allows the processor to be placed in close proximity to a welder, allowing a single operator to accomplish two tasks.

#### Versatility

The processor is designed to process a broad range of Raychem heat-shrinkable tubing products up to 25 mm [1.0 in] in diameter and 127 mm [5.0 in] in length. The infrared energy source is well-suited to efficient processing of either single-wall or adhesive-lined tubing. Temperature and time can be controlled to

accommodate a wide variety of products and substrates.

#### Safety Features:

- Circuit breaker for current surges
- Emergency Stop
- Pinch points eliminated by the housing design
- An over-temperature switch that shuts off all power in the event of an overheat condition
- Automatic cool-down circuit to prevent heat damage to integral components
- Circuit to prevent cycle initiation until the oven is up to temperature

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |

## Specifications and Dimensions

### Model 81CE (Continued)

| Electrical                     | Part No. 071965                                                         | Part No. 704393-000             |
|--------------------------------|-------------------------------------------------------------------------|---------------------------------|
| Power Requirements             | 120 VAC, 1Ø, 50/60 Hz, 15 A                                             | 220 VAC, 1 Ø, 208-240 VAC, 15 A |
| Heating elements               | 2 ea. 400 watt stamped foil with quartz face infrared, one top & bottom |                                 |
| Timing System                  | Eagle Digital Timer, 1 to 999 seconds                                   |                                 |
|                                |                                                                         |                                 |
| <b>Mechanical</b>              |                                                                         |                                 |
| Pneumatic cylinder requirement | 30 - 40 PSI clean shop air for jaw traversing                           |                                 |
|                                |                                                                         |                                 |
| <b>Dimensions cm [in.]</b>     |                                                                         |                                 |
| Control box dimensions         | 43.2 cm [17 in] L x 21.6 cm [8.5 in] W x 16.5 cm [6.5 in] H             |                                 |
| Control box weight             | 7.7 Kg [17 lb]                                                          |                                 |
| Heating chamber dimensions     | 38 cm [15 in] L x 24 cm [9.5 in] W x 34.3 cm [13.5 in] H                |                                 |
| Heating chamber weight         | 18 Kg [40 lbs]                                                          |                                 |
| Shipping dimensions            | 61 cm [24 in] x 61 cm [24 in] x 53 cm [21 in]                           |                                 |
| Shipping weight                | 41 Kg [90 lbs]                                                          |                                 |
|                                |                                                                         |                                 |
| <b>Tubing sizes</b>            |                                                                         |                                 |
| Inside diameter                | Up to 25 mm [1 in]                                                      |                                 |
| Length                         | Up to 127 mm [5 in]                                                     |                                 |
|                                |                                                                         |                                 |
| <b>Version</b>                 | <b>Description</b>                                                      | <b>Part No.</b>                 |
| Model 81CE -120 Volt           | CLTEQ-M81CE-120V-HTR                                                    | 071965-000                      |
| Model 81CE - 220 Volt          | CLTEQ-M81CE-240V-HTR                                                    | 704393-000                      |



## RBK-ILS-Processor MkII

### Installation of Splice Sealing Products Adjacent to Ultrasonic Welder

#### Product Facts

- Increased heating element life
- Installation times, temperatures and product size information (individual selection)
- Sequenced installations
- Operator key lock/password protection levels
- Automatic heater retraction on mains failure
- Automatic calibration (single cycle)
- RS232 interface allows time, temperature and product sizes for the next installation to be transferred from a remote machine (e.g. an ultrasonic welding tool)
- Machine hours and installation cycle counters
- Software upgradeable to support special applications
- Air cooling can be provided to an optional stub splice fixture in the RBK-Proc-Mk2-Proc-Aircool version



#### Applications

The RBK-ILS-Processor MkII is a semi-automatic unit designed specifically to install splice sealing products onto ultrasonically welded or crimped splice joints used in automotive harnesses.

The tool 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.)

- Automatic communication with upstream ultrasonic welder can allow time and temperature to be automatically set without operator intervention.

The operator is able to efficiently load both machines and so minimize 'dead time'. Installing Raychem splice sealing products immediately after welding gives reduced installation time and earliest 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.

The wire assembly is automatically ejected, with

the splice sealing product installed and the joint area sealed, insulated and strain relieved. In-line or stub-type splices can be installed.

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |



**RBK-ILS-Processor MkII** (Continued)

**Technical Specifications**

|                                                                                             |                                                                     |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Electrical Supply                                                                           | 220V-240V-50Hz                                                      |
| Power Consumption                                                                           | 1.7 Amps (Max)                                                      |
| Operating Temperature                                                                       | 550°C [1022°F] (Max)<br>(500°C [932°F] recommended)                 |
| Machine Cycle Times for splice sealing products used on typical range of automotive splices | 6 to 20 seconds depending on wire size and the number of wires used |
| Total System Noise                                                                          | <80dB                                                               |
| Dimensions                                                                                  | 390 x 365 x 225 mm [15 x 14 x 9 in]                                 |
| Weight                                                                                      | 18 Kg [40 lb]                                                       |

**Product Range**

|                                                      |                   |
|------------------------------------------------------|-------------------|
| RBK-ILS-125 Products                                 | Sizes 1 to 3A     |
| RBK-ILS-85 Products                                  | Sizes 6/1 to 12/3 |
| For Other Raychem Products (eg RBK-VWS, RBK-ESS....) | Contact TE        |

**Ordering Information**

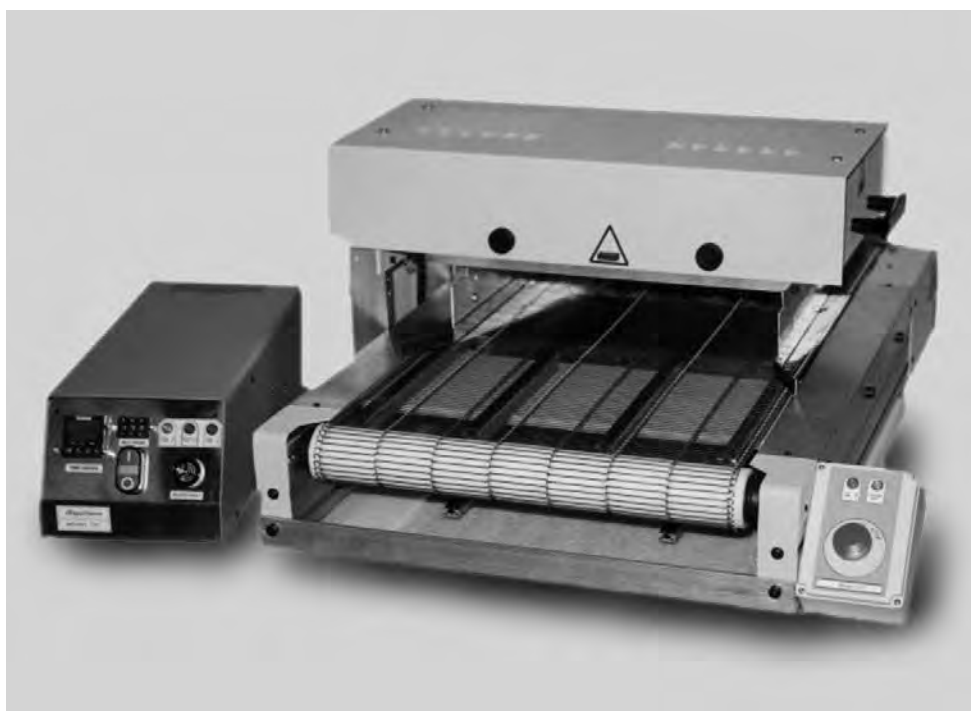
|             | Description                                                | Part No.   |
|-------------|------------------------------------------------------------|------------|
| Equipment   | RBK-Proc-Mk2-Processor                                     | 740331-000 |
|             | RBK-Proc-Mk2-Proc-Aircool                                  | A96930-000 |
| Accessories | Stub splice fixture - RBK-ILS-Proc-Stub-Sp-Fix             | 981721-000 |
|             | Air cooled stub splice fixture - RBK-ILS-Proc-Air-Cool-Kit | 843800-000 |
|             | 8 mm ring terminal fixture - RBK-ILS-Proc-Termfix-08mm     | 049857-000 |

## Model 105

### Tabletop Tunnel Oven

#### Product Facts

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



#### 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.

The M105 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 M105 has two upper heating chamber height positions, 54 mm [2.11 in] and 98 mm [3.86 in]. The position is adjusted by removing the pivot pins and relocating them in the bearing stands.

The upper chamber is cantilevered to permit processing of assemblies that require only a portion of the assembly to pass through the heat zone. The upper

chamber is equipped with adjustable heat shields to maximize the oven heating efficiency for various applications.

#### Controlled Heating Zone

The Model 105 Tunnel Oven has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures (ambient to 700°C) 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 potentiometer. The SCR drive controller and DC drive

motor ensure constant conveyor speed at any potentiometer setting from 100 to 999 [0.2 to 5.0 feet per minute], for precise heating of assemblies.

#### Minimal Skill Requirements

The open loading area of the entry section of the M105 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 [3 in] in diameter and infinite length. The infrared energy source is well-suited to 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.

#### Safety Features:

- Emergency Stop
- Automatic cool-down circuit to extend the life of the components
- Over-temperature switch that shuts off all power in the event of an overheat condition
- Lockout on temperature and speed controllers to prevent unauthorized changes
- Audible alarm indication of a heater failure
- Circuit breaker for current overload

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |

## Specifications and Dimensions

### Model 105 (Continued)

#### Electrical

|                       |                                                                              |
|-----------------------|------------------------------------------------------------------------------|
| Power requirements    | 210-240 VAC, 20A, 1Ø, 50/60 Hz                                               |
| Heating elements      | (2) 1500 watt infrared stamped foil with black quartz face, one top & bottom |
| Drive system          | DC gear motor with closed loop motor controller, 3-digit thumbwheel          |
| Air flow (cooling)    | 4 – 100 CFM fans, 2 - for upper heater housing, 2 – for product cooling      |
| Operating temperature | Set Point (Heater Surface) - Ambient to 700°C, Throughput = 50° to 200°C     |

#### Mechanical

|                      |                                                  |
|----------------------|--------------------------------------------------|
| Conveyor belt system | Wire mesh 70% open, with optional Teflon coating |
| Belt Speed           | 6.1 cm [0.2 ft] to 152 cm [5.0 ft] per minute    |

#### Dimensions cm [in]

|                        |                                                                 |
|------------------------|-----------------------------------------------------------------|
| Processor dimensions   | 99 cm [39 in] L x 68.5 cm [27 in] W x 41.7 cm [16.5 in] H       |
| Processor weight       | 68 Kg [150 lb]                                                  |
| Control box dimensions | 51.5 cm [20.25 in] L x 21.0 cm [8.25 in] W x 17.8 cm [7.0 in] H |
| Control box weight     | 7.7 Kg [17 lb]                                                  |
| Shipping dimensions    | 134.6 cm [53 in] L x 116.8 cm [46 in] W x 63.5 cm [25 in] H     |
| Shipping weight        | 146 Kg [320 lbs]                                                |

#### Tubing sizes

|                       |                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------|
| Tubing diameter (max) | Up to 76.2 mm [3.0 in]                                                                |
| Tubing length (max)   | 356 mm [14 in] perpendicular to belt travel, unlimited length parallel to belt travel |

#### Version

#### Description

#### Part No.

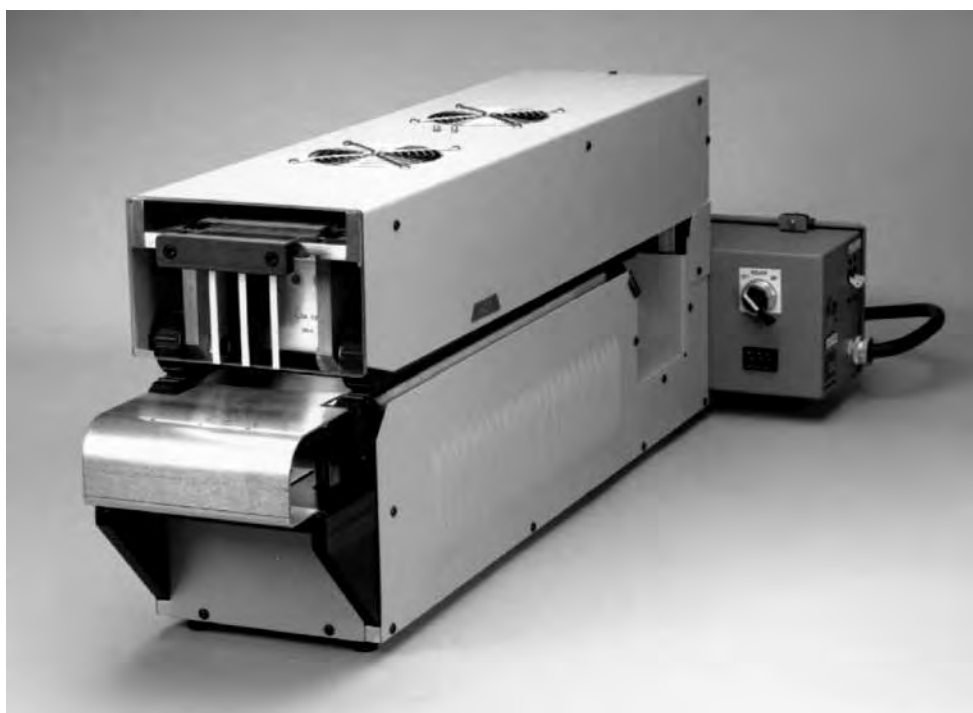
|                       |                        |            |
|-----------------------|------------------------|------------|
| Model 105 Tunnel Oven | CLTEQ-M105-TUNNEL-OVEN | 955018-000 |
|-----------------------|------------------------|------------|

## Model 16B

### Tabletop Belt Heater

#### Product Facts

- Closed-loop speed and temperature control
- Continuous controlled process
- Adaptable for different applications
- Bench top design
- Heater operation and over-temperature alarm lights



#### Applications

The Model 16B is our smallest (tabletop) conveyor type processor which 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 then through a fan-cooled cooling zone before depositing them into the unloading bin.

#### Controlled Heating Zone

The Model 16B processor has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures (ambient to 650° C) 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.

#### Speed Control

The belt speed is selected using a 3-digit thumbwheel via a closed-loop motor controller and DC gear motor.

#### Minimal skill requirements

There are clearly marked guides for aligning the assembly as well as the tubing or device being processed. The operator only has to center the assembly then the tubing and slide it into the belts. The belts grip and carry the assembly through the heating and cooling zone, depositing them into the unloading bin.

Labor costs are reduced significantly because once an operator loads an assem-

bly, that 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.

#### Versatility

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.

#### Safety Features:

- Circuit breaker for current surges

- Pinch points protected by the housing
- Belts that do not pinch with significant force
- An over-temperature switch that kills power in the event of an overheat condition
- Automatic cool-down circuit to prevent heat damage to components

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        |        | ■            |

## Specifications and Dimensions

### Model 16B (Continued)

| Electrical                                          | Part No. 827429-000                                                                    | Part No. 584313-000, 047143-000  |
|-----------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------|
| Power Requirements                                  | 120 VAC, 1Ø, 50/60 Hz, 20 A                                                            | 220 VAC, 1 Ø, 208-240 VAC, 15 A. |
| Heating elements                                    | 2 ea. 1000 watt stamped foil infrared with quartz face                                 |                                  |
| Drive system                                        | DC gear motor with closed loop motor controller, 3-digit thumbwheel                    |                                  |
| Air flow (cooling)                                  | 2 – 100 CFM fans in the upper heater housing                                           |                                  |
|                                                     |                                                                                        |                                  |
| Mechanical                                          |                                                                                        |                                  |
| Conveyor belt system                                | Double sided timing belts; two on each side of the processor – pitch 9.5 mm [0.375 in] |                                  |
| Belt Speed                                          | Up to 288 cm / min [7.5 ft / min]                                                      |                                  |
|                                                     |                                                                                        |                                  |
| Dimensions cm [in]                                  |                                                                                        |                                  |
| Processor dimensions                                | 48 cm [19 in] W x 109 cm [43 in] L x 33 cm [13 in] H                                   |                                  |
| Processor weight                                    | 41 Kg [90 lbs]                                                                         |                                  |
| Shipping dimensions                                 | 61 cm [24 in] W x 112 cm [43 in] L x 56 cm [22 in] H                                   |                                  |
| Shipping weight                                     | 68 Kg [150 lbs]                                                                        |                                  |
|                                                     |                                                                                        |                                  |
| Tubing sizes                                        |                                                                                        |                                  |
| Tubing diameter (max)                               | Up to 19 mm [0.75 in]                                                                  |                                  |
| Tubing length (max)                                 | Up to 90 mm [3.5 in]                                                                   |                                  |
|                                                     |                                                                                        |                                  |
| Version                                             | Description                                                                            | Part No.                         |
| Model 16B - 120 volt                                | CLTEQ-M16B-120V-3WIR                                                                   | 827429-000                       |
| Model 16B - 220 volt (4-wire)                       | CLTEQ-M16B-220V-4-WR                                                                   | 584313-000                       |
| Model 16B - 220 volt Mod. (3 wire with Transformer) | CLTEQ-M16B-220V-3W-M                                                                   | 047143-000                       |

## Model 19

### Belt Heater for Heat-Shrinkable Tubing Products

#### Product Facts

- Closed-loop speed and temperature control
- Continuous controlled process
- Adaptable for different applications
- CE approved for worldwide use
- Self-diagnostic circuitry
- Parts counter and hour meter



#### Applications

The Model 19 conveyor type processor is a reliable and versatile process heater which provides a controlled process for a wide variety of heat-shrinkable products.

Double-sided timing belts on either side of the upper and lower heating chambers draw the assemblies through a thermally controlled infrared heat zone, then through a fan-cooled zone before depositing them into the unloading bin.

The processor was designed to meet the requirements of the European Safety Directives and is CE approved, allowing for worldwide use.

#### Control Heating Zone

The Model 19 processor has two stamped foil heating elements that are manufactured to a strict wattage specification.

Consistent temperatures (ambient to 700°C) 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.

#### Speed Control

The belt speed is selected using a 3-digit thumbwheel (on the front panel) via a closed loop motor controller and DC gear motor.

#### Minimal Skill Requirements

There are clearly marked guides for aligning the assemblies as well as the tubing or device being processed. The operator only has to center the assembly, then the tubing and slide it into the belts. The belts grip and carry the assemblies through the heating and cooling zones, depositing them into the unloading bin.

#### Versatility

The processor is designed to process a broad range of Raychem heat-shrinkable products up to 25 mm [1 in] in diameter and 178 mm [7 in] in length. The infrared energy source is well-suited to efficient processing of either single wall or adhesive-lined tubing. Temperature and speed can be controlled to accommodate a wide

variety of products and substrates.

#### Safety Features:

- Emergency Stop
- Automatic cool-down circuit to extend the life of the components
- Over-temperature switch that shuts off all power in the event of an overheat condition
- Lockout on temperature and speed controllers to prevent unauthorized changes

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        | ■      | ■            |

## Specifications and Dimensions

### Model 19 (Continued)

#### Electrical

|                       |                                                                           |
|-----------------------|---------------------------------------------------------------------------|
| Power requirements    | 210-240 VAC, 20A, 1Ø, 50/60 Hz                                            |
| Heating elements      | 2 X Standard = 1580W, Wide = 1660W, Narrow = 880W                         |
| Drive system          | DC gear motor with closed loop motor controller; 3-digit thumbwheel       |
| Air flow (cooling)    | 2 – 100 CFM fans in the upper heater housing                              |
| Operating temperature | Set Point (Heater Surface) - Ambient to 700°C, Through-put = 50° to 200°C |

#### Mechanical

|                      |                                                                                        |
|----------------------|----------------------------------------------------------------------------------------|
| Conveyor belt system | Double sided timing belts; two on each side of the processor – pitch 9.5 mm [0.375 in] |
| Belt Speed           | Up to 152 cm / min [5.0 ft / min]                                                      |

#### Dimensions cm [in]

|                      |                                                      |
|----------------------|------------------------------------------------------|
| Processor dimensions | 53 cm [21 in] W x 135 cm [53 in] L x 45 cm [18 in] H |
| Shipping dimensions  | 66 cm [26 in] W x 147 cm [58 in] L x 58 cm [23 in] H |
| Processor weight     | 56 Kg [120 lbs]                                      |
| Shipping weight      | 86 Kg [190 lbs]                                      |

#### Tubing sizes

|                       |                                                                         |
|-----------------------|-------------------------------------------------------------------------|
| Tubing diameter (max) | Up to 2.5 cm [1.0 in]                                                   |
| Tubing length (max)   | Up to 12.7 cm [4.0 in] Standard or 178 mm [7.0 in] with Model 19 - Wide |

| Version                                 | Description            | Part No.   |
|-----------------------------------------|------------------------|------------|
| Model 19 - Standard (3.75 in. Elements) | CLTEQ-M19-BELT-HTR     | 714529-000 |
| Model 19 - Wide (6 in. Elements)        | CLTEQ-M19-BELT-HTR-6IN | 075135-000 |
| Model 19 - Narrow (1.5 in. Elements)    | CLTEQ-M19-BELTHTR-SS   | D43037-000 |

#### Optional Attachments

|                         |                     |            |
|-------------------------|---------------------|------------|
| Floor Stand with wheels | IR-1900-FLOOR-STAND | 889664-000 |
|-------------------------|---------------------|------------|



## Model 20

### Belt Heater for Heat-Shrinkable Tubing Products

#### Product Facts

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



#### Applications

The Model 20 conveyor type processor is a reliable and versatile process heater, which provides a controlled process for a wide variety of heat-shrinkable products.

Double-sided timing belts on either side of the upper and lower heating chambers draw the assemblies through a thermally controlled infrared heat zone, then through a fan-cooled zone before depositing them into the unloading bin.

#### Controlled Heating Zone

The Model 20 processor has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures (ambient to 700°C) 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.

#### Speed Control

The belt speed is selected using a 3-digit thumbwheel (on the front panel) via a closed-loop motor controller and DC gear motor.

#### Minimal Skill Requirements

There are clearly marked guides for aligning the assemblies as well as the tubing or device being processed. The operator only has to center the substrate, then align the tubing and slide the assembly into the belts. The belts grip and carry the assemblies through the heating and cooling

zones, depositing them into the unloading bin.

#### Versatility

The processor is designed to process a broad range of Raychem heat-shrinkable products up to 25 mm [1 in] in diameter and 127 mm [4 in] in length. The infrared energy source is well-suited to efficient processing of either single wall or adhesive-lined tubing. Temperature and speed can be controlled to accommodate a wide variety of products and substrates.

#### Safety Features:

- Emergency Stop
- Automatic cool-down circuit to extend the life of the components
- Over-temperature switch

that shuts off all power in the event of an overheat condition

- Lockout on temperature and speed controllers to prevent unauthorized changes

#### New Features

- Self-locking support post in the upper heating chamber for servicing, maintenance and emergency cool down
- Reversing motor relay which runs the timing belts in reverse until the Set Point temperature has been reached, preventing the operator from loading assemblies into the machine
- Hinged lower side panels for access to components, making routine service and maintenance much easier

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        |        | ■            |



## Specifications and Dimensions

### Model 20 (Continued)

#### Electrical

|                       |                                                                           |
|-----------------------|---------------------------------------------------------------------------|
| Power requirements    | 210-240 VAC, 20A, 1Ø, 50/60 Hz                                            |
| Heating elements      | 2 X Standard = 1580W, Wide = 1660W, Narrow = 880W                         |
| Drive system          | DC gear motor with closed loop motor controller; 3-digit thumbwheel       |
| Air flow (cooling)    | 2 – 100 CFM fans in the upper heater housing                              |
| Operating temperature | Set Point (Heater Surface) - Ambient to 700°C, Through-put = 50° to 200°C |

#### Mechanical

|                      |                                                                                        |
|----------------------|----------------------------------------------------------------------------------------|
| Conveyor belt system | Double sided timing belts; two on each side of the processor – pitch 9.5 mm [0.375 in] |
| Belt Speed           | Up to 152 cm / min [5.0 ft / min]                                                      |

#### Dimensions cm [in]

|                      |                                                      |
|----------------------|------------------------------------------------------|
| Processor dimensions | 53 cm [21 in] W x 135 cm [53 in] L x 45 cm [18 in] H |
| Shipping dimensions  | 66 cm [26 in] W x 147 cm [58 in] L x 58 cm [23 in] H |
| Processor weight     | 56 Kg [120 lbs]                                      |
| Shipping weight      | 86 Kg [190 lbs]                                      |

#### Tubing sizes

|                        |                             |
|------------------------|-----------------------------|
| Tubing diameter (max.) | Up to 25 mm [1.0 in]        |
| Tubing length (max.)   | Up to 104 mm [4.0 in] stand |

| Version                                 | Description           | Part No.   |
|-----------------------------------------|-----------------------|------------|
| Model 20 - Standard (3.75 in. Elements) | MODEL20CE-BELT-HEATER | CB8546-000 |

#### Optional Attachments

|                         |                     |            |
|-------------------------|---------------------|------------|
| Floor Stand with wheels | IR-1900-FLOOR-STAND | 889664-000 |
|-------------------------|---------------------|------------|

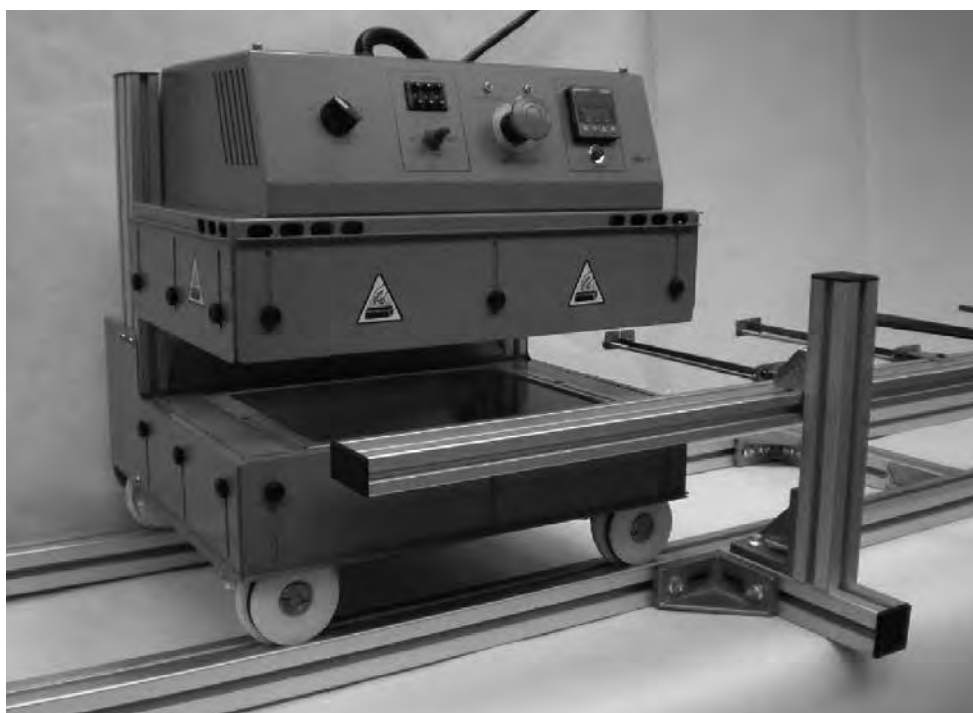
## VBH-1

### Versatile Bed Heater for Large Assemblies and Substrates

#### Product Facts

The Versatile Bed Heater (VBH-1) is the latest generation of reliable and versatile process heaters.

- Closed-loop speed and temperature control
- Controlled process
- Adaptable for a large variety long length and heat sensitive applications
- Heater operation and over-temperature alarm lights
- Heater and track are sold separately. See available track lengths on page 2-24.



#### Applications

The VBH-1 is an integrated modular unit consisting of an upper and lower heater chamber with a transporter base and motorized wheels that are directed through an aluminum track. The heater transporter automatically stops when it reaches the parking station at either end of the process area.

It has been designed to accommodate a large variety of difficult to process applications. With an adjustable upper heating chamber the heater separation can be adjusted from 37 mm [1.5 in] to a 150 mm [6 in] gap enabling the unit to process heat-shrinkable tubing products up to 127 mm [5 in] in diameter. The upper and lower chambers are provided with adjustable heat shields to maximize the oven heating efficiency.

#### Speed Control

The belt speed is selected using a 3-digit thumbwheel (on the front panel) via a closed-loop motor controller and DC gear motor.

#### Controlled Heating Zone

The VBH-1 processor has two stamped foil heating elements that are manufactured to a strict size and wattage specification. Consistent temperatures (ambient to 650°C) 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.

#### Minimal Skill Requirements

The open loading area of the holding fixtures on the VBH-1 requires that the operator simply place the assembly on the holding fixtures within the effective width of the heat zone. The assemblies can be removed once the heater transporter has passed over the assemblies and has come to a complete stop in either the right or left parking stations.

#### Versatility

The traveling heater is designed to process a broad range of heat-shrinkable products up to 127 mm [5 in] in diameter and infinite length.

The infrared energy source is well-suited 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.

- Emergency Stop
- Automatic cool-down circuit to extend the life of the components
- Over-temperature switch that shuts off all power in the event of an overheat condition
- Lockout on temperature and speed controllers to prevent unauthorized changes
- Safety guards to protect operator from moving parts and hot surfaces

#### Safety Features

| Available in: | Americas | Europe | Asia Pacific |
|---------------|----------|--------|--------------|
|               | ■        |        | ■            |

## Specifications and Dimensions

### VBH-1 (Continued)

#### Electrical

|                            |                                                                               |
|----------------------------|-------------------------------------------------------------------------------|
| Power Requirements         | 208/240 VAC, 1Ø, 50/60 Hz, 20 A                                               |
| Heating elements           | 2 X From 600 to 1600 watt infrared stamped foil with quartz face              |
| Drive system               | 1/12 hp DC motor with SCR Drive controller with a 3 digit speed potentiometer |
| Air flow (Cooling) chamber | 2 X 100 CFM fans in the upper heater housing / control box and 1 in lower     |
| Operating temperature      | Set Point (Heater Surface) - Ambient to 650°C, Through-put = 50° to 250°C     |

#### Mechanical

|                          |                                                                |
|--------------------------|----------------------------------------------------------------|
| Moving oven speed        | 12.7 cm [0.50 ft] to 254 cm [10.0 ft] / Minute                 |
| Heater separation        | Adjustable from 37 mm [1.5 in] to 150 mm [6 in] Upper Position |
| Effective heating length | 355 mm [14 in]                                                 |
| Effective heating width  | 254 mm [10 in]                                                 |

#### Dimensions cm [in]

|                            |                                                                         |
|----------------------------|-------------------------------------------------------------------------|
| Control box dimensions     | 407 mm [16 in] L x 305 mm [15 in] W x 125 mm [5 in] H                   |
| Heating Chamber dimensions | 457 mm [18 in] L x 407 mm [16 in] W x 533 mm [21 in] H – Full extension |
| Heating System weight      | 30 Kg [66 lb]                                                           |

#### Tubing sizes

|                 |                                                                                    |
|-----------------|------------------------------------------------------------------------------------|
| Tubing diameter | Up to 127 mm [5 in]                                                                |
| Tubing length   | 255 mm [10 in] perpendicular to heater travel, unlimited length parallel to heater |

| Heating unit     | Description            | Part No.   |
|------------------|------------------------|------------|
| VBH-1 Bed Heater | VBH-1-BED-HTR-220V-3WR | CJ1047-000 |

| Track                 | Description              | Part No.   |
|-----------------------|--------------------------|------------|
| 10 ft. Aluminum Track | VBH-1-BED-HTR-TRACK-10FT | CJ1494-000 |
| 15 ft. Aluminum Track | VBH-1-BED-HTR-TRACK-15FT | CM6819-000 |

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## Equivalents and Conversions

### Decimal Equivalents

| Fraction of Inch | Decimal of Inch | Decimal Millimeters | Fraction of Inch | Decimal of Inch | Decimal Millimeters |
|------------------|-----------------|---------------------|------------------|-----------------|---------------------|
| 1/64             | .0156           | 0.3969              |                  | .5118           | 13.0000             |
| 1/32             | .0313           | 0.7938              | 33/64            | .5156           | 13.0969             |
|                  | .0394           | 1.0000              | 17/32            | .5313           | 13.4938             |
| 3/64             | .0469           | 1.1906              | 35/64            | .5469           | 13.8906             |
| 1/16             | .0625           | 1.5875              |                  | .5512           | 14.0000             |
| 5/64             | .0781           | 1.9844              | 9/16             | .5625           | 14.2875             |
|                  | .0787           | 2.0000              | 37/64            | .5781           | 14.6844             |
| 3/32             | .0938           | 2.3813              |                  | .5906           | 15.0000             |
| 7/64             | .1094           | 2.7781              | 19/32            | .5938           | 15.0813             |
|                  | .1181           | 3.0000              | 39/64            | .6094           | 15.4781             |
| 1/8              | .1250           | 3.1750              | 5/8              | .6250           | 15.8750             |
| 9/64             | .1406           | 3.5719              |                  | .6299           | 16.0000             |
| 5/32             | .1563           | 3.9688              | 41/64            | .6406           | 16.2719             |
|                  | .1575           | 4.0000              | 21/32            | .6563           | 16.6688             |
| 11/64            | .1719           | 4.3656              |                  | .6693           | 17.0000             |
| 3/16             | .1875           | 4.7625              | 43/64            | .6719           | 17.0656             |
|                  | .1969           | 5.0000              | 11/16            | .6875           | 17.4625             |
| 13/64            | .2031           | 5.1594              | 45/64            | .7031           | 17.8594             |
| 7/32             | .2188           | 5.5563              |                  | .7087           | 18.0000             |
| 15/64            | .2344           | 5.9531              | 23/32            | .7188           | 18.2563             |
|                  | .2362           | 6.0000              | 47/64            | .7344           | 18.6531             |
| 1/4              | .2500           | 6.3500              |                  | .7480           | 19.0000             |
| 17/64            | .2656           | 6.7469              | 3/4              | .7500           | 19.0500             |
|                  | .2756           | 7.0000              | 49/64            | .7656           | 19.4469             |
| 9/32             | .2813           | 7.1438              | 25/32            | .7813           | 19.8438             |
| 19/64            | .2969           | 7.5406              |                  | .7874           | 20.0000             |
| 5/16             | .3125           | 7.9375              | 51/64            | .7969           | 20.2406             |
|                  | .3150           | 8.0000              | 13/16            | .8125           | 20.6375             |
| 21/64            | .3281           | 8.3344              |                  | .8268           | 21.0000             |
| 11/32            | .3438           | 8.7313              | 53/64            | .8281           | 21.0344             |
|                  | .3543           | 9.0000              | 27/32            | .8438           | 21.4313             |
| 23/64            | .3594           | 9.1281              | 55/64            | .8594           | 21.8281             |
| 3/8              | .3750           | 9.5250              |                  | .8661           | 22.0000             |
| 25/64            | .3906           | 9.9219              | 7/8              | .8750           | 22.2250             |
|                  | .3937           | 10.0000             | 57/64            | .8906           | 22.6219             |
| 13/32            | .4063           | 10.3188             |                  | .9055           | 23.0000             |
| 27/64            | .4219           | 10.7156             | 29/32            | .9063           | 23.0188             |
|                  | .4331           | 11.0000             | 59/64            | .9219           | 23.4156             |
| 7/16             | .4375           | 11.1125             | 15/16            | .9375           | 23.8125             |
| 29/64            | .4531           | 11.5094             |                  | .9449           | 24.0000             |
| 15/32            | .4688           | 11.9063             | 61/64            | .9531           | 24.2094             |
|                  | .4724           | 12.0000             | 31/32            | .9688           | 24.6063             |
| 31/64            | .4844           | 12.3031             |                  | .9843           | 25.0000             |
| 1/2              | .5000           | 12.7000             | 63/64            | .9844           | 25.0031             |
|                  |                 | 1                   |                  | 1.0000          | 25.4000             |

## Equivalents and Conversions (Continued)

### Conversion Factors

| Length                         | Area                                  | Volume                               | Mass                               |
|--------------------------------|---------------------------------------|--------------------------------------|------------------------------------|
| Inches x 25.40 = Millimeters   | Sq. inches x 6.452 = Sq. centimeters  | Cu. inches x 16.39 = Cu. centimeters | Ounces x 28.35 = Grams             |
| Millimeters x 0.03937 = Inches | Sq. centimeters x 0.1550 = Sq. inches | Cu. cm. x 0.06102 = Cu. inches       | Grams x 0.03527 = Ounces           |
| Feet x 0.3048 = Meters         | Sq. feet x 0.0929 = Sq. meters        | Cu. feet x 0.02832 = Cu. meters      | Pounds x 0.4536 = Kilograms        |
| Meters x 3.281 = Feet          | Sq. meters x 10.76 = Sq. feet         | Cu. meters x 35.31 = Cu. feet        | Kilograms x 2.205 = Pounds         |
| Miles x 1.609 = Kilometers     | Sq. miles x 2.59 = Sq. kilometers     |                                      | Kilograms/km x 0.6214 = Pounds/kft |
| Kilometers x 0.6214 = Miles    | Sq. kilometers x 0.3861 = Sq. miles   |                                      | Pounds/kft x 1.4881 = Kilograms/km |
| Ohms/km x 0.3048 = Ohms/kft    | Circular mils x 0.7854 = Sq. mil      |                                      |                                    |

### Prefixes (SI), Values, and Symbols

| Prefix | Value            | Symbol | Prefix | Value             | Symbol |
|--------|------------------|--------|--------|-------------------|--------|
| Tera   | 10 <sup>12</sup> | T      | Deci   | 10 <sup>-1</sup>  | d      |
| Giga   | 10 <sup>9</sup>  | G      | Centi  | 10 <sup>-2</sup>  | c      |
| Mega   | 10 <sup>6</sup>  | M      | Milli  | 10 <sup>-3</sup>  | m      |
| Kilo   | 10 <sup>3</sup>  | k      | Micro  | 10 <sup>-6</sup>  | μ      |
| Hecto  | 10 <sup>2</sup>  | h      | Nano   | 10 <sup>-9</sup>  | n      |
| Deca   | 10 <sup>1</sup>  | da     | Pico   | 10 <sup>-12</sup> | p      |

## Temperature Conversion Formula

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \div 1.8$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$$

| $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| -103               | -75.00             | -30                | -34.44             | 25                 | -3.89              | 65                 | 18.33              |
| -101.2             | -74.00             | -28                | -33.33             | 26                 | -3.33              | 66                 | 18.89              |
| -99.4              | -73.00             | -26                | -32.22             | 27                 | -2.78              | 67                 | 19.44              |
| -97.6              | -72.00             | -24                | -31.11             | 28                 | -2.22              | 68                 | 20.00              |
| -95.8              | -71.00             | -22                | -30.00             | 29                 | -1.67              | 69                 | 20.56              |
| -94.0              | -70.00             | -20                | -28.89             | 30                 | -1.11              | 70                 | 21.11              |
| -92.2              | -69.00             | -18                | -27.78             | 31                 | -0.56              | 71                 | 21.67              |
| -90.4              | -68.00             | -16                | -26.67             | 32                 | 0.00               | 72                 | 22.22              |
| -88.6              | -67.00             | -14                | -25.56             | 33                 | 0.56               | 73                 | 22.78              |
| -86.8              | -66.00             | -12                | -24.44             | 34                 | 1.11               | 74                 | 23.33              |
| -85.0              | -65.00             | -10                | -23.33             | 35                 | 1.67               | 75                 | 23.89              |
| -83.2              | -64.00             | -8                 | -22.22             | 36                 | 2.22               | 77                 | 25.00              |
| -81.4              | -63.00             | -6                 | -21.11             | 37                 | 2.78               | 77                 | 25.00              |
| -79.6              | -62.00             | -4                 | -20.00             | 38                 | 3.33               | 78                 | 25.56              |
| -77.8              | -61.00             | -2                 | -18.89             | 39                 | 3.89               | 79                 | 26.11              |
| -76.0              | -60.00             | 0                  | -17.78             | 40                 | 4.44               | 80                 | 26.67              |
| -74.2              | -59.00             | 1                  | -17.22             | 41                 | 5.00               | 81                 | 27.22              |
| -72.4              | -58.00             | 2                  | -16.67             | 42                 | 5.56               | 82                 | 27.78              |
| -70.6              | -57.00             | 3                  | -16.11             | 43                 | 6.11               | 83                 | 28.33              |
| -68.8              | -56.00             | 4                  | -15.56             | 44                 | 6.67               | 84                 | 28.89              |
| -67.0              | -55.00             | 5                  | -15.00             | 45                 | 7.22               | 85                 | 29.44              |
| -65.2              | -54.00             | 6                  | -14.44             | 46                 | 7.78               | 86                 | 30.00              |
| -63.4              | -53.00             | 7                  | -13.89             | 47                 | 8.33               | 87                 | 30.56              |
| -61.6              | -52.00             | 8                  | -13.33             | 48                 | 8.89               | 88                 | 31.11              |
| -59.8              | -51.00             | 9                  | -12.78             | 49                 | 9.44               | 89                 | 31.67              |
| -58.0              | -50.00             | 10                 | -12.22             | 50                 | 10.00              | 90                 | 32.22              |
| -56.2              | -49.00             | 11                 | -11.67             | 51                 | 10.56              | 91                 | 32.78              |
| -54.4              | -48.00             | 12                 | -11.11             | 52                 | 11.11              | 92                 | 33.33              |
| -52.6              | -47.00             | 13                 | -10.56             | 53                 | 11.67              | 93                 | 33.89              |
| -50.8              | -46.00             | 14                 | -10.00             | 54                 | 12.22              | 94                 | 34.44              |
| -49.0              | -45.00             | 15                 | -0.44              | 55                 | 12.78              | 95                 | 35.00              |
| -47.2              | -44.00             | 16                 | -8.89              | 56                 | 13.33              | 96                 | 35.56              |
| -45.4              | -43.00             | 17                 | -8.33              | 57                 | 13.89              | 97                 | 36.11              |
| -43.6              | -42.00             | 18                 | -7.78              | 58                 | 14.44              | 98                 | 36.67              |
| -41.8              | -41.00             | 19                 | -7.22              | 59                 | 15.00              | 99                 | 37.22              |
| -40                | -40.00             | 22                 | -6.11              | 60                 | 15.56              | 100                | 37.78              |
| -38                | -38.89             | 21                 | -6.11              | 61                 | 16.11              | 101                | 38.33              |
| -36                | -37.78             | 22                 | -5.56              | 62                 | 16.67              | 102                | 38.88              |
| -34                | -36.67             | 23                 | -5.00              | 63                 | 17.22              | 103                | 39.44              |
| -32                | -35.56             | 24                 | -4.44              | 64                 | 17.78              | 104                | 40.00              |

## Temperature Conversion Formula (Continued)

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \div 1.8$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$$

(Continued)

| $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ | $^{\circ}\text{F}$ | $^{\circ}\text{C}$ |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 105                | 40.55              | 145                | 62.78              | 185                | 85.00              | 325                | 162.78             |
| 106                | 41.11              | 146                | 63.33              | 186                | 85.55              | 330                | 165.56             |
| 107                | 41.66              | 147                | 63.88              | 187                | 86.11              | 335                | 168.33             |
| 108                | 42.22              | 148                | 64.44              | 189                | 87.22              | 340                | 171.11             |
| 109                | 42.77              | 149                | 65.00              | 189                | 87.22              | 345                | 173.89             |
| 110                | 43.33              | 150                | 65.56              | 190                | 87.78              | 350                | 176.67             |
| 111                | 43.88              | 151                | 66.11              | 191                | 88.33              | 355                | 179.44             |
| 112                | 44.44              | 152                | 66.66              | 192                | 88.88              | 360                | 182.22             |
| 113                | 45.00              | 153                | 67.22              | 193                | 89.44              | 365                | 185.00             |
| 114                | 45.55              | 154                | 67.77              | 194                | 90.00              | 370                | 187.78             |
| 115                | 46.11              | 155                | 68.33              | 195                | 90.55              | 375                | 190.55             |
| 116                | 46.66              | 156                | 68.88              | 196                | 91.11              | 380                | 193.33             |
| 117                | 47.22              | 157                | 69.44              | 197                | 91.66              | 385                | 196.11             |
| 118                | 47.77              | 158                | 70.00              | 198                | 92.22              | 390                | 198.89             |
| 119                | 48.33              | 159                | 70.55              | 199                | 92.77              | 395                | 201.67             |
| 120                | 48.89              | 160                | 71.11              | 200                | 93.33              | 400                | 204.44             |
| 121                | 49.44              | 161                | 71.66              | 205                | 96.11              | 405                | 207.22             |
| 122                | 50.00              | 162                | 72.22              | 210                | 98.89              | 410                | 210.00             |
| 123                | 50.55              | 163                | 72.77              | 215                | 101.67             | 415                | 212.78             |
| 124                | 51.11              | 164                | 73.33              | 220                | 104.44             | 425                | 215.56             |
| 125                | 51.67              | 165                | 73.89              | 225                | 107.22             | 425                | 218.33             |
| 126                | 52.22              | 166                | 74.44              | 230                | 110.00             | 430                | 221.11             |
| 127                | 52.77              | 167                | 75.00              | 235                | 112.78             | 435                | 223.89             |
| 128                | 53.33              | 168                | 75.55              | 240                | 115.56             | 440                | 226.67             |
| 129                | 53.88              | 169                | 76.11              | 245                | 118.33             | 445                | 229.44             |
| 130                | 54.44              | 170                | 76.67              | 250                | 121.11             | 450                | 232.22             |
| 131                | 55.00              | 171                | 77.22              | 255                | 123.89             | 455                | 235.00             |
| 133                | 56.11              | 172                | 77.77              | 260                | 126.67             | 460                | 237.78             |
| 133                | 56.11              | 173                | 78.33              | 265                | 129.44             | 465                | 240.55             |
| 134                | 56.66              | 174                | 78.88              | 270                | 132.22             | 470                | 243.33             |
| 135                | 57.22              | 175                | 79.44              | 275                | 135.00             | 475                | 246.11             |
| 136                | 57.77              | 176                | 80.00              | 280                | 137.78             | 480                | 248.89             |
| 137                | 58.33              | 177                | 80.55              | 285                | 140.55             | 485                | 251.67             |
| 138                | 58.88              | 178                | 81.11              | 290                | 143.33             | 490                | 254.44             |
| 139                | 59.44              | 179                | 88.66              | 295                | 146.11             | 495                | 257.22             |
| 140                | 60.00              | 180                | 82.22              | 300                | 148.89             |                    |                    |
| 141                | 60.55              | 181                | 82.77              | 305                | 151.67             |                    |                    |
| 142                | 61.11              | 182                | 83.33              | 310                | 154.44             |                    |                    |
| 143                | 61.66              | 183                | 83.88              | 315                | 157.22             |                    |                    |
| 144                | 62.22              | 184                | 84.44              | 320                | 160.00             |                    |                    |



## Glossary

**Abrasion-resistance**

A measure of the ability of a wire or wire covering to resist damage by mechanical means.

**Accelerated Aging**

A test in which voltage, temperature, or other test parameters are increased above normal operating values to obtain observable deterioration in a relatively short time. The plotted results give service life within the context of the test.

**Adapter**

A device usually attached to the rear of connectors that provides for the attachment of harnessing components, such as strain-relief clamps, heat-shrinkable boots, and braid.

**Adhesive Liner**

Lining that melts and flows inside a sleeve or molded part, filling any voids in between the substrate and the sleeve or molded part. DuraSeal has an adhesive liner.

**Adhesive (Hot Melt)**

Dual-wall tubing and pre-coated molded parts whose inner layer melts and flows when heated, fills voids in the areas being covered, and forms a mechanical bond to the substrate. Unlike an encapsulant, an adhesive forms a mechanical bond to the substrate.

**Aging**

Change in the properties of a material over time and under specific conditions. Generally refers to environmental stimulus such as heat and light.

**Amnesia**

The tendency over time for a heat-shrinkable elastomeric tubing or molded part to fail to recover completely to its specified recovered size. See Shelf Life.

**ASTM****(American Society for Testing and Materials)**

A nonprofit industry wide organization that formulates test methods and material specifications, and publishes standards, testing methods, recommended practices, definitions, and other materials.

**AWG****(American Wire Gauge)**

The recognized method (in the United States) of specifying conductor size. The higher the gauge number, the smaller the conductor size.

**Bare Conductor**

A conductor not covered with insulating material.

**Barrel**

- 1.) Connector barrel: The section of the terminal, splice, or contact that accommodates the stripped conductor.
- 2.) Insulation barrel: The section of the terminal, splice, or contact that accommodates the conductor insulation.
- 3.) Open barrel: The section of a cap that accommodates the conductor.

**Batch Number**

See Lot Number.

**Beaming**

Crosslinking by means of high-energy electrons.

**Bonding Temperature**

Temperature above which adhesive melts and flows sufficiently to form an adhesive bond between substrates.

**Breakdown Voltage**

The voltage at which an insulator or dielectric fails to maintain the applied voltage.

**Breakout**

A region in a harness assembly where a wire or a

group of wires is detached to form a separate, terminated branch. Also known as a transition.

**Brittle Temperature**

The temperature below which a material becomes brittle, often measured by a cold impact test.

**Cable Clamp**

A mechanical clamp attached to the cable side of a termination assembly to support the cable or wire bundle. It provides strain relief and absorbs vibration and shock that would otherwise be transmitted by the cable terminations.

**Cable Clamp Adapter**

A mechanical adapter that attaches to the rear of a termination assembly to allow the attachment of a cable clamp.

**Cable Sealing Clamp**

A device consisting of a gland nut designed to seal around the jacket of a cable.

**Chemical Resistance**

The ability of an insulation to withstand the presence of materials—such as acids, bases, water, salt water, and fuels—that can deteriorate the insulation, or that, if penetrable to the conductor, can cause dielectric loss of insulating qualities.

**Cold Bend**

A test conducted by wrapping tubing or cable around a mandrel or by bending it in an arc while at a low temperature.

**Cold Flow**

Permanent deformation of polymeric materials (insulation) at ambient temperature due to mechanical force or pressure (not due to heat softening).

**Cold Impact**

A test performed by subjecting a component to a speci-

## Glossary (Continued)

fied impact during exposure to low temperature. It measures the brittleness of the material.

### Color Code

A means of identifying cable components using solid colors or stripes. Also, the scheme that assigns a number from 0 to 9 for each of 10 colors.

### Color Stability

The time and temperature ranges within which the color of a material will remain within the specified color limit.

### Compound

An insulating or jacketing material made by formulating polymeric materials and additives.

### Concentricity

Ratio (expressed as a percentage) of the thinnest to the heaviest wall thickness. Measured on expanded or recovered tubing, or wire insulation, or jacketing.

### Conduit

A tubular raceway for holding wires or cables.

### Connector

A device used to physically and electrically connect two or more conductors.

### Connector Classes

Categories based on shape, function, and smallest-size contact in a series.

### Connector Insert

In connectors with metal shells, the part that holds contacts in proper arrangement while electrically insulating them from each other and from the shell.

### Contact

The element in a connector that makes the actual electrical connection. Also the parts of a connector that actually carry the electrical current, and are touched

together or separated to control the flow.

### Contact Crimp

A contact whose rear portion is a hollow cylinder that accepts the conductor. A crimping tool is applied to swage or form the contact metal firmly against the conductor. Sometimes referred to as a solderless contact.

### Contact Resistance

The direct-current resistance of a pair of mated contacts.

### Contact Size

The diameter of the engagement end of a pin contact; also related to the current-carrying capacity of a contact.

### Continuity

A continuous path for the flow of current in an electrical circuit.

### Continuous Operating Temperature

Maximum temperature at which a component will maintain an acceptable life-time performance, based on accelerated aging prediction.

### Continuous Service

Conditions (time, temperature, environment) that describe the lifetime requirements of a component.

### Core

- 1.) In cables, a component or assembly of components over which additional components, such as a shield or a sheath, are applied.
- 2.) Inner wall of dual-wall heat-shrinkable tubing.

### Coupling Ring

The portion of a plug that aids in the mating and demating of a plug and receptacle and holds the plug to the receptacle.

### Cover, Electrical Connector

An item specifically designed to cover the mating end of a connector for mechanical and/or environmental protection. Also known as a dust cover.

### Crimp

Final configuration of a terminal barrel formed by the compression of the terminal barrel and conductor.

### Crimping Die

Portion of the crimping tool that shapes the crimp.

### Crimping Tool

Mechanism used for crimping.

### Crosslinking

The formation of bonds between molecular chains in a polymer by means of chemical catalyzation or electron bombardment. The properties of the resulting thermosetting material are usually improved.

### Crosslinking by Irradiation

A method of crosslinking polymers that makes a non-flowing material. This generally improves the properties of the polymer.

### Crystallinity

The portion of polymer chains that are ordered in a regular (as opposed to amorphous) structure or a crystal lattice. Crystallinity tends to improve mechanical properties and fluid resistance. Crystalline or semicrystalline materials have a well-defined melting point (shrink temperature) at which the structure becomes disordered and the polymer flows.

### CSA (Canadian Standards Association)

An agency that has developed standard specifications for products with particular emphasis on safety in the end use.

### Current

## Glossary (Continued)

A movement or flow of electrons. Also, the measure of this flow, expressed in amperes.

### Current Rating

The maximum continuous electrical flow of current for which a device is designed to conduct for a specified time at a specified operation temperature. Usually expressed in amperes.

### Cut-through Resistance

Resistance of solid material to penetration by an object (typically a closely controlled knife edge) under conditions of pressure, temperature, and other elements.

### Dielectric

Any insulating material between two conductors that permits electrostatic attraction and repulsion to take place across it. A material having electrical insulating properties.

### Dielectric Breakdown

The voltage required to cause an electrical failure or breakthrough of the insulation. Determined by a destructive test. See also Breakdown Voltage.

### Dielectric Constant (also K)

The ratio of the capacitance between two electrodes with a solid, liquid, or gaseous dielectric, to the capacitance with air between the electrodes.

Also called permittivity and specific inductive capacity. Generally low values are desirable for insulation.

### Dielectric Strength

The maximum voltage a dielectric can withstand without rupture. Usually expressed as volts per mil.

### Dielectric Withstand Voltage (DWV)

A test voltage for a wire, cable, or insulation.

### Dissipation Factor

The ratio between the permittivity and the conductivity of a dielectric.

### Drain Wire

In a cable, an uninsulated conductor laid over the component, or components, in a foil-shield cable. Used as a ground connection.

### Dust Cover

See Cover, Electrical Connector.

### EID

See See Expanded ID.

### Elastic Memory

The ability of a crosslinked polymer to be deformed to some predetermined shape, hold that shape for a period, and then return to its original shape upon the application of heat.

### Elastomer

A material that exhibits very low or zero crystallinity and a high degree of flexibility (rubber is a synonym).

### Elongation

The ultimate elongation, or elongation at rupture. Expressed as a percentage of original length.

### EMI

Abbreviation for electromagnetic interference.

### Encapsulant

Description related to the way dual-wall tubing products and precoated molded parts melt and flow when heated, filling any void in the area being covered. Unlike an adhesive, an encapsulant does not form a mechanical bond to the substrate.

### Encapsulation

Covering and sealing.

### Environmentally Sealed

Description of a system to keep out moisture, dirt, air, or dust that might reduce performance.

### Epoxy

A family of thermosetting resins usually used as adhesives or encapsulants.

### ETFE (Ethylenetetrafluoroethylene)

A fluoropolymer used as base resin for SPEC 55 wire and HCTE.

### Expanded ID (EID)

The specified minimum (as supplied) internal diameter of tubing.

### Expansion Ratio

An expression of how much larger the inside diameter of a tubing is before shrinking. Specifically, the relationship of the minimum (expanded) inside diameter of tubing to the maximum (recovered) inside diameter, expressed as a ratio. See also Shrink Ratio.

### Extraction Tool

A tool used for removing contacts from a connector body.

### Extrusion

A process that conveys plastic insulation material, generally via a screw, through forming dies and subsequently cools the insulation material to form a predetermined shape.

### Feedthru (feedthrough)

A bushing in a wall or bulkhead with terminations on one or both sides.

### Flame-resistant

A descriptor applied to a material that is inherently resistant to burning.

### Flame Retardant

A descriptor applied to a material that has been made or treated so as to resist burning.

## Glossary (Continued)

### Fluoropolymer

A polymer that contains atoms of fluorine.

### Full Recovery Temperature, Minimum

See Recovery Temperature.

### Gauge

A term used to denote the physical size of a wire. See also AWG.

### Grounding Conductor

A conductor that provides a current return path from an electrical device to ground.

### Hardness

A general term that correlates with strength, rigidity, and resistance to abrasion or penetration. Measured on Shore or Rockwell scales. See also Shore.

### Harness

A system providing electrical connection between two or more points.

### Heat Aging

A test that subjects components or materials to temperatures above normal operating values to evaluate changes in performance in order to predict service life. See also Accelerated Aging.

### Heat Shock

A test to determine the stability of a material by continuously exposing it to an extremely high temperature for a short period of time. The test was developed both to demonstrate that the material is crosslinked and to observe any problems in dripping, cracking, or flowing.

### Heat-Shrinkable Material

A polymeric material capable of being reduced in size when exposed to heat.

### Hookup Wire and Cable

Wiring used to connect various points in electronic assemblies.

### Hot-Melt Adhesive

An adhesive that becomes activated by heating. When heated, it melts, flows over the substrate surface, and forms an adhesive bond. Reheating causes the adhesive to remelt.

### ID (Internal Diameter)

The inside or internal diameter of a tubing.

### Insulated Terminal

A solderless terminal with an insulated sleeve over the barrel to prevent a short circuit in certain installations.

### Insulation, Electrical

A nonconductive material usually surrounding or separating two conductive materials. Often called the dielectric in cables designed for high-frequency use.

### Insulation, Thermal

A nonconductive material that prevents the passage of heat.

### Insulation Resistance

Minimum electrical resistance permitted between any pair of contacts and between conductors and grounding devices of the same connectors in various combinations. An indication of the insulating properties of a material.

### Interconnection

The joining of one individual device with another.

### Irradiation

In insulations, the exposure of the material to high-energy emissions for the purpose of favorably altering the molecular structure via crosslinking.

### Jacket

- 1.) A material covering over a wire or cable assembly.
- 2.) Outer covering of a dual-wall heat-shrinkable tubing.

### kV (Kilovolt)

A unit equal to 1000 volts.

### Kynar

Trade name (of Atofina Chemicals, Inc.) for polyvinylidene fluoride and its copolymers.

### Life Cycle

A test to determine the length of time before failure in a controlled, usually accelerated environment.

### Liner

See Core.

### Longitudinal Change (Shrink Tubing)

The change in length of tubing when recovered. Expressed in the percent of change from the original length.

### Loss

Electrical energy that is dissipated as heat.

### Loss Factor

The product of the power factor and dielectric constant of an insulating material.

### Lot Number

The number that identifies one production run of material. Also known as a batch number.

### Lug

A termination, usually crimped or soldered to a conductor, that allows connection to be made with a retaining screw.

### Marking

A printed identification number or symbol applied to the surface of a wire or cable.

### Megarad

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**Glossary** (Continued)

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A unit for measuring radiation dosage.

**Melt/Flow Index**

Measurement of the flow of thermoplastic material under given conditions of temperature and pressure. Expressed as grams per unit of time.

**Melting Point**

The temperature at which crystallinity disappears when crystalline material is heated.

**Mil**

A unit equal to one one-thousandth of an inch (.001"); used in measuring the diameter of a conductor or thickness of insulation over a conductor.

**MIL-SPEC**

Abbreviation for Military Specification, which is a document the U.S. Government issues to define a product that will be used in military end-use applications.

**Milking Off**

Action that occurs when the inner layer (the encapsulant or adhesive) of the tubing or molded part acts as a lubricant, allowing the tubing to slip off the substrate (because the tubing wants to recover to a smaller diameter).

**Minimum Full Recovery Temperature**

See Recovery Temperature.

**MO (Manufacturing Order)**

A series of operation-work-order cards identifying materials to be used and the type and quantity of products to be manufactured. An MO is controlled and issued by Production Control to the manufacturing operation.

**MOD Code (Material Modification Code)**

A code designating a particular stage in the production process. Most MOD codes

describe the way the product is packaged.

**MS (Manufacturing Specification)**

A set of process instructions used in the manufacturing of tubing products. Customer Logistics, Product Management, or Manufacturing Engineering initiate the MS; Manufacturing Engineering controls it. The product design and quality parameters are provided to Manufacturing Engineering by Product Development and Quality Assurance. Successful trial runs of a new product or design usually precede the initiation of an MS (see SMO). A proprietary Raychem document, an MS is not available to customers.

**Nick**

A small cut or notch in conductor strands or insulation.

**Nominal**

A descriptor applied to a dimension representing the center of the range of tolerance or a value if no tolerance is applied.

**OFT (Optional Flame Test)**

Canadian Standards Association's test for flame-retardance. Tubing with an OFT rating is highly flame-retardant.

**Ohm**

The unit of electrical resistance.

**Operating Temperature**

The maximum internal temperature at which a system, harness, or connector may operate in continuous service; generally expressed as a time and temperature.

**Operating Temperature Range**

The range between the maximum and the minimum internal temperature of insu-

lation in a system, harness, or connector in continuous service. The lower limit is determined by low-temperature flex test.

**Optional Flame Test**

See OFT.

**Packaging**

The process of physically locating, connecting, and protecting devices or components.

**PC (Production Control)**

Group responsible for directing and regulating the movement of goods through the entire manufacturing cycle, from the requisitioning of raw materials to the delivery of the finished products.

**PCN**

See RPN.

**Permittivity**

See Dielectric Constant.

**Pigtail**

A short conductor or wire extending from an electrical or electronic device to serve as a jumper or ground connection.

**Pin Contact**

An electrical terminal, usually in a connector. Normally a smaller termination than a lug.

**Plastic Deformation**

Change in dimensions under a load that does not recover when the load is removed.

**Plasticizer**

A softener or lubricant added to a compound to make it easier to process or more flexible in use.

**Poke Through**

A term describing stray wires in a solder joint that poke through the insulation.

**Polyamide**



## Glossary (Continued)

A polymer formed by the reaction of a diamine and a diacid. Nylons are commercial polyamides characterized by toughness, solvent resistance, and sharp melting point.

### Polymer

A material of high molecular weight formed by the chemical union of monomers.

### Polyolefin

A family of polymers (such as polyethylene and polypropylene) made from olefin monomers.

### Potting

The permanent sealing of the cable end of a connector with a compound or material that thermosets into an elastomer, to exclude moisture and/or to provide strain relief.

### Pre-etching

The act of surface preparation before encapsulating.

### Primary Insulation

The inner member of a dual-wall wire insulation. The insulation applied directly on the conductor. Also referred to as the core. See also Core.

### PVC (Polyvinyl chloride)

A polymer compound used as wire insulation.

### PVDF

Polyvinylidene fluoride.

### Quality Assurance

Systematic, planned, and documented activities designed to provide confidence that a product will meet specifications.

### Quality Control

Activities that monitor, measure, and control the characteristics of a material, component, or product to documented specifications.

### Quick Disconnect

A type of connector shell that permits rapid locking and unlocking of two connector halves.

### Radiation Crosslinking

The act of crosslinking a material with ionizing radiation. (Most Raychem products are radiation crosslinked, with an electron beam as the form of ionizing radiation.) See also Crosslinking by Irradiation.

### Rated Temperature

The maximum temperature at which a component can operate for extended periods with acceptable changes in its basic properties.

### Rated Voltage

The maximum voltage at which an electric component can operate for extended periods without undue degradation.

### Recover (Heat-shrinkable Components)

Activation of the elastic memory principle (usually with heat) to cause a tubing or molded part to return to its original size.

### Recovered ID (RID)

In heat-shrink tubing, the guaranteed maximum internal diameter of tubing after being freely recovered.

### Recovery Temperature

The minimum temperature required to fully shrink a product, that is, for the product to recover completely.

### Resistance

A measure of the difficulty in moving electrical current through a conductor or insulation when a voltage is applied. It is measured in ohms.

### RID

See Recovered ID.

### RPN (Raychem Product Number)

A 10-digit number (such as 123456-4-001) assigned to every standard product and every product manufactured on a special manufacturing order (SMO). The first 6 digits represent the PCN (Product Control Number), followed by a 1-digit MOD Code, and finally a 3-digit suffix. See also MOD Code and SMO.

### RT and RW specifications

Specification that describes standard product properties. Qualification and acceptance inspection criteria are incorporated into RT and RW specifications. RT and RW specifications are issued and controlled by the Specifications Group.

### SCD (Specification Control Drawing)

Drawing that defines configuration and material parameters. Issued and controlled by the specifications group, SCDs are frequently used in conjunction with RT Specifications for Thermofit products.

### Sealant

Soft, tacky, pliable material that seals where mechanical strength is not required.

### Sealed

Environmentally protected by the thermoplastic inserts or core of encapsulant/ adhesive that has melted down around the substrate.

### Secant Modulus

A measure of material stiffness; stiffer material has a higher secant modulus. More specifically, the secant modulus is the ratio of stress (nominal) to corresponding strain at any specified point on the stress-strain curve. It is expressed in force per unit area (usually kilograms per square centimeters or pounds per square inch), and reported together with the specified stress or strain.

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**Glossary** (Continued)

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**Service Life**

Period of time during which the product is expected to perform satisfactorily.

**Service Rating**

The maximum voltage or current that a termination is designed to carry continuously.

**Shelf Life**

Generally, the length of time a product or material may be stored without deterioration. Specifically, the length of time during which shrink tubing will retain its expanded ID and return to its recovered ID. Usually not a concern—except for some “amnesic” materials. See Amnesia.

**Shore**

A scale for comparing hardness. Higher Shore values represent harder materials. The hardness of a polymer, for example, is usually represented as Shore A or Shore D, with D being harder.

**Shrink Ratio**

An expression of how much the inside diameter of shrink tubing will reduce in size when recovered. The inverse of the expansion ratio. See also Expansion Ratio.

**Shrink Temperature, Minimum**

The minimum temperature at which a product begins to recover.

**Skew**

Any out-of-squareness of the cut end of a piece of tubing after shrinking.

**SMO (Special Manufacturing Order)**

An order to evaluate manufacturing and production capability for a new or changed design for a customer and to provide

development samples of potential products for customers. SMO products are separate and distinct from standard products. New, potential products are usually run as SMO products for a minimum of three times before being considered for manufacture as a standard product.

**Solid Conductor**

A conductor composed of one single strand.

**Solvent Resistance**

The ability of a material to retain physical and electrical properties after being immersed in specific solvents.

**SPC (Statistical Process Control)**

The use of statistical techniques such as control charts to analyze a process or its output so as to take appropriate actions to achieve and maintain a state of control and to improve the capability of the process.

**Specific Gravity**

The ratio of the density (mass per unit volume) of a material to that of water.

**Specific Inductive Capacity**

See Dielectric Constant.

**Splice**

A joint connecting conductors with good mechanical strength and conductivity; a terminal that permanently joins two or more wires.

**Strain Relief**

The technique for or act of removing or lessening the strain or stress on a joint, splice, or termination. Solder Sleeve devices provide strain relief.

**Strip**

To remove insulation from a wire or cable.

**Stripe**

A continuous longitudinal or spiral color strip applied on the surface of a wire, cable, or tubing for identification.

**Substrate**

The material—such as a wire, post, or tab—over which an interconnection device is used.

**Tear Test**

A test to determine the tear strength of an insulating material. Usually includes exposure to given thermal conditions or a programmed series of conditions for prescribed periods of time.

**Temperature Rating**

The maximum temperature at which the insulating material may be used in continuous operation without loss of its basic properties. Usually time dependent.

**Tensile Strength**

The pull stress (in force per unit area) required to break a given specimen.

**Thermal Rating**

The effect of heat or cold applied at such a rate that nonuniform thermal expansion or contraction occurs within a given material or combination of materials. In electrical terminations, the effect can cause inserts and other insulation material to pull away from the metal parts.

**Thermal Shock**

The effect of high and low temperatures applied at a rapid rate such that nonuniform thermal expansion or contraction occurs within a given material or combination of materials. The result could be stress-cracking or shattering of material.

**Thermoplastic**

## Glossary (Continued)

A material that softens (melts and flows) when heated and becomes firm when cooled. A type of plastic that can be remelted a number of times without any important change in properties. Nylon, GE's Lexan, and PVC—examples of this type of plastic—are resilient after molding.

### Thermoset

A material that hardens or sets when heated and, once set, cannot be resoftened by heating. This application of heat is called "curing."

### Thermosetting Plastic

A type of plastic in which an irreversible chemical reaction takes place while the plastic is being molded under heat and pressure.

### Thermosetting Adhesive

A curing adhesive that requires heat to promote curing. This type of plastic will not soften when reheated. See Epoxy.

### Tolerance

The total amount by which a quantity is allowed to vary from nominal; thus, the tolerance is half the algebraic difference between the maximum and minimum limits.

### Traceability

The ability to trace the history, application, or location of an item and like items or activities by means of recorded identification. The lot number/manufacturing order (MO) number, or SMO number used to identify items or groups of items is traceable back to inspection and procurement records.

### UL (Underwriters' Laboratories)

A nonprofit independent testing organization that operates a listing service for electrical and electronic materials and equipment.

### Ultraviolet Degradation

The degradation caused by long-time exposure of a material to sunlight or other ultraviolet rays.

### Voltage

The term most often used in place of electromotive force, potential, potential difference, or voltage drop to designate the electric pressure that exists between two points and that is capable of producing a current when a closed circuit is connected between the two points.

### Voltage Breakdown

The voltage necessary to cause insulation failure.

### Voltage Rating

The voltage that may be continuously applied to wire.

### Volume Resistivity

Reciprocal of conductivity; the resistance of a material to the flow of electrical current, usually expressed in ohm-cm.

### VW-1

A rating determined by the Underwriters' Laboratories' (UL) optional Vertical Wire Flame Test—the most difficult flame test for tubing. Tubings with a VW-1 rating are highly flame-retardant.

### Wall Thickness

The thickness of the applied insulation or jacket.

### Water Absorption Test

A method to determine the water uptake of a material. It is time and temperature dependent.

### Water Blocking

The sticking together of insulated wires; usually caused by heat.

### Wicking

The longitudinal flow of a liquid in a wire or cable construction due to capillary action. (This may also apply to solder.)

### Withstanding Voltage

The test voltage an electrical connector can withstand for one minute without showing evidence of electrical breakdown when the voltage is applied between conductors and grounding devices of the connectors in various combinations.

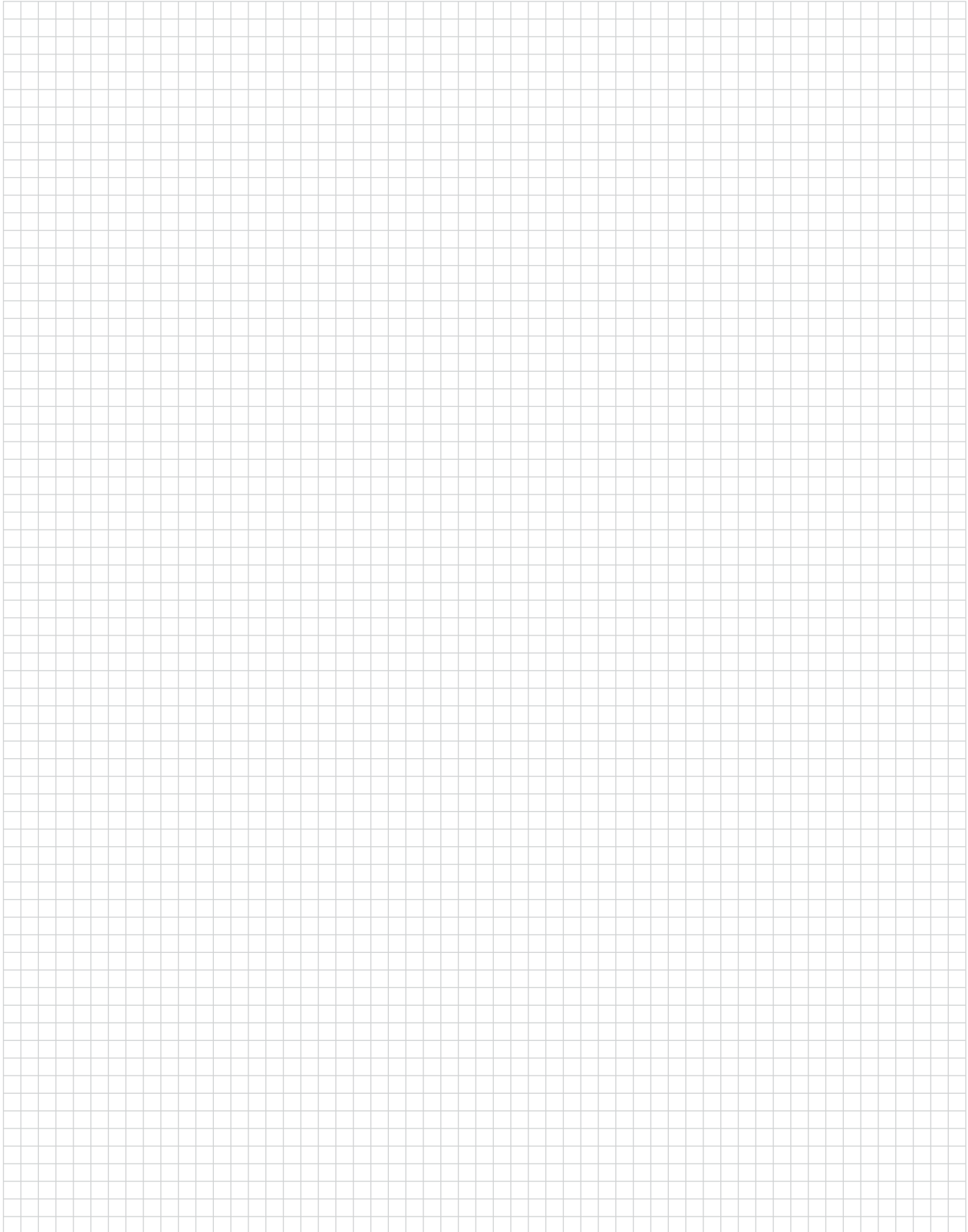


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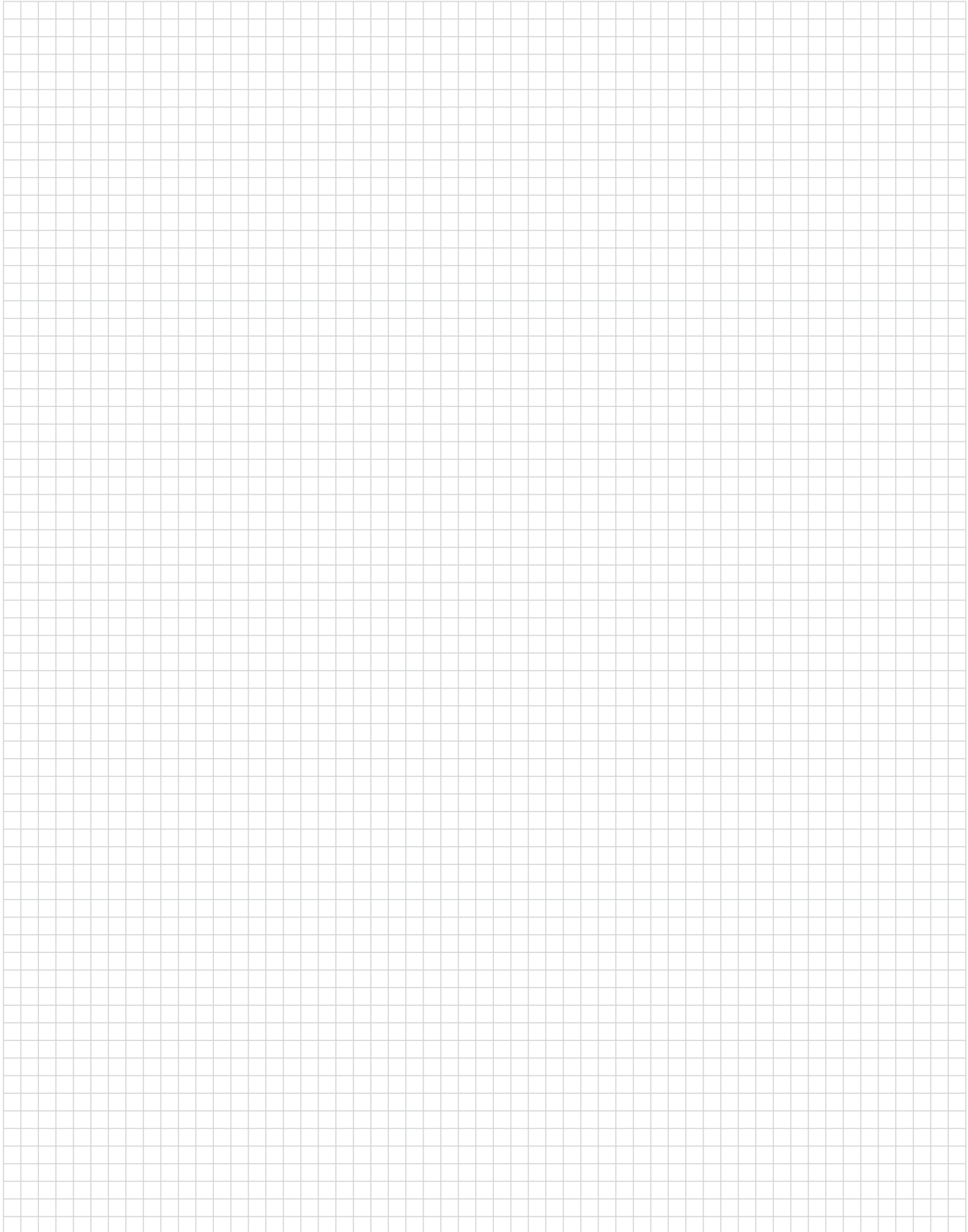
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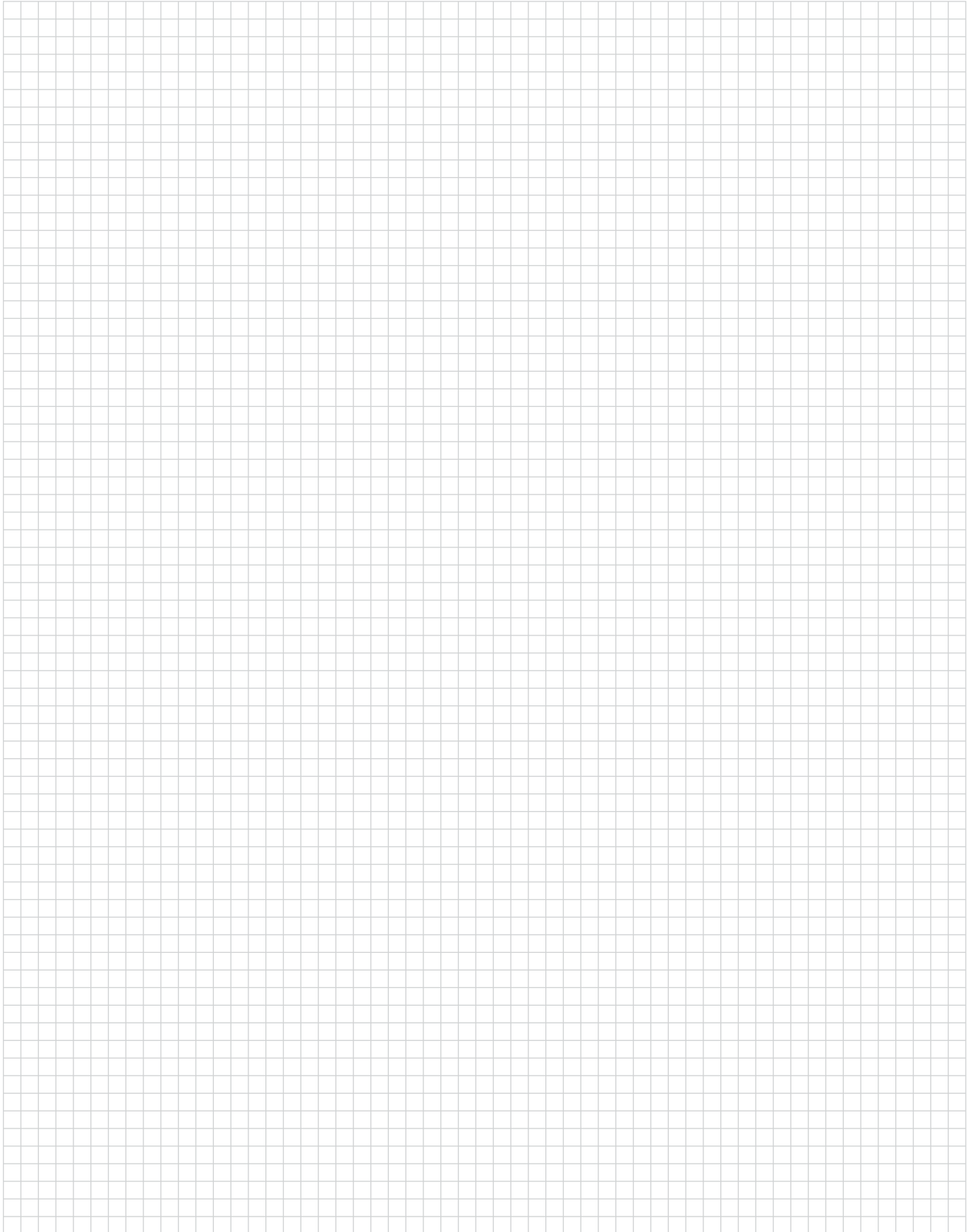
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