Section 14.
Shrink & Non-Shrink Tubing

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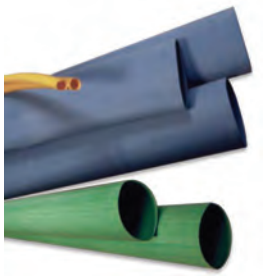
HS-101 PVC Heat Shrinkable Tubing

Construction: **Insulation:** PVC

Features:
2:1 Shrink Ratio. Excellent all purpose, highly flexible insulation. Highly flame retardant.* Excellent chemical, physical and electrical properties. Low shrink temperature. Easily marked. Superior resistance to abrasion. Free of polybrominated biphenyls and polybrominated biphenyl oxides and ethers, which are classified as environmentally hazardous substances. Meets UL, CSA and Military specifications.

Applications:
Insulation and strain relief of wire splices, terminals and wire connections. Electrical insulation and protection of in-line components. Bundling wires for flexible, light-duty harnesses. Color coding or identifying wire, cables, terminals and components. Commercial and military applications.

Additional Information:
Shrink Ratio: 2:1. Minimum Recommended Shrink Temperature: 90ºC (194ºF).
Operating Temperature Range: -55ºC to 135ºC. See table below for more information.



Technical Data:

Temperature:
135°C

Rated Voltage: 600V

Color Code:
Standard Colors: Black, Clear, White, Red, Yellow, Green, Blue

Approvals:
UL Subject 224 VW-1.
CSA OFT rated for 600V.
SAE-AMS-DTL-23053/5 Classes 1&3 (Colors).
SAE-AMS-DTL-23053/5 class 2 (Clear)

*Except clear

Part Number		Expanded I.D. Minimum		Recovered I.D. Maximum		Recovered Wall Nominal		Standard Packaging (per box) Product on Spools		4-foot Lengths
	Size	in.	mm	in.	mm	in.	mm	ft. / Spool	Total ft. / Box	Total ft. / Box
HS101-3/64-X	3/64	.046	1.17	.023	0.58	.016	0.41	1,000'	3,000'	1,000'
HS101-1/16-X	1/16	.063	1.60	.031	0.79	.017	0.43	1,000'	3,000'	1,000'
HS101-3/32-X	3/32	.093	2.36	.046	1.17	.020	0.51	500'	1,500'	1,000'
HS101-1/8-X	1/8	.125	3.18	.062	1.57	.020	0.51	500'	1,500'	1,000'
HS101-3/16-X	3/16	.187	4.75	.093	2.36	.020	0.51	250'	750'	1,000'
HS101-1/4-X	1/4	.250	6.35	.125	3.18	.025	0.64	200'	600'	800'
HS101-3/8-X	3/8	.375	9.53	.187	4.75	.025	0.64	200'	600'	500'
HS101-1/2-X	1/2	.500	12.70	.250	6.35	.025	0.64	200'	600'	400'
HS101-3/4-X	3/4	.750	19.05	.375	9.53	.030	0.76	200'	600'	200'
HS101-1-X	1	1.000	25.40	.500	12.70	.035	0.89	100'	300'	96'
HS101-1-1/4-X	1 1/4	1.250	31.75	.625	15.87	.040	1.02	100'	300'	96'
HS101-1-1/2-X	1 1/2	1.500	38.10	.750	19.05	.040	1.02	100'	200'	96'
HS101-2-X	2	2.000	50.80	1.000	25.40	.045	1.14	100'	200'	96'
HS101-3-X	3	3.000	76.20	1.500	38.10	.050	1.27	50'	50'	48'
HS101-4-X	4	4.000	101.60	2.000	50.80	.055	1.40	50'	50'	48'

Complete catalog available online at: www.lapptannehill.com

HS-105 PVC Heat Shrinkable Tubing

Construction: Insulation: PVC

Features:
2:1 Shrink ratio. Low shrink temperature. All colors, including clear, are highly flame retardant. Engineered for total compatibility with PVC jacketed wire and cable. Resists many chemicals and oils,* chlorine, moisture, salt water and fungus. Proprietary stabilizers provide outstanding resistance to UV light. 'Clear' is crystal clear, colors are vivid. High gloss, matte, metallic, neon, pearlescent "designer" colors and custom color formulations are available. Highly engineered formulation provides superior strength – 30% stronger than polyolefin. Available in standard sizes – up to extra large 4" diameters. Meets RoHS, UL, CSA and Military specifications.

Applications:
Applications requiring smooth, tight-fitting, aesthetic coverings, especially for products with irregular shapes. Protecting products – outdoors and indoors – from UV light, fading, harsh chemicals, chlorinated cleansers, moisture, salt water, fungus, dirt, abrasion and splintering. Providing "crystal clear" see-through protection that will not become cloudy, yellow or crack over time. The preferred choice for use with PVC wire and cable. Insulation and strain relief of wire harnesses, terminals and wire splices. Applications requiring outstanding dielectric and mechanical protection without damage to enclosed, underlying or adjacent components.

Additional Information:
Shrink ratio: 2:1. Minimum Recommended shrink temperature: 100ºC (212ºF).
Operating temperature range: -20ºC to 105ºC. Longitudinal Shrinkage: Approximately 15%.

Technical Data:

Temperature:
105°C

Rated Voltage: 600V

Color Code:
Standard Colors: Black, White, Red, Blue, Yellow, Clear

Approvals:
Lead free and RoHS compliant
UL subject 224 VW-1
CSA OFT rated for 600V
ASTM D 3150
SAE-AMS-DTL-23053/2 Class 2

*Including chlorinated cleaners, lubricating grease, penetrating oils, electrical insulation oils, and others.

Part Number		Expanded I.D. Minimum		Recovered I.D. Maximum		Recovered Wall Nominal		Standard Packaging (per box) Product on Spools	
	Size	in.	mm	in.	mm	in.	mm	ft. / Spool	Total ft. / Box
HS105-3/64-X	3/64	.046	1.17	.023	0.58	.020	0.51	*1,000'	2,000'
HS105-1/16-X	1/16	.063	1.60	.032	0.82	.020	0.51	*1,000'	2,000'
HS105-3/32-X	3/32	.093	2.36	.046	1.17	.025	0.64	*1,000'	2,000'
HS105-1/8-X	1/8	.125	3.18	.063	1.60	.025	0.64	*1,000'	2,000'
HS105-3/16-X	3/16	.187	4.75	.093	2.36	.025	0.64	*1,000'	2,000'
HS105-1/4-X	1/4	.250	6.35	.125	3.18	.025	0.64	*1,000'	2,000'
HS105-5/16-X	5/16	.313	7.94	.157	3.99	.028	0.71	*500'	1,000'
HS105-3/8-X	3/8	.375	9.53	.187	4.75	.028	0.71	*500'	1,000'
HS105-1/2-X	1/2	.500	12.70	.250	6.35	.028	0.71	*250'	500'
HS105-1/2-X	1/2	.500	12.70	.250	6.35	.028	0.71	500'	1,000'
HS105-5/8-X	5/8	.625	15.88	.313	7.94	.033	0.84	250'	500'
HS105-3/4-X	3/4	.750	19.05	.375	9.53	.033	0.84	250'	500'
HS105-1-X	1	1.000	25.40	.500	12.70	.038	0.97	250'	500'
HS105-1-1/4-X	1 1/4	1.250	31.75	.625	15.88	.041	1.04	250'	500'
HS105-1-1/2-X	1 1/2	1.500	38.10	.750	19.05	.043	1.09	100'	200'
HS105-2-X	2	2.000	50.80	1.000	25.40	.048	1.22	100'	200'
HS105-2-1/2-X	2 1/2	2.500	63.50	1.250	31.75	.058	1.47	100'	200'
HS105-3-X	3	3.000	76.20	1.500	38.10	.068	1.73	50'	100'
HS105-4-X	4	4.000	101.60	2.000	50.80	.073	1.85	50'	100'

* Pressurized Spools

HS-105 x .032 Heavy Wall PVC Heat Shrinkable Tubing

Construction: **Insulation:** PVC

Features:
2:1 Shrink ratio. Low shrink temperature. Highly flame retardant. Resists many chemicals and oils,* sunlight, moisture and fungus. 30% stronger than polyolefin. Custom automotive and architectural grade products. Meets UL, CSA and Military specifications.

Applications:
Applications requiring a heavier wall to provide additional support for splices and terminations. Applications requiring an extra level of abrasion and impact resistance. Applications requiring smooth, tight-fitting, aesthetic coverings for products with irregular shapes. Protecting products-outdoors and indoors – from UV light, fading, harsh chemicals, chlorinated cleansers, moisture, fungus, dirt and abrasion. Applications with PVC wire and cable. Insulation and strain relief of wire harnesses, terminals and wire splices. Applications requiring outstanding dielectric and mechanical protection without damage to enclosed or adjacent components.

Additional Information:
Shrink ratio: 2:1. Minimum Recommended Shrink Temperature: 100ºC (212º).
Operating Temperature Range: -20ºC to 105ºC. Longitudinal Shrinkage: Approximately 15%.

Technical Data:

Temperature: 105°C

Color Code: Standard Color: Black

Rated Voltage: 600V

Approvals: UL Subject 224 VW-1
CSA OFT rated for 600V

*Including chlorinated cleaners, lubricating grease, penetrating oils, electrical insulation oils, and others.

Part Number		Expanded I.D. Minimum		Recovered I.D. Maximum		Recovered Wall Nominal		Standard Packaging (per box) Product on Spools	
	Size	in.	mm	in.	mm	in.	mm	ft. / Spool	Total ft. / Box
HS105HW-1/16-X	1/16	.063	1.60	.032	0.82	.032	0.81	* 1,000'	2,000'
HS105HW-3/32-X	3/32	.093	2.36	.046	1.17	.032	0.81	* 1,000'	2,000'
HS105HW-1/8-X	1/8	.125	3.18	.063	1.60	.032	0.81	* 1,000'	2,000'
HS105HW-3/16-X	3/16	.187	4.75	.093	2.36	.032	0.81	* 1,000'	2,000'
HS105HW-1/4-X	1/4	.250	6.35	.125	3.18	.032	0.81	* 1,000'	2,000'
HS105HW-5/16-X	5/16	.313	7.94	.157	3.99	.032	0.81	* 500'	1,000'
HS105HW-3/8-X	3/8	.375	9.53	.187	4.75	.032	0.81	* 500'	1,000'
HS105HW-1/2-X	1/2	.500	12.70	.250	6.35	.032	0.81	* 250'	500'

* Pressurized Spools

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4900 Tubing

Construction: **Insulation:** PVC

Features:
105ºC rated lead-free PVC tubing. Excellent general purpose flexible tubing. Resistant to many chemicals, oils and acids. Resistant to heat. Resistant to abrasion. High dielectric strength. Wide operating temperature range. Passes UL VW-1 Flame Test. Meets EU "End of Life" and "Lead Free" requirements. Meets UL, CSA, and Military specifications.

Applications:
Bundling and protecting wire harnesses. Electrical insulation of wire splices, terminals and connectors. Protection against chafing. Ground strap protection.

Additional Information:
Operating Temperature Range: -20ºC to 105ºC. See table for Physical/Electrical/Chemical Properties.

Technical Data:

Temperature:
105°C

Rated Voltage:
300V for Size #24 through Size #1
600V for Size 5/16 through Size 2"

Color Code:
Sizes up to 1 inch: Black, White, Red, Yellow, Clear
Sizes above 1 inch: Black, White, Clear

Approvals:
AMS 3631. ASTM D 922
Mil-I-631D Grade C QPL approved

Part Number		Nominal I.D.		Nominal Wall		Standard Packaging (per box) Product on Spools	
	AWG No.	in.	mm	in.	mm	ft./ Spool	Total ft./ Box
4900-24-X	24	.022	0.56	.012	0.30	2,500'	5,000'
4900-22-X	22	.027	0.69	.012	0.30	2,500'	5,000'
4900-20-X	20	.034	0.86	.016	0.41	1,000'	4,000'
4900-19-X	19	.038	0.97	.016	0.41	1,000'	4,000'
4900-18-X	18	.042	1.07	.016	0.41	1,000'	4,000'
4900-17-X	17	047	1.19	.016	0.41	1,000'	4,000'
4900-16-X	16	.053	1.35	.016	0.41	1,000'	4,000'
4900-15-X	15	.059	1.50	.016	0.41	1,000'	4,000'
4900-14-X	14	.066	1.68	.016	0.41	1,000'	4,000'
4900-13-X	13	.076	1.93	.016	0.41	1,000'	4,000'
4900-12-X	12	.085	2.16	.016	0.41	1,000'	4,000'
4900-11-X	11	.095	2.41	.016	0.41	1,000'	4,000'
4900-10-X	10	.106	2.69	.016	0.41	1,000'	4,000'
4900-9-X	9	.118	3.00	.020	0.51	1,000'	4,000'
4900-8-X	8	.133	3.38	.020	0.51	1,000'	4,000'
4900-7-X	7	.148	3.76	.020	0.51	1,000'	4,000'
4900-6-X	6	.166	4.21	.020	0.51	1,000'	2,000'
4900-3/16-X	5 (3 / 16)	.186	4.72	.020	0.51	1,000'	2,000'
4900-4-X	4	.208	5.28	.020	0.51	1,000'	2,000'
4900-3-X	3	.234	5.94	.020	0.51	1,000'	2,000'
4900-1/4-X	1 / 4	.250	6.35	.020	0.51	1,000'	2,000'
4900-2-X	2	.263	6.68	.020	0.51	1,000'	2,000'
4900-1-X	1	.294	7.47	.020	0.51	1,000'	2,000'
4900-5/16-X	5 / 16	.313	7.94	.025	0.64	500'	1,000'
4900-0-X	0	.330	8.38	.025	0.64	500'	1,000'
4900-3/8-X	3 / 8	.375	9.53	.025	0.64	500'	1,000'
4900-7/16-X	7 / 16	.438	11.11	.025	0.64	500'	1,000'
4900-1/2-X	1 / 2	.500	12.70	.025	0.64	500'	1,000'
4900-9/16-X	9 / 16	.563	14.29	.030	0.76	250'	500'
4900-5/8-X	5 / 8	.625	15.88	.030	0.76	250'	500'
4900-3/4-X	3 / 4	.750	19.05	.035	0.89	250'	500'
4900-7/8-X	7 / 8	.875	22.23	.035	0.89	100'	400'
4900-1-X	1"	1.000	25.40	.035	0.89	100'	400'
4900-1-1/8-X	1 1 / 8	1.125	28.58	.035	0.89	100'	400'
4900-1-1/4-X	1 1 / 4	1.250	31.75	.040	1.02	100'	400'
4900-1-3/8-X	1 3 / 8	1.375	34.93	.045	1.14	50'	200'
4900-1-1/2-X	1 1 / 2	1.500	38.10	.045	1.14	50'	200'
4900-1-3/4-X	1 3 / 4	1.750	44.45	.055	1.40	50'	200'
4900-2-X	2"	2.000	50.80	.060	1.52	50'	200'

4900 X .032 Tubing

Construction: **Insulation:** PVC

Features:
105ºC rated heavy wall lead-free PVC tubing. Excellent general purpose flexible tubing with a 1/32" wall thickness. Resistant to many chemicals, oils and acids. Resistant to heat. Resistant to abrasion. High dielectric strength. Wide operating temperature range. Passes UL VW-1 Flame Test. Meets EU "End of Life" and "Lead Free" requirements. Meets UL, CSA and Military specifications.

Applications:
Applications requiring compliance with UL specifications for .032" spacing between components. Bundling and protecting wire harnesses. Insulating wire splices, terminals and connectors. Protection against chafing. Ground strap protection.

Additional Information:
Operating Temperature Range: -20ºC to 105ºC. See table below for Physical/Electrical/Chemical Properties.

Technical Data:

Temperature:
105ºC

Rated Voltage: 600V

Color Code:
Standard Colors: Black, Clear

Approvals:
UL Subject 224 VW-1
CSA OFT rated for 600V
AMS 3631
ASTM D 922

Part Number		Nominal I.D.		Nominal Wall		Standard Packaging (per box) Product on Spools	
	AWG No.	in.	mm	in.	mm	ft./ Spool	Total ft./ Box
4900-HW-24-X	24	.022	0.56	.032	0.81	1,000'	4,000'
4900-HW-22-X	22	.027	0.69	.032	0.81	1,000'	4,000'
4900-HW-20-X	20	.034	0.86	.032	0.81	1,000'	4,000'
4900-HW-19-X	19	.038	0.97	.032	0.81	1,000'	4,000'
4900-HW-18-X	18	.042	1.07	.032	0.81	1,000'	4,000'
4900-HW-17-X	17	.047	1.19	.032	0.81	1,000'	4,000'
4900-HW-16-X	16	.053	1.35	.032	0.81	1,000'	4,000'
4900-HW-15-X	15	.059	1.50	.032	0.81	1,000'	4,000'
4900-HW-14-X	14	.066	1.68	.032	0.81	1,000'	4,000'
4900-HW-13-X	13	.076	1.93	.032	0.81	1,000'	4,000'
4900-HW-12-X	12	.085	2.16	.032	0.81	1,000'	4,000'
4900-HW-11-X	11	.095	2.41	.032	0.81	1,000'	4,000'
4900-HW-10-X	10	.106	2.69	.032	0.81	1,000'	4,000'
4900-HW-9-X	9	.118	3.00	.032	0.81	1,000'	4,000'
4900-HW-8-X	8	.133	3.38	.032	0.81	500'	1,000'
4900-HW-7-X	7	.148	3.76	.032	0.81	500'	1,000'
4900-HW-6-X	6	.166	4.21	.032	0.81	500'	1,000'
4900-HW-3/16-X	5 (3/16)	.186	4.72	.032	0.81	500'	1,000'
4900-HW-4-X	4	.208	5.28	.032	0.81	500'	1,000'
4900-HW-3-X	3	.234	5.94	.032	0.81	500'	1,000'
4900-HW-1/4-X	1/4	.250	6.35	.032	0.81	500'	1,000'
4900-HW-2-X	2	.263	6.68	.032	0.81	500'	1,000'
4900-HW-1-X	1	.294	7.47	.032	0.81	500'	1,000'
4900-HW-5/16-X	5/16	.313	7.94	.032	0.81	500'	1,000'
4900-HW-0-X	0	.330	8.38	.032	0.81	500'	1,000'
4900-HW-3/8-X	3/8	.375	9.53	.032	0.81	500'	1,000'
4900-HW-7/16-X	7/16	.438	11.11	.032	0.81	500'	1,000'
4900-HW-1/2-X	1/2	.500	12.70	.032	0.81	250'	500'

RNF-100

Construction: Wide range of sizes and colors. **Insulation:** Flexible, Flame-Retardant, General Purpose, Polyolefin Tubing.

Features:
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).

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.

Additional Information:
Minimum shrink temperature: 95ºC (203ºF). Minimum full recover temperature: 121ºC (250ºF)

Technical Data:

Temperature:
-55ºC to 135ºC

Rated Voltage: N/A

Color Code:
See ordering information

Approvals:
UL, CSA,
AMS-DTL-23053/5 Class 1
and Class 2.

Specifications/Approvals

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

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

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), green (-5, GN), clear (-X, CL)
	Nonstandard	Brown (-1, BN), orange (-3, OR), 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".

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

TE connectivity Authorized Reseller

RNF-150

Construction: **Insulation:** High-Performance, Flame-Resistant, Flexible, Fluoropolymer Tubing.

Features:
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.

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.

Additional Information:
Minimum shrink temperature: 110°C (230°F). Minimum full recover temperature: 150°C (302°F)

Specifications/Approvals

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

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

Technical Data:

Temperature:
-55°C to 150°C (-67°F to 302°F)

Rated Voltage: N/A

Color Code:
Standard-Black (0).
Nonstandard-white (9)

Approvals:
UL, ASM-DTL-23053/18 Class 2.

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).	

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Versafit

Construction: **Insulation:** Highly Flame-Retardant, Very Flexible, Low-Shrink-Temperature, Polyolefin Tubing.

Features:
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. High 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 insulated 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.

Additional Information:
Minimum shrink temperature: 70ºC (158ºF). Minimum full recovery temperature: 90ºC (194ºF)

Specifications/Approvals

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

*Formerly MIL I 23053/5 and MIL DTL 23053/5

Technical Data:

Temperature:
-55ºC to 135ºC (-67ºF to 275ºF)

Rated Voltage: N/A

Color Code:
See ordering information

Approvals:
UL, CSA, AMS-DTL-23053/5*

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	25.53 ± 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), green (-5), sizes 3/64 through 1-inch only)
	Nonstandard	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.	
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".

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Versafit V4

Construction: **Insulation:** Very-Thin-Wall, Very Flexible, Highly Flame-Retardant, Polyolefin Tubing.

Features:
2:1 shrink ratio. Very thin wall provides space saving 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 savings 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.

Additional Information:
Minimum shrink temperature: 70ºC (158ºF). Minimum full recovery temperature: 90ºC (194ºF)

Specifications/Approvals

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

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, Versafit V4-1.0-0).	

Technical Data:

Temperature:
-30ºC to 125ºC (-22ºF to 257ºF)

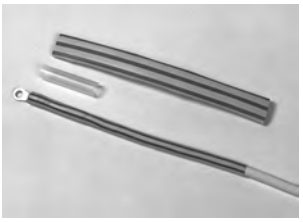
Rated Voltage: N/A

Color Code:
See ordering information.
Black

Approvals:
UL, CSA

TE connectivity Authorized Reseller

DCPT



Construction: **Insulation:** Flexible, Flame-Retardant, Dual-Color, Polyolefin Tubing.

Features:
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.

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.

Specifications/Approvals

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

Technical Data:

Temperature:
-55°C to 135°C (-67°F to 275°F)

Rated Voltage: N/A

Color Code:
Standard: yellow/green stripe (-45)

Approvals:
UL, CSA, VG 95343 Pt5 Type A

Product Dimensions

Size	Inside Diameter		Recovered Wall Thickness**
	Minimum Expanded as Supplied	Maximum Recovered After Heating	After Heating
2:1			
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]
51/19	51.0 [2.000]	19.0 [0.748]	1.02 ± 0.15 [0.040 ± 0.006]
3:1 (Europe only)			
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]

**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).	

RP-4800

Construction: **Insulation:** High-Shrink Ratio, Flame-Retardant, Polyolefin Tubing.

Features:
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.

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.

Additional Information:
Minimum shrink temperature: 95ºC (203ºF). Minimum full recovery temperature: 121ºC (250ºF)

Specifications/Approvals

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

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

Technical Data:

Temperature:
-55ºC to 135ºC. (-67ºF to 275ºF)

Rated Voltage: N/A

Color Code:
See ordering information.
Standard: Black

Approvals:
UL, AMS-DTL-23053/5
Class 1 Overexpanded

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).	

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ATUM

Construction: **Insulation:** High-Shrink-Ratio, Adhesive-Lined Polyolefin Tubing.

Features:
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.

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.

Specifications/Approvals

Series	UL**	Military	Raychem
ATUM	E85381 600V, 110°C	AMS-DTL-23053/4,* Class 3	RW-2063 - Black 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.

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)
3:1				
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]
4:1				
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.

Technical Data:

Temperature:
-55°C to 110°C (-67°F to 230°F)

Rated Voltage: N/A

Color Code:
Standard color: Black

Approvals:
UL, AMS-DTL-23053/4 Class 3.

Complete catalog available online at:
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TE connectivity Authorized Reseller

DWP-125

Construction: **Insulation:** Flexible, High-Shrink-Ratio, Adhesive-Lined, Polyolefin Tubing.

Features:
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.

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.

Additional Information:
Minimum shrink temperature: 80°C (176°F). Minimum full recovery temperature: 125°C (257°F)

Specifications/Approvals

Series	UL	CSA	Military	Raychem
DWP-125	E35586 600 V, 125°C	LR31929 600 V, 125°C	AMS-DTL-23053/4* Class 3 (colors only)	DWP-125 SCD

*Formerly MIL-I-23053/4 and MIL-DTL-23053/4. Meets the material properties except for Sealing Efficiency.

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).	

Technical Data:

Temperature:
-40°C to 110°C (-40°F to 230°F)

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
- UL, CSA, AMS-DTL-23053/4 Class 3 (colors only)

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

TE connectivity Authorized Reseller

ES1000

Construction: **Insulation:** Clear, High-shrink-ratio, Adhesive-Lined, Semirigid Polyolefin Tubing.

Features:
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.

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

Specifications/Approvals

Series	UL*	Raychem
ES1000	E85381 600 V, 125°C	RT-1113

Product Dimensions

Part Number	Inside Diameter (Including Core)		Recovered Wall Thickness*		
	Minimum Expanded as Supplied	Maximum Recovered After Heating	Minimum Total Wall After Heating	Minimum Jacket Wall After Heating	Minimum 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-X-50MM).	

Technical Data:

Temperature:
-40°C to 130°C (-40°F to 266°F)

Rated Voltage: N/A

Color Code:
Standard: Clear

Approvals:
UL

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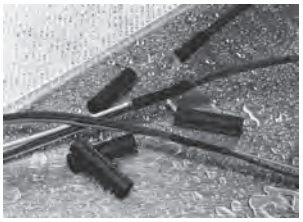
TE connectivity Authorized Reseller

ES2000

Construction: **Insulation:** Flame-Retardant, High-Shrink-Ratio, Adhesive-Lined Semirigid Polyolefin Tubing.



Features:
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.

Specifications/Approvals

Series	UL*	Raychem
ES2000	E85381 600 V, 125°C	RT-1112

Product Dimensions

Part Number	Inside Diameter (Including Core)		Recovered Wall Thickness*		
	Minimum Expanded as Supplied	Maximum Recovered After Heating	Minimum Total Wall After Heating	Minimum Jacket Wall After Heating	Minimum 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. 2-0-50MM).	

Technical Data:

Temperature:
-40°C to 130°C (-40°F to 266°F)

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
UL

Please contact your sales representative for detailed information at sales@lapptannehill.com

TE connectivity Authorized Reseller

SCL

Construction: **Insulation:** Semirigid, encapsulant-lined polyolefin tubing.

Features:
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.

Additional Information:
Minimum shrink temperature: 125°C (257°F). Minimum full recovery temperature: 135°C (275°F)

Specifications/Approvals

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

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

Technical Data:

Temperature:
-55°C to 110°C (-67°F to 230°F)

Rated Voltage: N/A

Color Code:
Standard color: Black

Approvals:
UL, AMS-DTL-23053/4, Class 1

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).	

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

TE connectivity Authorized Reseller

TAT-125

Construction: **Insulation:** Adhesive-Lined, Flexible, polyolefin tubing.

Features:
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.

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.

Additional Information:
Minimum shrink temperature: 95°C (203°F). Minimum full recovery temperature: 121°C (250°F)

Specifications/Approvals

Series	UL*	Military	Raychem
TAT-125 Type 1 (colors)	E85381 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.

Technical Data:

Temperature:
-55°C to 110° (-67°F to 230°F)

Rated Voltage: N/A

Color Code:
Standard color: Black

Approvals:
UL, AMS-DTL-23053/4, Class 2

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).	

Complete catalog available online at: www.lapptannehill.com

TE connectivity Authorized Reseller

DR-25

Construction: **Insulation:** Heat-Shrinkable, Flexible, Chemical and Abrasion Resistant Tubing.

Features:
Flame-retardant. System 25 tubing. Shrink Ratio 2:1. RoHS compliant.

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.

Specifications/Approvals

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

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

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)	

Technical Data:

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

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
AMS-DTL-23053/16,
VG95343 Part 5 Type D,
VDE 0341/Pt 9005,
Def Stan 59-97 Issue 3 Type 6B,
BS 4G-198 Part 3 10A.

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

NT-MIL

Construction: **Insulation:** Flexible, Rugged, Modified Elastomeric Tubing.

Features:
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 solvent, including aviation and ground vehicle fuels, lubricating oil, and hydraulic fluids. Meets the stringent requirement 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.

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

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).	

Technical Data:

Temperature:
-70°C to 121°C (-94°F to 250°F)

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
AMS-DTL-23053/1*, Classes 1 &2

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TE connectivity Authorized Reseller

NTFR

Construction: **Insulation:** Very Flexible, Rugged Neoprene Elastomer Tubing.

Features:
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. Performance exceeds the stringent requirements of SAE-AMS-DTL-23053/1, Class 2. System 20. RoHS compliant.

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.

Specifications/Approvals

Series	Military	Agency	Raychem
NTFR	SC-X-15112	AMS 3623	RT-511

Technical Data:

Temperature:
-70°C to 121°C (-94°F to 250°F)

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
SC-X-15112

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).	

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TE connectivity Authorized Reseller

RW-175

Construction: **Insulation:** High-temperature, Chemical-Resistant, Polyvinylidene Fluoride Tubing.

Features:
2:1 shrink ratio. Tough, semirigid, very-thin-wall insulation. High flame-resistance, meeting the requirements of AMS-DTL-23053* Test C, 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: 135ºC (275ºF). RoHS compliant.

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.

Additional Information:
Minimum shrink temperature: 155ºC (311ºF). Minimum full recovery temperature: 175ºC (347ºF).

Specifications/Approvals

Series	UL	CSA	Military	Industry	Raychem
RW-175	E35586 VW-1 600 V, 150°C	LR31929 VW-1 600 V, 150°C	AMS-DTL-23053/8* Def. Stan. 59-97 Type 3 VG 95343 Pt 5 Type F BS 3G 198 Pt4	VDE 0341 Pt 9005	RW-3029/1 RW-3029/2

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

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).	

Technical Data:

Temperature:
-55ºC to 175ºC. (-67ºF to 347ºF))

Rated Voltage: N/A

Color Code:
See ordering information.
Standard color: Clear

Approvals:
UL, CSA, AMS-DTL-23053/8

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TE connectivity Authorized Reseller

RW-200 / RW-200-E

Construction: **Insulation:** Heat-shrinkable, Chemical-Resistant, High-Temperature Tubing.

Features:
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.

Applications:
Raychem premium heat-shrinkable tubing is fabricated from Viton® fluoroelastomers – a crosslinked material designed for a wide range of applications. It is available in two configurations. RW-200-E is the thickest wall version. RW-200 has the thinnest wall for lighter weight applications. Offering fluid resistance, RW-200 tubing can be used in applications up to 200ºC (392ºF).

Additional Information:
Minimum shrink temperature: 100ºC (212ºF). Minimum full recovery temperature: 175ºC (347ºF)

Specifications/Approvals

Series	Military	Raychem
RW-200	AMS-DTL 23053/13*	RW-3037
RW-200-E	Def. Stan. 59-97 Issue 3 Type 4A VG 95343 Part 5 Type E VDE 0341/Pt9005 BS 4G-198 Part 3 12A	RW-3037

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

Product Dimensions

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

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

Ordering Information

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).

Technical Data:

Temperature:
RW-200: -40ºC to 200ºC (-40ºF to 392ºF).
RW-200-E: -55ºC to 200ºC (-67ºF to 392ºF)

Rated Voltage: N/A

Color Code:
Standard: Black

Approvals:
AMS-DTL 23053/13*

Complete catalog available online at: www.lapptannehill.com

TE connectivity Authorized Reseller

Y Transition Thermofit® Molded Parts 382A012 thru 046

Construction: **Insulation:** See table below. **Jacket:** See table below.

Features: See table below **Applications:** Provides strain relief and mechanical protection on cable harness assemblies.
Additional Information: Coating is optional. As supplied dimensions appearing in table are for uncoated parts. When coating is added, entry diameters will be reduced by .06 max.

Technical Data:

Rated Voltage: N/A

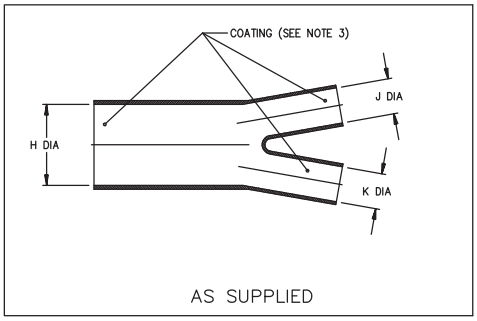
Color Code: Standard: Black

Thermofit® Molded Parts
Specification Control Drawing

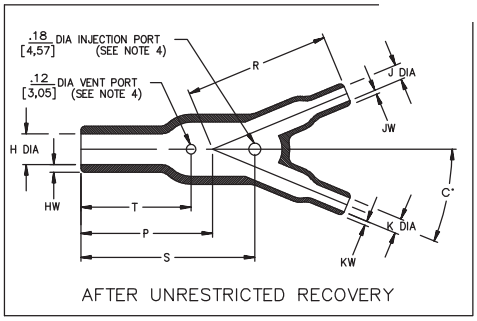
Part Number : 382A012 thru 046
Description : Transition, Y

NOTES

1. All dimensions are in inches [millimeters] ; lbs [gms]
2. Dimensions appearing in table are as follows:
   a – As Supplied
   b – After Unrestricted Recovery
3. Coating is optional. As supplied dimensions appearing in table are for uncoated parts. When coating is added, entry diameters will be reduced by .06 max.
4. Molding ports are optional. When –00 modification number is specified molding ports will be located as shown.
5. Weight shown in table of dimensions is based on polyolefin part.



AS SUPPLIED



AFTER UNRESTRICTED RECOVERY

TABLE OF DIMENSIONS

PART NUMBER	H Min a	H Max b	J Min a	J Max b	K Min a	K Max b	P ±10% b	R ±10% b	S ±10% b	T ±10% b	HW ±20% b	JW & KW ±20% b	C ±5% b	Weight Nom b
382A012	.52 [13,2]	.24 [6,1]	.26 [6,6]	.13 [3,3]	.26 [6,6]	.13 [3,3]	.88 [22,4]	.76 [19,3]	.94 [23,9]	.61 [15,5]	.06 [1,52]	.04 [1,02]	22 1/2°	.004 [1,81]
382A023	1.06 [26,9]	.49 [12,4]	.52 [13,2]	.24 [6,1]	.52 [13,2]	.24 [6,1]	1.50 [38,1]	1.70 [43,2]	2.10 [53,3]	1.30 [33,0]	.10 [2,54]	.06 [1,52]	22 1/2°	.026 [11,79]
382A034	1.52 [38,6]	.71 [18,0]	1.06 [26,9]	.49 [12,4]	1.06 [26,9]	.49 [12,4]	2.58 [65,5]	3.10 [78,7]	3.10 [78,7]	2.20 [55,9]	.12 [3,05]	.10 [2,54]	22 1/2°	.141 [63,96]
382A046	2.19 [55,6]	1.02 [25,9]	1.06 [26,9]	.50 [12,7]	1.06 [26,9]	.50 [12,7]	3.35 [85,1]	3.70 [94,0]	4.40 [111,8]	2.80 [71,1]	.18 [4,57]	.10 [2,54]	22 1/2°	.249 [112,95]

TE Connectivity
300 CONSTITUTION DRIVE
MENLO PARK, CALIFORNIA 94025

Revision : T1
Date : 29MAR11

Part Number : 382A012 thru 046
Description : Transition, Y

Thermofit® Molded Parts
Specification Control Drawing

Part Number : 382A012 thru 046
Description : Transition, Y

COMPATABILITY CHART

MATERIAL DASH NO.	MATERIAL DESCRIPTION	RT SPEC	COATING SLASH NO.	COATING S NO.	COATING DESCRIPTION
–3	Polyolefin, Semi–rigid	RT–301	/42; /86; /87	S–1017; S–1048; S–1052	Adhesive
–4	Polyolefin, Flexible	RT–1304	/42; /86; /87; /180	S–1017; S–1048; S–1052; S–1030	Adhesive
–5	Elastomer, Flexible	RT–501	/42	S–1017	Adhesive
–6	Silicone	RT–602	N/A		
–12	*VITON, Flexible	RT–1312	N/A		
–25	Elastomer, Fluid Resistant	RT–1325	/42; /86	S–1017; S–1048	Adhesive
–100	Polyolefin, Semi–flexible ZEROHAL™	RT–1323	/86, /180	S–1048, S–1030	Adhesive

*VITON is a Registered Trademark of Dupont

ORDERING INFORMATION

382A0XX –XX –XX /XXX

Base part number
Material dash number (See Compatability Chart)
Modification number (If necessary, see front of scd binder for a complete list)
Adhesive slash number (If necessary, see Compatability Chart)

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THIS DRAWING IS SUBJECT TO CHANGE WITHOUT NOTICE; CONSULT YOUR NEAREST FIELD REPRESENTATIVE FOR CURRENT REVISION

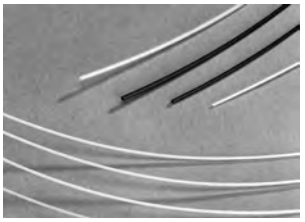
TE Connectivity
300 CONSTITUTION DRIVE
MENLO PARK, CALIFORNIA 94025

Revision : T1
Date : 29MAR11

Part Number : 382A012 thru 046
Description : Transition, Y

CAD FILE MP94214

MT1000



Construction: **Insulation:** Altera Medical-Grade, USP Class VI, High-Temperature, Semirigid, Fluoropolymer Tubing.

Features:
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. Double-bagged packaging. Compatibility with gamma, ETO, steam, and dry-heat sterilization. RoHS compliant.

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.

Specifications/Approvals

Series	Material	Master File Number	Raychem
MT1000	USP Class VI	MAF-444	MT1000 SCD
MT1000A	USP Class VI	MAF-798	MT1000A SCD

Technical Data:

Temperature:
-55°C to 175°C (-67°F to 347°F)

Rated Voltage: N/A

Color Code:
Standard: Black, Translucent

Approvals:
MT1000-USP Class VI, MAF-444.
MT1000A--USP Class VI, MAF-798.

Product Dimensions

Size	Inside Diameter		Recovered Wall Thickness*
	Minimum Expanded as Supplied	Maximum Recovered After Heating	After Heating
3/64	1.17 [0.046]	0.58 [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	4.7 [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]	4.7 [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]

*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), 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).	

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

TE connectivity Authorized Reseller

MT2000

Construction: **Insulation:** Altera Medical-Grade, USP Class VI, Lubricious, Thin-Wall, Polyolefin Tubing.

Features:
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. Plastic spools and double-bagged packaging. Compatibility with gamma and ETO sterilization. RoHS compliant.

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.

Additional Information:
Minimum shrink temperature: 110°C (230°F). Minimum full recovery temperature: 140°C (284°F).

Specifications/Approvals

Series	Material	Master File Number	Raychem
MT2000	USP Class VI	MAF-727	MT2000 SCD
MT2000A	USP Class VI	MAF-799	MT2000A SCD

Product Dimensions

Size	Inside Diameter		Wall Thickness	
	Minimum Expanded as Supplied	Maximum Recovered After Heating	As Supplied (Nominal)	Recovered* After Heating
1.0	1.0 [0.040]	0.45 [0.018]	0.12 [0.005]	0.25 ± 0.05 [0.010 ± 0.002]
2.0	2.0 [0.080]	0.80 [0.032]	0.12 [0.005]	0.25 ± 0.05 [0.010 ± 0.002]
3.0	3.0 [0.120]	1.20 [0.048]	0.12 [0.005]	0.25 ± 0.05 [0.010 ± 0.002]
6.0	6.0 [0.240]	2.40 [0.096]	0.12 [0.005]	0.25 ± 0.05 [0.010 ± 0.002]
10.0	10.0 [0.400]	4.00 [0.160]	0.15 [0.006]	0.36 ± 0.05 [0.014 ± 0.002]

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

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).	

Technical Data:

Temperature:
-40°C to 105°C (-40°F to 221°F)

Rated Voltage: N/A

Color Code:
Standard: Black, clear

Approvals:
MT2000-USP Class VI,
MT2000A- USP Class VI.

Complete catalog available online at: www.lapptannehill.com

TE connectivity Authorized Reseller

MT3000

Construction: Insulation: Altera Medical-Grade, USP Class VI, High-Temperature, Flexible, Fluoropoylmer Tubing.

Features:
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. Plastic spools and double-bagged packaging. Compatibility with steam (limited cycles), gamma, ETO, and dry-heat sterilization. RoHS compliant.

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.

Additional Information:
Minimum shrink temperature: 110°C (230°F). Minimum full recovery temperature: 150°C (302°).

Specifications/Approvals

Series	Material	Master File Number	Raychem
MT3000	USP Class VI	MAF-472	MT3000 SCD
MT3000A	USP Class VI	MAF-472	MT3000A SCD

Product Dimensions

Size	Inside Diameter		Recovered Wall Thickness*
	Minimum Expanded as Supplied	Maximum Recovered After Heating	After Heating
3/64	1.17 [0.046]	0.58 [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	4.7 [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 ± 0.05 [0.012 ± 0.002]
3/8	9.5 [0.375]	4.7 [0.187]	0.30 ± 0.05 [0.012 ± 0.002]
1/2	12.7 [0.500]	6.4 [0.250]	0.30 ± 0.05 [0.012 ± 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]

*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)
	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).	

Technical Data:

Temperature:
-55°C to 150°C. (-67°F to 302°F).

Rated Voltage: N/A

Color Code:
Standard: Black. Nonstandard: White

Approvals:
MT3000-USP Class VI.
MT3000A USP Class VI

Check out our complete inventory of products at www.lapptannehill.com

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MT5000

Construction: **Insulation:** Altera Medical-Grade USP Class VI, Flexible, Polyolefin Tubing.

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

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.

Specifications/Approvals

Series	Material	Master File Number	Raychem
MT5000	USP Class VI	MAF-469	MT5000 SCD
MT5000A	USP Class VI	MAF-800	MT5000A SCD

Product Dimensions

Size	Inside Diameter		Recovered Wall Thickness*
	Minimum Expanded as Supplied	Maximum Recovered After Heating	After Heating
3/64	1.17 [0.046]	0.58 [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]

*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), 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).	

Technical Data:

Temperature:
-70°C to 105°C (-94°F to 221°F)

Rated Voltage: N/A

Color Code:
Standard: Black, clear, and blue.
Non-standard: White, red, yellow, green.

Approvals:
MT5000 ISP Class VI.
MT5000A USP Class VI

Please contact your sales representative for detailed information at sales@lapptannehill.com

TE connectivity Authorized Reseller

MT6000

Construction: **Insulation:** Altera Medical-Grade, USP Class VI, High Shrink Ratio, Polyolefin Tubing.

Features:
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. Plastic spools and double-bagged packaging. Compatibility with gamma and ETO sterilization. RoHS compliant.

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.

Specifications/Approvals

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

Product Dimensions

Size	As Supplied	Recovered	
	Inside Diameter (D) Minimum in.	Inside Diameter (d) Maximum in.	Wall Thickness (W) Nominal in.
1/16	.063 [1.60]	.015 [0.38]	.016 ± .003 [0.40 ± .007]
3/32	.093 [2.36]	.023 [0.58]	.016 ± .003 [0.40 ± .007]
1/8	.125 [3.18]	.031 [0.79]	.017 ± .003 [0.43 ± .007]
3/16	.187 [4.75]	.046 [1.17]	.020 ± .003 [0.50 ± .007]
1/4	.250 [6.35]	.062 [1.58]	.020 ± .003 [0.50 ± .007]
3/8	.375 [9.53]	.093 [2.36]	.020 ± .003 [0.50 ± .007]
1/2	.500 [12.7]	.125 [3.18]	.025 ± .003 [0.64 ± .007]

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) Specify MT6000A for adhesive-lined constructions (special order)	

Technical Data:

Temperature:
-70°C to 90°C. (-94°F to 194°F).

Rated Voltage: N/A

Color Code:
Standard: Black and clear.
Nonstandard: Blue, red, white, yellow, green.

Approvals:
MT6000 USP Class VI.
MT6000A USP Class VI

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

TE connectivity Authorized Reseller

MicroFit

Construction: MicroFit tubing is offered in three materials: RW-175, MT1000, and MT2000. MicroFit tubing offers a high shrink ratio (up to 3:1) and fits a range of diameters from .007" to .045".

Features:
MicroFit tubing provides electrical insulation, mechanical protection, and strain relief in the smaller, more compact medical devices and commercial electronics products manufactured today. MicroFit tubing's high shrink ratio eases installation since the tubing's diameter is large enough to slide easily over the micro-sized substrate. Yet, upon heating, the same tubing shrinks to fit tightly on a wide range of substrate diameters.

Applications:
RW-175 and MT1000 tubings utilize a tough semirigid fluoropolymer. They are especially suitable for applications requiring high temperature performance, outstanding resistance to abrasion and cut-through, and excellent resistance to a variety of fluids. RW-175 meets NASA requirements for low-outgassing materials. MT1000 tubing may be sterilized by radiation, ethylene oxide, steam, and dry heat with no significant change in physical properties. MT2000 tubing is made from a tough,modified polyolefin that offers flexibility,lubricity, and good electrical insulation performance. MT2000's low shrink temperature enables the tubing to shrink faster than other materials with similar attributes, thereby reducing the risk of damage to temperature sensitive substrates. MT2000 tubing may be sterilized by gamma radiation or ethylene oxide with no significant change in physical properties.

Additional Information:
Packaging: in 4-foot lengths (RW-175); on plastic spools, double-bagged (MT1000, MT2000)
Ordering descriptionSpecify product name, material type, size, and color; for example, MFT-MT2000-No.1-0 (0=Black).
Always order the largest size that will shrink snugly over the component being covered. A variety of special order sizes may be made available upon request.

Technical Data:

Temperature:
- RW-175, MT1000 Full recovery temperature: 175°C.
- Continuous operating temperature: –55°C to 175°C.
- Recommended maximum temperature for use as a primary insulator: 135°C.
- MT2000 Full recovery temperature: 140°C.
- Continuous operating temperature: –40°C to 105°C.

Rated Voltage: N/A

Color Code:
- RW-175, MT1000:
  Standard: Clear
  Nonstandard: Black.
- MT2000:
  Standard: Black, clear
  Nonstandard: White, red, yellow, blue, orange

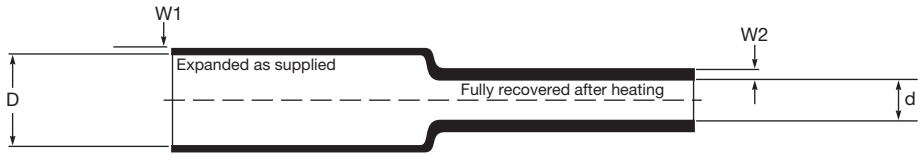
Approvals:
See Specifications chart

Specifications*

Type	Raychem	Material	Master File Number
RW-175	RW-175 MicroFit SCD		
MT1000, MT2000	Altera MicroFit SCD	USP Class VI	MAF-444 (MT1000), MAF-727 (MT2000)

*When ordering, always specify latest issue.

***Dimensions* (millimeters/*inches*)**



Part number	Inside diameter D (min.) Expanded as supplied		d (max.) Recovered after heating		Wall thickness W1 As supplied (nominal)		W2 (max.) Recovered after heating****	
MFT-**-No. 1-***	0.356	*0.014*	0.178	*0.007*	0.076	*0.003*	0.127	*0.005*
MFT-**-No. 2-***	0.610	*0.024*	0.305	*0.012*	0.064	*0.0025*	0.152	*0.006*
MFT-**-No. 33-***	1.143	*0.045*	0.432	*0.017*	0.064	*0.0025*	0.118	*0.007*
MFT-**-No. 65-***	0.635	*0.025*	0.254	*0.010*	0.127	*0.005*	0.330	*0.013*

**Replace double asterisk with material number: RW-175, MT1000 or MT2000 ***Replace triple asterisk with color-code number. ****Wall thickness will be less if tubing recovery is restricted during shrinkage.

TE connectivity Authorized Reseller

MicroFit *(continued)*

RW-175 MicroFit specification values

	Property	Unit	Requirement	Method of test
Physical	Dimensions	mm *(inches)*	See reverse	ASTM D 2671
	Tensile strength	psi *(MPa)*	5000 *(34.5)* minimum	ASTM D 2671 2" per minute
	Ultimate elongation	percent	150 minimum	ASTM D 2671 2" per minute
	Secant modulus (expanded)	psi *(MPa)*	1 x 10^5 *(690)* minimum	ASTM D 2671
	Heat shock (4 hours at 300°C/*572°F*)		No dripping, flowing or cracking	AMS-DTL-23053, 5/16" mandrel
	Low temperature flexibility (4 hours at -55°C/*-67°F*)		No cracking after wrapping on mandrel	ASTM D 2671 Procedure C 5/16" mandrel
Electrical	Dielectric strength	volts/mil *(volts/mm)*	800 *(31,500)* minimum	ASTM D 2671

Altera MicroFit specification values

	Property	Unit	Requirement	Method of test
Physical	Dimensions	mm *(inches)*	See reverse	ASTM D 2671
	Tensile strength MT1000 MT2000	psi *(MPa)*	 5000 *(34.5)* minimum 3000 *(20.7)* minimum	ASTM D 2671 2" per minute
	Ultimate elongation MT1000 MT2000	percent	 150 minimum 200 minimum	ASTM D 2671 2" per minute
	Secant modulus (expanded) MT1000 MT2000	psi *(MPa)*	 1.0 X 10^5 *(690)* minimum 5.0 X 10^4 *(344)* minimum	ASTM D 2671
Electrical	Dielectric strength MT1000 MT2000	volts/mil *(volts/mm)*	 800 *(31,500)* minimum 1000 *(39,360)* minimum	ASTM D 2671
	Dielectric withstand 3000 V, 60 Hz	seconds	60 minimum	ASTM D 2671
Chemical	Heavy metals analysis Cadmium Mercury Lead Bismuth Antimony	ppm	1 maximum (total of all metals)	USP XXII Physiochemical Tests - Plastics (See note below)

Note: Sample preparation and extraction is per USP XXII. Metals analysis may be colorimetric as described in USP XXII or by equivalent quantitive analytical method.

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

MT-FEP

Construction: **Insulation:** Altera Medical-Grade, USP Class VI, Heat-Shrinkable FEP Tubing.

Features:
Standard 1.6:1 shrink ratio. Tight control of longitudinal change, standard +/-5%. Custom ratios, sizes, and longitudinal change percentages available. 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. Compatible with autoclave sterilization, ethylene oxide, steam, and dry-heat. RoHS complaint.

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.

Specifications/Approvals

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

Product Dimensions

Reference Chart Customer's Substrate FR	OD (in.)	Size to Order	Approximate Size for Reference Fractional	mm.	As Supplied Inside Diameter (D) Minimum in.	Recovered Inside Diameter (d) Maximum in.	Recovered Wall Thickness (W) Nominal in.
3	0.039	042	3/64	1.0	0.042	0.030	0.008 ± 0.002
4	0.053	062	1/16	1.5	0.062	0.040	0.008 ± 0.002
5	0.066	079	5/64	2.0	0.079	0.050	0.008 ± 0.002
6	0.079	100	3/32	2.5	0.100	0.062	0.008 ± 0.002
7	0.092	115	7/64	3.0	0.115	0.072	0.010 ± 0.002
8	0.105	136	1/8	3.5	0.136	0.084	0.010 ± 0.002
9	0.118	149	9/64	3.8	0.149	0.092	0.010 ± 0.002
10	0.131	166	11/64	4.2	0.166	0.102	0.010 ± 0.002
11	0.144	187	3/16	4.7	0.187	0.115	0.010 ± 0.002
12	0.158	200	13/64	5.0	0.200	0.122	0.010 ± 0.002
13	0.170	215	7/32	5.5	0.215	0.131	0.010 ± 0.002
14	0.184	233	15/64	6.0	0.233	0.142	0.010 ± 0.002
15	0.197	250	1/4	6.3	0.250	0.150	0.010 ± 0.002
16	0.210	266	17/64	6.7	0.266	0.160	0.010 ± 0.002
17	0.223	282	9/32	7.2	0.282	0.170	0.012 ± 0.003
18	0.236	299	19/64	7.5	0.299	0.180	0.012 ± 0.003
19	0.249	315	5/16	8.0	0.315	0.190	0.012 ± 0.003
20	0.263	335	21/64	8.5	0.335	0.200	0.012 ± 0.003
22	0.288	355	23/64	9.0	0.355	0.220	0.012 ± 0.003
24	0.315	397	25/64	10.0	0.397	0.240	0.015 ± 0.003
26	0.341	430	7/16	11.0	0.430	0.260	0.015 ± 0.003
28	0.367	462	15/32	11.7	0.462	0.280	0.015 ± 0.003
30	0.393	500	1/2	12.7	0.500	0.300	0.015 ± 0.003
32	0.419	533	17/32	13.5	0.533	0.320	0.015 ± 0.003
34	0.445	566	9/16	14.4	0.566	0.340	0.015 ± 0.003

Technical Data:

Temperature:
Minimum shrink temperature: 190°C (374°F).
Minimum full recovery temperature: 210°C (410°F).

Rated Voltage: N/A

Color Code:
Standard: Clear

Approvals:
USP Class VI

Ordering Information

Size selection	Order the appropriate FEP size based on your substrate. Example, 6F catheter has a 0.079" OD, order MT-FEP-100-X
Standard packaging	Cleaned and packaged in a clean room Cut pieces (actual length in inches) or spooled (plastic spool); all variations are double-bagged in anti-static bags

Part Numbering System

MT-FEP - _ - _ - _ - _

Packaging
Cut pieces (IN) or spooled (SP)

Color
Clear (-X) - Standard
Custom colors available on request

Recovered ID (IN)
Used for non-standard sizes only

Size
Size chart for standard sizes
Expanded ID (IN) for non-standard sizes

Product Name

Example of standard product, MT-FEP-115-X-60IN
Example of non-standard product, MT-FEP-.081-.078-X-36IN

TE connectivity Authorized Reseller

MT-LWA

Construction: 2:1 and 3:1 shrink ratio.
Insulation: Altera Medical Grade, Flexible, Modified Polyolefin.

Features:
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. RoHS compliant.

Technical Data:

Temperature:
Minimum shrink temperature: 95°C (203°F).
Minimum full recovery temperature: 121°C (250°F).

Rated Voltage:
N/A

Color Code:
Clear unless otherwise specified

Approvals:
MT-LWA

2:1 Expansion Ratio Dimensions (±)

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

3:1 Expansion Ratio Dimensions (±)

Size	As Supplied		Recovered			
	Inside Diameter (D)		Inside Diameter (d)		Wall Thickness (W)	
	in.	*mm.*	in.	*mm.*	in.	*mm.*
.047	0.053 ± 0.006	1.35 ± 0.15	0.013 ± 0.002	0.33 ± 0.05	0.012 ± 0.002	0.31 ± 0.05

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

Size	As Supplied		Recovered			
	Inside Diameter (D) Minimum		Inside Diameter (d) Maximum		Wall Thickness (W) Nominal	
	in.	*mm.*	in.	*mm.*	in.	*mm.*
.032	0.032	0.81	0.011	0.28	0.010 ± 0.002	0.25 ± 0.05
.063	0.063	1.60	0.021	0.53	0.016 ± 0.002	0.41 ± 0.05
.078	0.078	1.98	0.025	0.64	0.016 ± 0.002	0.41 ± 0.05
.094	0.094	2.39	0.031	0.79	0.020 ± 0.003	0.51 ± 0.08
.110	0.110	2.79	0.034	0.86	0.020 ± 0.003	0.51 ± 0.08
.125	0.125	3.18	0.042	1.07	0.020 ± 0.003	0.51 ± 0.08
.188	0.188	4.78	0.063	1.60	0.020 ± 0.003	0.51 ± 0.08
.250	0.250	6.35	0.083	2.11	0.025 ± 0.003	0.64 ± 0.08
.375	0.375	9.53	0.125	3.18	0.025 ± 0.003	0.64 ± 0.08

Complete catalog available online at:
www.lapptannehill.com

TE connectivity Authorized Reseller

MT-LWA (continued)

Properties

Property	Unit	Requirement	Test Method
Physical			
* Dimensions	Inches *(mm)*	In accordance with Tables 1 & 2	ASTM D 2671
* Longitudinal Change	Percent	+0, -10 maximum	
* Concentricity (as supplied)	Percent	70 minimum (2:1 Exp. Ratio) 60 minimum (3:1 Exp. Ratio)	ASTM D 2671
* Tensile Strength	psi *(MPa)*	1500 minimum *(10.3)*	ASTM D 2671, 20"/ minute
* Ultimate Elongation	Percent	200 minimum	
* 2% Secant Modulus (as supplied)	psi *(MPa)*	2.5 x 10^4 maximum *(172)*	ASTM D 2671
Heat Resistance 168 hours at 175°C (347°F) Followed by test for:			
Ultimate Elongation	Percent	100 minimum	ASTM D 2671, 20"/minute
Electrical Dielectric Strength	Volts/mil *(kVolts/mm)*	500 minimum *(19.7)*	ASTM D 2671
Dielectric Withstand 3000V, 60 Hz	sec	60 minimum	ASTM D 2671
Chemical Fluid Resistance 24 hours at 23 ± 3°C *(77 ± 5°F)* Isopropyl Alcohol 5% Saline Solution Cidex** Followed by tests for:			ASTM D 2671
Dielectric Strength	Volts/mil *(kVolts/mm)*	400 minimum *(15.7)*	ASTM D 2671
Tensile Strength	psi *(MPa)*	1000 minimum *(6.9)*	ASTM D 2671
Heavy Metals Analysis Cadmium, Mercury Lead, Bismuth, Antimony	ppm	1 maximum (total of all listed metals)	USP XXII Physicochemical Tests-Plastics (Note 1)

* Denotes lot acceptance test **Trademark of Johnson & Johnson Company

Note 1 Sample preparation and extraction is per USP XXII. Metals analysis may be colorimetric as described in USP XXII or by equivalent quantitative analytical method.

Ordering Information

Color	Clear unless otherwise specified
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 (SP), double-bagged
Ordering description	Specify product name and size (for example, MT-LWA-032-X-SP) For non-standard sizes specify expanded ID and recovered ID (for example, MT-LWA-.045-.024-X-SP)

TE connectivity Authorized Reseller

MT-PBX (D*)

Construction: Insulation: Altera Medical-Grade, USP Class VI, Heat Shrink Polyether Block Amide (PEBA) Tubing. D*=Durometer of material.

Features:
2:1 shrink ratio. Tough robust material in a variety of colors. Flexible to semi-rigid; Shore D Durometer dependent. Excellent mechanical protection properties. Inner adhesive lining optional (MT-PBX (D*A)). USP Class VI material, no heavy metals. Plastic spools and double-bagged packaging. Can withstand repeated autoclave sterilization; sterilization by Gamma Radiation, Ethylene Oxide, steam, and dry-heat. RoHS compliant.

Applications:
Engineered for applications requiring excellent mechanical protection and resistance to abrasion as well as good electrical insulation performance. Also used for catheter shafts, strain relief, identification of components, and devices, and process aid.

Specifications/Approvals

Series	Material	Raychem
MT-PBX(D*)	USP Class VI	MT-PBX(D*) SCD
MT-PBX(D*A)	USP Class VI	MT-PBX (D*A) SCD

Product Dimensions

Size	As Supplied	Recovered	
	Inside Diameter (D) Minimum in.	Inside Diameter (d) Maximum in.	Wall Thickness (W) Nominal in.
014	0.014 [0.36]	0.007 [0.17]	0.002 ± 0.0005 [0.05 ± 0.01]
024	0.024 [0.60]	0.012 [0.30]	0.002 ± 0.0005 [0.05 ± 0.01]
040	0.040 [1.00]	0.020 [0.50]	0.004 ± 0.001 [0.102 ± 0.025]
060	0.060 [1.52]	0.030 [0.89]	0.004 ± 0.001 [0.102 ± 0.025]
100	0.100 [2.54]	0.050 [1.27]	0.004 ± 0.001 [0.102 ± 0.025]
120	0.120 [3.04]	0.060 [1.52]	0.004 ± 0.001 [0.102 ± 0.025]

Ordering Information

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

Part Numbering System

MT-PBX _ - _ - _ - _ - _

Packaging
Spool, cut pieces length, sticks

Color
Black (-0), Clear (-X) - Standard
Blue (-6), Green (-5), White (-9), Yellow (-4)

Recovered ID (IN)
Used for non-standard expansion ratio only

Expanded ID (IN)

Durometer
25, 35, 40, 55, 63, and 72
A for adhesive lining option

Product Name

Example of standard product, MT-PBX72-100-X-6IN
Example of non-standard product with adhesive lining, MT-PBX55A-120-080-X-SP

Technical Data:

Temperature:
-70°C to 130°C. (-94°F to 226°F)

Rated Voltage: N/A

Color Code:
Standard: Black, clear.
Non-standard: blue, green, white, yellow.

Approvals:
MT-PBX(D*) USP Class VI.
MT-PBX(D*) USP Class VI

TE connectivity Authorized Reseller

Shrink-N-Shield® (2:1)

Construction: Shielding and jacketing tubing, 2:1 shrink ratio, polyolefin.
Insulation: Mil-I-23053/5 heat shrink tubing and Zippertubing's Z-3250-Cn conductive cloth.

RoHS

Features:
Easy one-step installation. High performance Mil-Spec jacketing. Excellent high frequency EMI shielding. Government listed NSN's. Lower total installed costs. -55° to 135°C operating limit.

Applications:
Protection to wire and cable bundles. It is ideal for cables diameters of 1/2" and less.

Technical Data:
See table below

Temperature: 135°C

Color Code: Black + Many

Rated Voltage: N/A

Approvals: Made from Mil-I-23053/5 Type I & Type II, Class 1 Tubing

▸▸ Order Part Number: ZT99-18-006-*

Thickness (inch)	Material Type	Temp Range (°C)	Flame Retard	Break Strength	Ratings	Dielectric (volts/mil)
.020" - .035"	Polyolefin Heat Shrink Tubing (Shielded), 2:1 Shrink Ratio	-55 to 135	UL224, All Tubing	1,500 (after shrinkage)	Made from Mil-I-23053/5, Type I & II, Class 1 Tubing	500 v/mil (after shrinkage) Jacket, <.1 Ohms/sq Conductive Shield

EMI Shields Available	Flexibility	Fluid Resist	Cable Types	Sizes	Colors	Closures Available
Z-3250-CN	Medium	Excellent	Round	3/16, 1/4, 3/8, 1/2, 3/4, 1.0, 1-1/2 (before shrinkage) N/A	Black (+ Many)	N/A

Nominal Size BEFORE and AFTER Shrinkage				
Zippertubing Size	BEFORE	BEFORE	AFTER	AFTER
	Inside Diameter in.	Wall Thickness in.	Inside Diameter in.	Wall Thickness in.
3/16	0.187	0.01	0.093	0.020
1/4	0.250	0.01	0.125	0.025
3/8	0.375	0.01	0.188	0.025
1/2	0.500	0.01	0.250	0.025
3/4	0.750	0.01	0.375	0.030
1.0	1.000	0.01	0.500	0.035
1-1/2	1.500	0.01	0.750	0.035

Complete catalog available online at: www.lapptannehill.com

Shrink-N-Shield® (3:1)

Construction: One-step shielding and jacketing tubing, 3:1 shrink ratio, polyolefin.

Features:
Easy one-step installation. 3:1 shrink ratio tubing. Excellent high frequency EMI shielding. Ideal when cable end obstructions exist. Lower total install cost. -55º to 135ºC operating limit.

Applications:
Ideal for cable diameters of 5/8" and less and the 3:1 shrink ratio allows for installation over pre-terminated components and hardware here standard 2:1 ratio tubing cannot be installed.

Technical Data:
See table below

Temperature: 135ºC

Color Code: Black + Many

Rated Voltage: N/A

Approvals: Commercial ratings

▸▸ Order Part Number: ZT01-18-001-*

Thickness (inch)	Material Type	Temp Range (°C)	Flame Retard	Break Strength	Ratings	Dielectric (volts/mil)
.031" - .059"	High Expansion Ratio Polyolefin Heat Shrink Tubing (Shielded), 3:1 Shrink Ratio	-55 to 135	Yes, (will pass UL224, All Tubing)	1,500 (after shrinkage)	Commercial	500 v/mil (after shrinkage) Jacket, <.1 Ohms/sq Conductive Shield

EMI Shields Available	Flexibility	Fluid Resist	Cable Types	Sizes	Colors	Closures Available
Z-3250-CN	Medium	Excellent	Round	3/8, 1/2, 3/4, 1.0, 1-1/2 & 2.0 (before shrinkage) N/A	Black (+ Many)	N/A

Nominal Size BEFORE and AFTER Shrinkage				
Zippertubing Size	BEFORE	BEFORE	AFTER	AFTER
	Inside Diameter in.	Wall Thickness in.	Inside Diameter in.	Wall Thickness in.
3/8	0.360	N/A	0.120	0.031
1/2	0.480	N/A	0.160	0.033
3/4	0.720	N/A	0.240	0.039
1.0	0.945	N/A	0.315	0.048
1-1/2	1.575	N/A	0.515	0.050
2.0	2.000	N/A	0.670	0.059

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Please contact us at sales@lapptannehill.com, or visit our website at: www.lapptannehill.com

3M™ Heat Shrink Tubing FP-301

Construction: Flexible, polyolefin, 2:1 shrink ratio.
Jacket: 3M™ FP-301 offers an outstanding balance of electrical, physical and chemical properties for a wide variety of industrial and military applications.

Features:
FP-301 tubing is split resistant, mechanically tough, easily marked and resists cold flow.
Applications:
FP-301 tubing is typically used as a shrink-fit electrical insulation over cable splices and terminations. It is also used for lightweight wire harness covering, wire marking, wire bundling, component packaging and fire-resistant covering.

Standard Sizes and Dimensions

Ordering Size (Nominal)	Expanded I.D. (Minimum) In.	(mm)	Recovered I.D. (Maximum In.	(mm)	Recovered Wall Thickness (Nominal) In.	(mm)
3/64	.046	(1,17)	.023	(0,58)	.016	(0,41)
1/16	.063	(1,60)	.031	(0,79)	.017	(0,43)
3/32	.093	2,36)	.046	(1,17)	.020	(0,51)
1/8	.125	(3,18)	.062	(1,57)	.020	(0,51)
3/16	.187	(4,75)	.093	(2,36)	.020	(0,51)
1/4	.250	(6,35)	.125	(3,18)	.025	(0,64)
3/8	.375	(9,53)	.187	(4,75)	.025	(0,64)
1/2	.500	(12,70)	.250	(6,35)	.025	(0,64)
3/4	.750	(19,05)	.375	(9,53)	.030	(0,76)
1	1.000	(25,40)	.500	(12,70)	.035	(0,89)
1-1/2	1,500	(38,10)	.750	(19,05)	.040	(1,02)
2	2.000	(50,80)	1.000	(25,40)	.045	(1,14)
3	3.000	(76,20)	1.500	(38,10)	.050	(1,27)
4	4.000	(101,60)	2.000	(50,80)	.055	(1,40)

Technical Data:

Temperature:
135ºC

Rated Voltage: N/A

Color Code:
Standard: Black, Clear

Approvals:
- SAE-AMS-DTL-23053/5 Class 1, Class 2 (Clear)*.
- AMS-3636, AMS-3637.
- UL Recognized, File E-39100, at 600 Volts Maximum @125ºC.
- CSA Certified, CSA LR38227, at 600 volts maximum @ 125ºC.
- ABS. *Formerly Mil-I-23053/5 and MIL-DTL-23053/5

Typical Properties

Physical Property	Typical Value US units (metric)
Tensile Strength	2400 psi
Ultimate Elongation	400%
Longitudinal Change	±5%
Secant Modulus (2%)	13,000 psi
Specific Gravity	1.3 (Opaque) .93 (Clear)
Operating Temperature	-67° to 275°F (-55° to +135°C)
Shrink Temperature (minimum)	212°F (100°C)
Heat Aging (336 hrs. @ 175° C)	Elongation 175%
Heat shock (4 hrs. @ 250° C)	No dripping, flowing, cracking, passes mandrel wrap test
Low Temperature Flexibility (4 hrs @ -55° C)	No cracking
Scant Modules (2%)	13,000 psi
Flammability Self-extinguish, Meets UL 224 All-Tubing Flame Test (Except Clear)	Pass

Electrical Property (Test Method)	Typical Value
Dielectric Strength	900 V/mil
Volume Resistivity	10^{15} ohm/cm

Chemical Property (Test Method)	Typical Value
Corrosion Resistance (Copper mirror)	Non-corrosive
Fungus Resistance	Non-nutrient
Water Absorption	0.2%
Solvent Resistance	Excellent

Not for specifications.
Values are typical, not to be considered minimum or maximum.
Properties measured at room temperature 73°F (23°C) unless otherwise stated.

NOTE: The clear tubing is not flame retardant or UL listed.

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

3M™ Heat Shrink Tubing EPS-200

Construction: Adhesive-lined, 2:1, flexible, polyolefin;
Jacket: EPS-200 tubing is made from flame-retardant, flexible polyolefin with a thin layer of special thermoplastic adhesive. The heat-shrinkable outer wall is selectively cross-linked, while maintaining the high flow and excellent adhesion of the inner sealant liner.

Features:
EPS-200 tubing rapidly shrinks to a skintight fit, forcing the melted adhesive lining to flow and cover the substrate. The adhesive forms a flexible bond with a wide variety of rubbers, plastics and metals. Upon cooling, the adhesive solidifies, forming a permanent, non-drying, flexible and water resistant barrier. Adhesive reflow will occur at temperatures above 80ºC (176º).
Applications:
EPS-200 tubing offers convenient protection of electronic components, wire splices, or bundling of wires. Automotive, truck and marine wiring splices and connections are quickly and easily protected from harsh environments.

Standard Sizes and Dimensions

Ordering Size (Nominal)	Expanded I.D. (Minimum) In.	(mm)	Recovered I.D. (Maximum In.	(mm)	Total Recovered Wall Thickness (Nominal) In.	(mm)	Meltable Recovered Wall Thickness In.	(mm)
1/8	.125	(3,18)	.063	(1,60)	.027	(0,68)	.004	(0,10)
3/16	.187	(4,75)	.093	(2,36)	.027	(0,68)	.004	(0,10)
1/4	.250	(6,35	.125	(3,18)	.030	(0,76)	.005	(0,13)
3/8	.375	(9,53)	.187	(4,75)	.031	(0,79)	.005	(0,13)
1/2	.500	(12,70)	.250	(6,35)	.032	(0,81)	.006	(0,15)
3/4	.750	(19,05)	.375	(9,53)	.037	(0,94)	.006	(0,15)
1	1.000	(25,40)	.500	(12,70)	.046	(1,17)	.008	(0,20)
1-1/2	1,500	(38,10)	.750	(19,05)	.049	(1,24)	.008	(0,20)
2	2.000	(50,80)	1.000	(25,40)	.060	(1,52)	.015	(0,38)

Technical Data:

Temperature:
The operating temperature range is from -55ºC (-67ºF) to 110ºC (230ºF), with a shrinking temperature minimum of 121ºC (250ºF)

Rated Voltage: N/A

Color Code:
Standard Color: Black. Also available in Clear, Red, and Yellow.

Approvals:
UL Listed, UL File E-39100.
Mil-DTL-23053/4 Class 2

Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum.
Properties measured at room temperature 73°F (23°C) unless otherwise stated.

Physical Property	Typical Value US units (metric)
Tensile Strength	2100 PSI
Ultimate Elongation	450%
Longitudinal Change	+1, -5%
Secant Modulus (2%)	17,000 PSI
Specific Gravity	1.3
Heat Aging (outer wall only) 168 hrs @ 175ºC	Elongation 175%
Heat shock (outer wall only) 4 hrs @ 225 ºC	No dripping, flowing, cracking
Low Temperature Flexibility (outer wall only) 4 hrs @ -55 ºC	No cracking
Flammability	Self-extinguishing, meets UL224 All-Tubing Flame Test (jacket)

Electrical Property (Test Method)	Typical Value US units (metric)
Dielectric Strength	800 V/mil
Volume Resistivity	10^{14} ohm/cm

Chemical Property (Test Method)	Typical Value US units (metric)
Corrosion Resistance (Copper mirror)	Non-corrosive
Fungus Resistance	Non-nutrient
Water Absorption	0.3%
Fluid Resistance	Excellent

Adhesive	Typical Value
Peel Strength, pli	
Polyethylene	30
PVC	10
Lead	15
Aluminum	40
Corrosive Effect (Copper mirror)	Non-corrosive

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

3M™ Heat Shrink Tubing EPS-300

Construction: Adhesive-lined, 3:1, flexible, polyolefin;
Jacket: EPS-300 tubing is made from flame-retardant, flexible polyolefin with an internal layer of special thermoplastic adhesive. The heat-shrinkable outer wall is selectively cross-linked, while maintaining the high flow and excellent adhesion of the inner sealant liner.

Features:
EPS-300 is a 3:1 thin-wall, flexible tubing offering the advantages of integral, adhesive-lined construction.
Applications:
EPS-300 tubing offers excellent environmental protection for electronic components, wire splices, wire bundles and harness breakouts. Automotive, truck and marine wiring splices and harness breakouts are quickly and easily protected from harsh environments.

Standard Sizes and Dimensions

Ordering Size (Nominal)	Expanded I.D. (Minimum) In.	(mm)	Recovered I.D. (Maximum In.	(mm)	Total Recovered Wall Thickness (Nominal) In.	(mm)	Meltable Recovered Wall Thickness In.	(mm)
1/8	.125	(3,18)	.040	(1,02)	.040	(1,02)	.020	(0,51)
3/16	.187	(4,75)	.062	(1,57)	.040	(1,02)	.020	(0,51)
1/4	.250	(6,35	.080	(2,03)	.040	(1,02)	.020	(0,51)
3/8	.375	(9,53)	.120	(3,05)	.055	(1,40)	.025	(0,62)
1/2	.500	(12,70)	.160	(4,06)	.070	(1,78)	.030	(0,76)
3/4	.750	(19,05)	.250	(6,35)	.085	(2,16)	.035	(0,89)
1	1.000	(25,40)	.320	(8,13)	.100	(2,54)	.040	(1,02)
1-1/2	1,500	(38,10)	.510	(12,95)	.100	(2,54)	.040	(1,02)

Technical Data:

Temperature:
The operating temperature range is from -55ºC (-67ºF) to 110ºC (230ºF), with a shrinking temperature minimum of 121ºC (250ºF).

Rated Voltage: N/A

Color Code:
Standard Color: Black and Red. Also available in Clear, White and Yellow

Approvals:
UL Listed, UL File E-157227. ABS. Mil-DTL-23053/4, Class 3

Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum.
Properties measured at room temperature 73°F (23°C) unless otherwise stated.

Physical Property	Typical Value US units (metric)
Tensile Strength	2100 PSI
Ultimate Elongation	450%
Longitudinal Change	+1, -15%
Secant Modulus (2%)	17,000 PSI
Specific Gravity	1.3
Heat Aging (outer wall only) 168 hrs @ 175ºC	Elongation 175%
Heat shock (outer wall only) 4 hrs @ 225 ºC	No dripping, flowing, cracking
Low Temperature Flexibility (outer wall only) 4 hrs @ -55 ºC	No cracking
Flammability	Self-extinguishing, meets UL224 All-Tubing Flame Test (jacket)

Electrical Property (Test Method)	Typical Value US units (metric)
Dielectric Strength	700 V/mil
Volume Resistivity	10^{14} ohm/cm

Chemical Property (Test Method)	Typical Value US units (metric)
Corrosion Resistance (Copper mirror)	Non-corrosive
Fungus Resistance	Non-nutrient
Water Absorption	0.3%
Fluid Resistance	Excellent

Adhesive	Typical Value
Peel Strength, pli	
Polyethylene	30
PVC	10
Lead	15
Aluminum	40
Corrosive Effect (Copper mirror)	Non-corrosive

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

3M™ ITCSN Heavy Wall Heat Shrink Tubing

Construction: **Jacket:** ITCSN is fabricated from cross-linked polyolefin. The tubing is highly split resistant, and fast shrinking to provide rapid installation. The tubing comes standard with a factory-applied adhesive/sealant.

Features:
Fast and easy installation. Thick walls top resist puncture and abrasion damage. Complete environmental protection. Versatile, a minimum number of sizes cover the entire range of applications. Shrink ratio as high as 4:1. Resists acids and alkalies. Bonds to a wide variety of substrate. Reliable and proven. UV resistant.

Applications:
Primary electrical insulation for solid dielectric wire and cable rated to 1000 volts. For indoor, outdoor or overhead use. Direct buried or submersible. Insulating secondary splices. Shrink ratio as high as 4:1. Physical protection and moisture sealing of high voltage air insulated connectors and lugs, such as lug connections to bus bars. Relocation of service. Dig-in repairs. Sheath repairs.

Additional Information:
Performance Tests: UL 486D – ITCSN Tubing was subjected to the requirements of UL 486D and passed all tests. ITCSN is UL Listed per UL 486D. CSA Certified.
Maintenance: 3M ITCSN Heat Shrink Tubing is not impaired by freezing or overheating due to ambient temperature found in storage or shipping. Normal storage and stock rotation is recommended.

Technical Data:

Temperature: 110ºC

Rated Voltage: 600V

Color Code: Standard Color: Black

Approvals: UL Listed (UL486D, 600V). CSA Certified

Physical and Electrical Typical Properties

Property and Test Method	Typical Value*
Continuous Operating Temperature (less adhesive)	-55˚C to 110˚C
Color	Black
Shore D Hardness (ASTM D-2240)	42
Low Temperature Flexibility (4 hours @ -55˚C)	No Cracking
Heat Shock (4 hours @ 255˚C)	No Cracking, Flowing or Dripping
2% Secant Modulus (ASTM D-882 A)	14,000psi (98MPa)
Specific Gravity (ASTM D-792 A-1)	1.28
Water Absorption (ASTM D-570 6.1)	0.05%
Ultimate Elongation	475%
Longitudinal Change	+1, -10%
Dielectric Strength (60 mils) (ATSM D-149)	500 v/mil
Volume Resistivity (ATSM D-257)	1 x 10^{14} ohm cm
Fungus Resistance (ATSM G-21)	Non-nutrient
Corrosivity (Mil-I-23053/15)	Non-corrosive
Air-Oven Aging (7days@ 175˚C) –Tensile Strength –Elongation	 2,680 psi (18 MPa) 375%
Ultimate Tensile Strength (ASTM D-412)	2400 psi (16 MPa)

Installation Techniques

Exact instructions are available on a separate sheet. the following is a summary of the instructions.

1. Thoroughly clean and prepare cable.
2. Slide 3M ITCSN onto cable.
3. Install connector, if applicable.
4. Center tubing.

5. Shrink tubing from center.

6. Heat until tubing is completely shrunk and adhesive/ sealant (if applicable) is squeezed from ends.

Physical and Electrical Typical Properties

Product Number	Cable Size Range	Minimum Expanded/ Maximum Recovered I.D.		Cable O.D. Use Range Maximum - Minimum		Certification and Listings	
ITCSN-0400	12 - 6 AWG (4 - 10 mm²)	0.40 / 0.15"	10,2 / 3,8 mm	0.35 - 0.17"	9 -3,3 mm	UL E102356	CSA LR86335
ITCSN-0800	8 - 1/0 AWG (10 - 15 mm²)	0.80 / 0.20"	20,3 / 5,1 mm	0.65 - 0.24"	18 - 5,6 mm	UL E102356	CSA LR86335
ITCSN-01100	2 - 4/0 AWG (35 - 95 mm²)	1.10 / 0.37"	27,9 / 9,4 mm	0.88 - 0.40"	24 - 9,4 mm	UL E102356	CSA LR86335
ITCSN-1500	3/0 AWG - 400kcmil (95 - 185 mm²)	1.50 / 0.50"	38,1 / 12,7 mm	1.19 - 0.60"	33 - 12,1 mm	UL E102356	CSA LR86335
ITCSN-2000	250 - 750kcmil (150 - 300 mm²)	2.00 / 0.65"	50,8 / 16,5 mm	1.60 - 0.75"	44,5 - 19,0 mm	UL E102356	CSA LR86335
ITCSN-3000	600 - 1250kcmil (400 - 625 mm²)	3.00 / 1.00"	76,2 / 25,4 mm	2.25 - 1.20"	63,5 - 25,4 mm		CSA LR86335
ITCSN-4500	1500 - 2500kcmil (800 - 1000 mm²)	4.50 / 1.50	114,3 / 38,1 mm	4.00 - 1.50"	101,6 - 38,1 mm		
ITCSN-6000	2.1 - 4.8" (53 - 122 mm²)	6.00 / 1.80"	152,4 / 45,7 mm	5.50 - 1.80	139,7 - 45,7 mm		

3M™ Heat Shrink Tubing HDT

Construction: Heavy-Duty, Polyolefin 3:1 Shrink ratio; **Jacket:** HDT is a flame-retardant product that comes with a factory-applied sealant. This sealant is a heat-activated thermoplastic material that remains soft and flexible over long periods under adverse environmental conditions. During heating the sealant softens, bonds to underlying surfaces and fills small voids that might be present.

Features:
When cool, the HDT sealant forms a barrier against water, moisture, dirt and other environmental contaminants. Heavy-duty tubing is fabricated from specially formulated cross-linked polyolefin, assuring long-term environmental protection. The tubing is also high chemical, abrasive and split resistant.

Applications:
Can be used as cable sleeve, flame retardant, polyolefin for 1kV or other long term environmental protection-highly chemical, abrasion and split resistant.

Technical Data:

Temperature:
The tubing is rated for continuous operation at -55ºC (-67ºF) to 110ºC (230ºF). Minimum shrink temperature is 121ºC (250ºF). Uncoated product (without sealant) is available on special order.

Color Code:
See chart for colors and sizes

Approvals:
SAE-AMS-DTL-23053/15, Class 1* ABS.
*Formerly MIL-I-23053/15 and MIL-DTL-23053/15

Standard Sizes and Dimensions (without adhesive)

Part Number	Cable Range	Expanded I.D. (Minimum) in. (mm)	Recovered I.D. (Minimum) in. (mm)	Recovered Outer Wall Thickness (Nomimal) in. (mm)	Length in.	Std. Pkg. Pieces/ Carton	Color
HDT-0300-48A	#14 - #8 AWG	.30 (7,62)	.10 (2,5)	.08 (2,0)	48	20	Red and Black
HDT-0400-48A	#12 - #6 AWG	.40 (10,2)	.15 (3,8)	.09 (2,3)	48	20	Red and Black
HDT-0800-48A	#8 - 1/0 AWG	.80 (20,3)	.20 (5,1)	.11 (2,8)	48	20	Red and Black
HDT-1100-48A	#2 – 4/0 AWG	1.10 (27,9)	.37 (9,4)	.12 (3,0)	48	20	Red and Black
HDT-1500-48A	3/0 – 400 MCM	1.50 (38,1)	.50 (12,7)	.17 (4,3)	48	20	Black Only
HDT-2000-48A	250 – 750 MCM	2.00 (50,8)	.65 (16,5)	.17 (4,3)	48	10	Black Only
HDT-3000-48A	600 – 1250 MCM	3.00 (76,2)	1.00 (25,4)	.17 (4,3)	48	10	Black Only
HDT-4500-48A	1500 – 2500 MCM	4.50 (114,3)	1.50 (38,1)	.17 (4,3)	48	5	Black Only
HDT-6000-48A	2.1” – 4.8” O.D.	6.00 (152,4)	1.80 (45,7)	.17 (4,3)	48	5	Black Only
HDT-7000-48A	2.5” – 5.6” O.D.	7.00 (177,8)	2.00 (50,8)	.17 (4,3)	48	5	Black Only

Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum.
Properties measured at room temperature 73°F (23°C) unless otherwise stated.

Physical Properties	Typical Value US units (metric)
Tensile Strength	2400 psi
Ultimate Elongation	475%
Longitudinal Change	+1, -10%
Secant Modulus	14,000 psi
Specific Gravity	1.28
***Heat Aging** 7 Days @ 175ºC (347ºF)	Elongation 225%
***Heat Shock** 4 hrs @ 225ºC (437ºF)	No dripping, cracking, flowing
***Low Temperature Flexibility** 4 hrs. @ -55ºC (-67ºF)	No cracking
Flammability	Self-extinguish

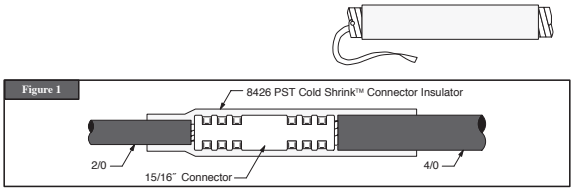
Electrical Properties	Typical Value US units (metric)
Dielectric Strength	500 V/mil (60 mils)
Volume Resistivity	10^{14} ohm-cm

Chemical Properties	Typical Value US units (metric)
Corrosion Effect	Non-corrosive
Solvent Resistance Tensile Strength Dielectric Strength	1500 psi 200 v/mil
Water Absorption	0.02%
Fungus Resistance	Non-nutrient

***Outer wall only.**

3M Cold Shrink™ Connector Insulators - 8420 Series

Construction: 3M Cold Shrink™ Connector Insulators are open-ended, tubular, rubber sleeves which are factory expanded and assembled onto a removable core. The core is removed after the tube has been positioned for installation over an inline connection, terminal lug, etc., allowing the tube to shrink and form a water-resistant seal;
Insulation: The insulating tube is made of EPDM rubber which contains no chlorides or sulfurs.



Features:
Simple installation, requires no tools. Accommodates a wide range of cable sizes. No torches or heat required. Good thermal stability. Seals tight, retains its resiliency and pressure even after prolonged years of aging and exposure. Excellent wet electrical properties. Improved, tougher rubber formulation to withstand backfilling. Water-resistant. Meets the water seal requirements of ANSI C119.1. No mastic or tape required to seal. Resists fungus. Resistant acids and alkalies. Resists ozone.

Technical Data:
Color Code: Black

Applications:
Primary electrical insulation for all solid dielectric (rubber and plastic) insulated wire and cable splicing rated to 1000 volts. Direct burial or submersible. For indoor, outdoor. Physical protection and moisture sealing for high-voltage, air-insulated connectors and lugs such as spacer cable and lug connections to bus bar. Insulation of secondary splices, copper or aluminum conductors. Relocation of service. Dig-in repairs. Sheath repairs. Environmental sealing for communication and other non-electrical applications. Insulation of inline conductor transition connectors. (See Figure 1).

Additional Information:
Sizes: Six diameter sizes will cover a range of 1000 volt cable from 10 AWG through 1000 kcmil, copper and aluminum conductors.

Typical Physical and Electrical Properties
EPR (Ethylene Propylene Rubber)

Physical Properties

Test Method	Typical Value*
Color	Black
300% Modulus (ASTM D 412-75)	480 psi (3,3 MPa)
Ultimate Tensile (ASTM D 412-75) Original	1400 psi (9,6 MPa)
Ultimate Elongation (ASTM D 412-75) Original	750%
Die C Tear (ASTM D 624C-73) Original	150 pli (26,3 KN/m)
Fungus Resistance (ASTM G-21) 28 days exposure	No Growth
Moisture Absorption 7 days 90ºC (194ºF) H_2O	wt. gain 1.8%

Electrical Properties

Test Method	Typical Value*
Dielectric Strength (ASTM D 149-75) Original @ 1,78 mm	365 v/mil (14,3 Mv/m)
7 days in H_2O at 90ºC (194ºF)	282 v/mil (11,1 Mv/m)

*All values are averages and are not intended for specific purposes.

Cold Shrink™ Selection Table

Product Number	Conductor Sizes AWG & Kcmil	Product Diameter Range (minimum – maximum)* inches (mm)	Relaxed Tube Length inches (mm)
8423–6	6 – 4	0.31 – 0.56 (7,80 – 14,3)	6.0 (152)
8424–8	10 – 1/0**	0.10 – 0.82 (2,54 – 20,9)	8.0 (203)
8425–8	2 – 1/0	0.40 – 0.82 (10,1 – 20,9)	8.0 (203)
8426–9 8426–11	2/0 – 250 2/0 – 250	0.55 – 1.18 (13,9 – 30,1) 0.55 – 1.18 (13,9 – 30,1)	9.0 (229) 11.0 (279)
8427–6*** 8427–12 8427–16	— 250 – 400 250 – 400	0.67 – 1.38 (16,8 – 35,1) 0.67 – 1.38 (16,8 – 35,1) 0.67 – 1.38 (16,8 – 35,1)	6.0 (152) 12.0 (305) 16.0 (406)
8428–6*** 8428–12 8428–18	— 450 – 800 450 – 800	0.95 – 1.94 (24,0 – 49,3) 0.95 – 1.94 (24,0 – 49,3) 0.95 – 1.94 (24,0 – 49,3)	6.0 (152) 12.0 (305) 18.0 (457)
8429–6*** 8429–9**** 8429–12 8429–18	— 900 – 1000 900 – 1000 900 – 1000	1.27 – 2.67 (32,2 – 67,8) 1.27 – 2.67 (32,2 – 67,8) 1.27 – 2.67 (32,2 – 67,8) 1.27 – 2.67 (32,2 – 67,8)	6.0 (152) 9.0 (229) 12.0 (305) 18.0 (457)
8430–9*** 8430–18	— 1250 – 2000	1.68 – 3.69 (42,6 – 93,7) 1.68 – 3.69 (42,6 – 93,7)	9.0 (229) 18.0 (457)

NOTES:
* Minimum = Seal Diameter. Maximum = Connector Clearance Dimension.
** Product contains range-extending adapters (Without adapters, 8424–8/8425–8 ranges are identical).
*** Primary uses: Sealing of terminal lug barrels, conduit couplings and conduit–to–cable breakouts.
**** Maximum connector length: 5.625˝ (For longer connector bodies, select 8429–12/8429–18 as needed).

IMPORTANT: Use wire insulation/jacket diameters and connector O.D. for final sizing confirmation.

Maintenance
3M Cold Shrink™ Connector Insulator Assemblies are stable under normal storage conditions. They are not impaired by freezing or overheating due to the ambient temperatures found in storage or shipping. Normal storage and stock rotation are recommended. 3M Cold Shrink™ removable core material is polypropylene and recyclable with other PP waste.

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

3M™ VTN-200 Tubing

Construction: Modified Fluoroelastomer

Features:
3M™ VTN-200 heat-shrinkable tubing is highly abrasion and cut-through resistant and can withstand a wide variety of fuels, lubricants, acids and high corrosive fluids at temperatures up to 200ºC. In addition to its high continuous operating temperature and chemical-resistance properties, this tubing is very flexible and is easily marked by hot-stamp or print-wheel methods.

Applications:
Because of its outstanding high-temperature fluid performance, VTN-200 Tubing is often used to protect wiring and component covers in aircraft/aerospace applications including electronic control systems and hydraulic fluid transport mechanisms and in chemical plants.

Additional Information:
Standard Packaging: Spools
Ordering Information: Order VTN-200 Tubing by product name, size equivalent to the expanded inside diameter, package type and color. Always order the largest size that will shrink snugly over the component to be covered. Example: VTN-200, 3/16", black, spools.

Technical Data:

Temperature:
VTN-200 is rated for continuous operation from -55ºC (-67ºF) to 200ºC (392ºF)

Color Code:
Standard Color: Black

Approvals:
MIL-DTL-23053/13, MIL-R-46846, Type III, Class 1

Standard Sizes and Dimensions

Ordering Size	Expanded I.D. (Minimum)		Recovered I.D. (Maximum)		Recovered Wall Thickness (Nominal)	
	in.	(mm)	in.	(mm)	in.	(mm)
1/8	.125	(3,18)	.062	(1,57)	.030	(0,76)
3/16	.187	(4,75)	.093	(2,36)	.035	(0,89)
1/4	.250	(6,35)	.125	(3,18)	.035	(0,89)
3/8	.375	(9,53)	.187	(4,75)	.035	(0,89)
1/2	.500	(12,70)	.250	(6,35)	.035	(0,89)
5/8	.625	(15,88)	.312	(7,92)	.042	(1,07)
3/4	.750	(19,05)	.375	(9,53)	.042	(1,07)
7/8	.875	(22,23)	.438	(11,11)	.049	(1,24)
1	1.000	(25,40)	.500	(12,70)	.049	(1,24)
1-1/4	1.250	(31,75)	.625	(15,88)	.055	(1,40)
1-1/2	1.500	(38,10)	.750	(19,05)	.055	(1,40)
2	2.000	(50,80)	1.000	(25,40)	.065	(1,65)

Typical Properties

Applicable Specification
MIL-DTL-23053/13; MIL-R-46846, Type III, Class 1

Physical

Tensile Strength	2400 PSI
Ultimate Elongation	450%
Longitudinal Change	+1,-10%
Specific Gravity	1.7
Operating Temperature Range	–55°C to +200°C
Shrink Temperature (Min.)	175°C (347°F)
Low Temperature Flexibility (4 hrs. @ –55°C)	No cracking
Flammability	Self-extinguish

Electrical

Dielectric Strength	500 V/mil
Volume Resistivity	10^{12} ohm-cm

Chemical

Corrosion Resistance	Non-corrosive
Fuel & Oil Resistance	Excellent
Solvent Resistance	Excellent
Abrasion Resistance	Excellent
Acids & Alkalis Resistance	Excellent

Technical information provided consists of typical product data and should not be used for specification purposes. Unless otherwise noted, all tests are performed at room temperature.

3M™ Heat Shrink Heavy Duty End Caps

Construction: 3M Part numbers SKE 4/10 to SKE 45/100

Applications:
Heat shrinkable end caps are typically used to seal cable ends and provide mechanical and environmental protection. With the exception of SKE 4/10, these end caps can be fitted with air valves suitable for pressurized cable applications.

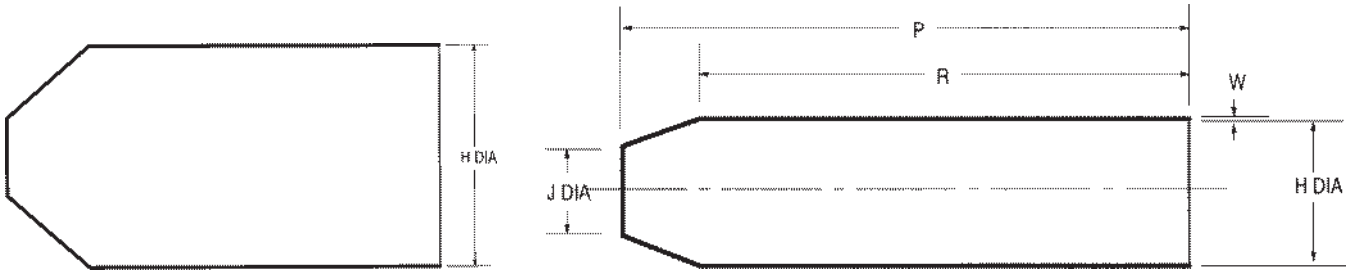
Additional Information:
Materials available: -1 Semi-rigid Flame Retardant Polyolefin. -3 Flexible Polyolefin, Halogen Free. -6 Flexible Flame Retardant Polyolefin. Standard part supplied with -250 adhesive.

Technical Data:
See chart

Color Code:
Standard Color: Black

Expanded part (as supplied)

Fully recovered part (after heating)



PART NUMBER	H DIA		J DIA	P ±10% R	R ±10% R	HW ±20% R	For Cable Diameters
	MIN X	MAX R	MAX R				
SKE 4/10	0.39	0.16	0.12	1.32	1.18	0.08	0.16 - 0.31
	(9.91)	(4.06)	(3.05)	(33.53)	(29.97)	(2.03)	(4-8)
SKE 8/20	0.79	0.30	0.26	2.18	1.97	0.09	0.31 - 0.43
	(20.07)	(7.62)	(6.60)	(55.37)	(50.04)	(2.29)	(8-16)
SKE 15/40	1.57	0.59	0.41	3.54	3.15	0.12	0.59-1.26
	(39.88)	(14.99)	(10.41)	(89.92)	(80.01)	(3.05)	(15-32)
SKE 25/63	2.48	0.98	0.63	5.63	5.12	0.13	1 - 1.97
	(62.99)	(24.89)	(16.00)	(143.00)	(130.05)	(3.30)	(25-50)
SKE 30/76	2.99	1.18	0.67	6.22	5.91	0.16	1.18 - 2.36
	(75.95)	(29.97)	(17.02)	(157.99)	(150.11)	(4.06)	(30-60)
SKE 45/100	3.94	1.77	1.02	6.40	5.50	0.16	1.77 - 3.15
	(100.08)	(44.96)	(25.91)	(162.56)	(139.70)	(4.06)	(45-80)

Notes:
- All dimensions in both inches and metric, all angles in degrees
- Dimensions in table: X = Expanded (Minimum) R = Recovered (Maximum)
- Color: Black
- 3M CAGE Code: 20999

Materials Available

-1	Semi-rigid Flame Retardant Polyolefin
-3	Flexible Polyolefin, Halogen Free
-6	Flexible Flame Retardant Polyolefin

Standard Part Supplied with -250 Adhesive

Adhesive (Part #)	Factory Applied	Description
TTS-250	-250	Thermoplastic 80°C

Check out our complete inventory of products at www.lapptannehill.com

CPX 876: Thin wall, cross-linked polyolefin, flexible heat shrink tubing

Features and Benefits

- 2:1 shrink ratio
- Highly flame retardant (colors only)
- Continuous operating temperature: -55°C to 135°C
- Shrink temperature: 90°C

Applications

- Electrical insulation of wire splices and terminals
- Strain relief of wire terminations
- Protects components from abrasion and fluids

SAE-AMS-DTL-23053/5, Class 1 & 3

Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths		Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths	
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0047	1.2	3/64	0.6	3/128	0.45	0.018	300	1,000	0500	12.7	1/2	6.4	1/4	0.64	0.025	60	200
0062	1.6	1/16	0.8	1/32	0.45	0.018	300	1,000	0625	16.0	5/8	8.0	5/16	0.64	0.030	60	200
0093	2.4	3/32	1.2	3/64	0.51	0.020	300	1,000	0750	19.0	3/4	9.5	3/8	0.76	0.030	30	100
0125	3.2	1/8	1.6	1/16	0.51	0.020	300	1,000	1000	25.4	1	12.7	1/2	0.89	0.035	30	100
0187	4.8	3/16	2.4	3/32	0.51	0.020	300	1,000	1250	32.0	1¼	16.0	5/8	0.89	0.040	30	100
0250	6.4	1/4	3.2	1/8	0.64	0.025	150	500	1500	38.1	1½	19.0	3/4	1.02	0.040	30	100
0375	9.5	3/8	4.8	3/16	0.64	0.025	150	500	2000	50.8	2	25.4	1	1.14	0.060	30	100
0500	12.7	1/2	6.4	1/4	0.64	0.025	60	200	3000	76.2	3	38.1	1½	1.27	0.060	15	50
0625	16.0	5/8	8.0	5/16	0.64	0.030	60	200	4000	101.6	4	50.8	2	1.40	0.060	15	50

CPA 300: Thin wall, adhesive lined, cross-linked polyolefin heat shrink tubing

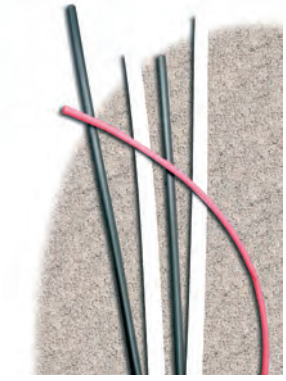
Features and Benefits

- 3:1 shrink ratio
- Highly flame retardant
- Continuous operating temperature: -55°C to 125°C
- Shrink temperature: 120°C

Applications

- Environmental sealing of simple in-line splices
- Strain relief and sealing of connectors & terminals
- Mechanical protection of components

SAE-AMS-DTL-23053/4, Class 3



Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Total Wall Thickness (nom) W		Recovered Meltable Wall Thickness (nom)		Lengths (Sticks)	
	mm	in	mm	in	mm	in	mm	in	m	in
0125	3.2	1/8	1.0	0.040	1.0	0.040	0.5	0.020	1.2	48
0187	4.7	3/16	1.5	0.060	1.0	0.040	0.5	0.020	1.2	48
0250	6.4	1/4	2.0	0.080	1.0	0.040	0.5	0.020	1.2	48
0375	9.5	3/8	3.2	0.125	1.5	0.060	0.7	0.027	1.2	48
0500	12.7	1/2	4.1	0.160	1.8	0.070	0.8	0.030	1.2	48
0750	19.1	3/4	6.4	0.250	1.8	0.070	0.8	0.030	1.2	48
1000	25.4	1	8.1	0.320	2.5	0.100	1.0	0.040	1.2	48
1250	31.8	1¼	10.6	0.416	2.5	0.100	1.0	0.040	1.2	48
1500	39.9	1½	13.0	0.510	2.5	0.100	1.0	0.040	1.2	48

Deray® V25: Diesel resistant, flexible, elastomeric heat shrink tubing

Features and Benefits

- 2:1 shrink ratio
- Flexible
- Flame retardant
- Continuous operating temperature: -75°C to 120°C
- Shrink temperature: 130°C

Applications

- Protective covering for military cables & harnesses

SAE-AMS-DTL-23053/16

Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths		Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths	
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0125	3.2	1/8	1.6	1/16	0.80	0.031	50	164	0750	19.0	3/4	9.5	3/8	1.50	0.059	30	98
0187	4.8	3/16	2.4	3/32	0.90	0.035	50	164	1000	25.4	1	12.7	1/2	1.90	0.075	30	98
0250	6.4	1/4	3.2	1/8	1.00	0.039	50	164	1500	38.0	1½	19.0	3/4	2.50	0.098	15	49
0375	9.5	3/8	4.8	3/16	1.10	0.043	50	164	2000	51.0	2	25.4	1	3.10	0.122	15	49
0500	12.7	1/2	6.4	1/4	1.30	0.051	30	98									

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Deray® KY 175: Transparent, thin wall PVDF (polyvinylidene fluoride) heat shrink tubing

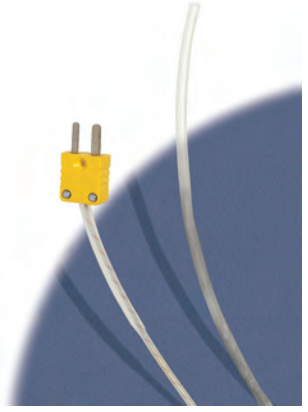
Features and Benefits

- 2:1 shrink ratio
- Highly flame retardant, semi-rigid
- Continuous operating temperature: -55°C to 175°C
- Shrink temperature: 175°C

Applications

- Strain relief & insulation of high temperature wires
- Protection against aggressive fluids

SAE- AMS- DTL- 23053/8



Order Number	Expanded		Recovered				Lengths		Order Number	Expanded		Recovered				Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W					Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0047	1.2	3/64	0.6	3/128	0.24	0.009	1.2	48	0250	6.4	1/4	3.2	1/8	0.30	0.012	1.2	48
0062	1.6	1/16	0.8	1/32	0.24	0.009	1.2	48	0375	9.5	3/8	4.8	3/16	0.30	0..012	1.2	48
0094	2.4	3/32	1.2	3/64	0.24	0.009	1.2	48	0500	12.7	1/2	6.4	1/4	0.30	0.012	1.2	48
0125	3.2	1/8	1.6	1/16	0.24	0.009	1.2	48	0750	19.0	3/4	9.5	3/8	0.40	0.016	1.2	48
0187	4.8	3/16	2.4	3/32	0.24	0.009	1.2	48	1000	25.4	1	12.7	1/2	0.50	0.020	1.2	48

Deray® VT 220: Thin wall, fluoroelastomer heat shrink tubing

Features and Benefits

- 2:1 shrink ratio
- Flame retardant
- Continuous operating temperature: -55°C to 220°C
- Shrink temperature: 175°C

Applications

- Bundling and strain relief of wire harnesses in high temperature applications

SAE-AMS-DTL-23053/13

Order Number	Expanded		Recovered				Lengths		Order Number	Expanded		Recovered				Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W					Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0125	3.2	0.125	1.6	0.063	0.8	0.031	50	164	0750	19.0	0.75	9.5	0.374	1.1	0.042	30	98
0187	4.8	0.188	2.4	0.094	0.9	0.035	50	164	1000	25.4	1	12.7	0.500	1.2	0.049	30	98
0250	6.4	0.25	3.2	0.126	0.9	0.035	50	164	1500	38	1.5	19.0	0.748	1.4	0.055	15	49
0375	9.5	0.375	4.8	0.189	0.9	0.035	50	164	2000	52	2	25.4	1.000	1.6	0.065	15	49
0500	12.7	0.5	6.4	0.252	0.9	0.035	30	98									

Deray® SpliceMelt: Adhesive lined, cross-linked polyolefin heat shrink tubing

Features and Benefits

- 4:1 shrink ratio
- Adhesive bonds readily to PVC, XLPE & PP-EPDM
- Continuous operating temperature: -40°C to 125°C
- Shrink temperature: 120°C

Applications

- Environmental sealing of in-line splices
- Sealing and strain relief of connectors & terminals
- Abrasion protection and electrical insulation of automotive wiring harness splices

Order Number	Expanded		Recovered				Cut Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft
1	6.0	0.236	1.4	0.055	1.35	0.053	50	1.97
2	8.0	0.315	1.6	0.063	1.75	0.069	50	1.97
3	12.0	0.472	2.5	0.098	2.00	0.079	65	2.56
4	18.0	0.708	3.7	0.146	2.60	0.102	75	2.95

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CDR: Semi-rigid, adhesive lined, cross-linked polyolefin heat shrink tubing

RoHS

Features and Benefits

- 4:1 shrink ratio
- Highly resistant to Diesel and other common automotive fluids and solvents
- Continuous operating temperature: -40°C to 130°C
- Shrink temperature: 130°C

Applications

- Protection of wire splices used in trucks, buses, tractors and construction equipment
- Strain relief
- Abrasion protection and electrical insulation

Order Number	Expanded		Recovered				Cut Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft
1	6	0.236	1.27	0.050	1.27	0.050	50	1.97
2	8	0.315	1.52	0.060	1.52	0.060	50	1.97
3	12	0.472	2.03	0.080	1.91	0.075	65	2.56
4	18	0.710	3.81	0.150	2.41	0.095	75	2.95

CFW: Heavy wall, cross-linked polyolefin heat shrink tubing

CSA UL RoHS

Features and Benefits

- 3:1 shrink ratio
- Rated for 1 kV, 90°C continuous use
- Continuous operating temperature: -55°C to 110°C
- Shrink temperature: 120°C

Applications

- Strain relief and mechanical protection
- Insulation of primary low voltage cables

Order Number	Expanded		Recovered				Lengths		Order Number	Expanded		Recovered				Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W					Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0350	8.9	0.35	3.0	0.12	1.8	0.07	1.2	48	2700	68.1	2.70	22.1	0.87	3.8	0.15	1.2	48
0500	13.0	0.51	4.1	0.16	2.0	0.08	1.2	48	3500*	89.9	3.54	30.0	1.18	3.8	0.15	1.2	48
0750	19.1	0.75	6.1	0.24	3.0	0.12	1.2	48	4700*	119.9	4.72	39.9	1.57	3.8	0.15	1.2	48
1100	27.9	1.10	8.9	0.35	3.0	0.12	1.2	48	5100*	129.5	5.10	39.9	1.57	3.8	0.15	1.2	48
1500	38.1	1.50	11.9	0.47	3.6	0.14	1.2	48	6000*	152.4	6.00	50.8	2.00	3.8	0.15	1.2	48
2000	50.8	2.00	16.0	0.63	3.6	0.14	1.2	48	6700*	170.2	6.70	56.6	2.23	3.8	0.15	1.2	48

FCFW: Flame retardant, heavy wall, cross-linked polyolefin heat shrink tubing

CSA UL RoHS

SAE-AMS-DTL-23053/15 Class 1

Features and Benefits

- 3:1 shrink ratio
- Flame retardant
- Continuous operating temperature: -55°C to 110°C
- Shrink temperature: 120°C

Applications

- Insulation of low voltage cables
- Battery cable protection
- Flame retardant systems

Order Number	Expanded		Recovered				Lengths		Order Number	Expanded		Recovered				Lengths	
	Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W					Internal Diameter (min) D		Internal Diameter (max) d		Wall Thickness (nom) W			
	mm	in	mm	in	mm	in	m	ft		mm	in	mm	in	mm	in	m	ft
0350	8.9	0.35	3.0	0.12	1.8	0.07	1.2	48	2000	50.8	2.00	16.0	0.63	4.1	0.16	1.2	48
0500	13.0	0.51	4.1	0.16	2.4	0.08	1.2	48	2700	68.1	2.70	22.1	0.87	4.1	0.16	1.2	48
0750	19.1	0.75	6.1	0.22	2.5	0.09	1.2	48	3500*	89.9	3.54	30.0	1.18	4.1	0.16	1.2	48
1100	27.9	1.10	8.9	0.35	3.0	0.12	1.2	48	4700*	119.9	4.72	39.9	1.57	4.2	0.17	1.2	48
1500	38.1	1.50	11.9	0.47	4.1	0.16	1.2	48	6000*	152.4	6.00	50.8	2.00	3.8	0.15	1.2	48

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CFHR: High ratio, flame retardant, cross-linked polyolefin heat shrink tubing

Features and Benefits

- 6:1 shrink ratio
- Flame retardant
- Continuous operating temperature: -55°C to 110°C
- Shrink temperature: 120°C

Applications

- Wire harnesses
- Abrasion and impact resistance
- Strain relief and protection of cables

Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths		Order Number	Expanded Internal Diameter (min) D		Recovered Internal Diameter (max) d		Recovered Wall Thickness (nom) W		Lengths	
Semi-Rigid	mm	in	mm	in	mm	in	m	ft	Flexible	mm	in	mm	in	mm	in	m	ft
0750	19.0	0.750	3.2	0.125	3.2	0.123	1.2	48	1250	31.8	1.25	5.6	0.220	1.5	0.060	1.2	48
1300	33.0	1.300	5.5	0.220	3.4	0.135	1.2	48	1750	44.4	1.75	8.0	0.315	2.4	0.095	1.2	48
1750	44.4	1.750	7.4	0.290	3.6	0.140	1.2	48	2500	63.5	2.50	12.7	0.500	3.0	0.120	1.2	48
2000	50.8	2.000	8.3	0.330	4.3	0.170	1.2	48	3000	76.2	3.20	19.1	0.750	3.6	0.140	1.2	48
2750	69.8	2.750	11.7	0.460	4.8	0.190	1.2	48									
3500	88.9	3.500	17.1	0.673	4.3	0.170	1.2	48									
4700	119.4	4.700	22.9	0.900	4.8	0.190	1.2	48									

QuickWrap: Heat shrink wrap around sleeves

Features and Benefits

- Shrink ratio: 3:1
- High impact and abrasion resistance
- Continuous operating temperature: -55°C to 110°C
- Shrink temperature: 120°C

Applications

- Connectorized cable repair
- Retrofit protection
- Cable jacket repairs

FCFW QuickWrap

Order Number	Length		Width		Recommended Overlap				Expanded Sleeve I.D. with Overlap				Application Range (min - max)		Conductor Size
	in	mm	in	mm	in (min)	mm (min)	in (max)	mm (max)	in (min)	mm (mim.)	in (max)	mm (max)	in	mm	AWG/MCM 600/1000 V
1500	12	305	5.7	145	1.13	28.6	2.36	59.8	0.75	19.1	1.14	29.0	0.50 - 1.00	13 - 25	#2/0 - 350
2000	12	305	7.3	185	1.13	28.6	3.14	79.8	1.00	25.4	1.64	41.7	0.70 - 1.50	18 - 38	250 - 500
2700	12	305	9.5	241	1.20	30.5	4.24	107.7	1.35	34.3	2.32	58.9	1.00 - 2.00	25 - 58	600 - 1000

CFM QuickWrap

Order Number	Length		Width		Recommended Overlap				Expanded Sleeve I.D. with Overlap				Application Range (min - max)		Conductor Size
	in	mm	in	mm	in (min)	mm (min)	in (max)	mm (max)	in (min)	mm (mim.)	in (max)	mm (max)	in	mm	AWG/MCM 600/1000 V
1100	6	152	4.1	104	0.79	20.1	1.35	34.3	0.65	16.5	0.78	19.8	0.35-0.68	9-17	#6-1/0
1500	12	305	5.7	145	1.13	28.6	2.36	59.8	0.75	19.1	1.14	29.0	0.50 - 1.00	13 - 25	#2/0 - 350
2000	12	305	7.3	185	1.13	28.6	3.14	79.8	1.00	25.4	1.64	41.7	0.70 - 1.50	18 - 38	250 - 500
2700	12	305	9.5	241	1.20	30.5	4.24	107.7	1.35	34.3	2.32	58.9	1.00 - 2.00	25 - 58	600 - 1000

CFW QuickWrap

Order Number	Length		Width		Recommended Overlap				Expanded Sleeve I.D. with Overlap				Application Range (min - max)		Conductor Size
	in	mm	in	mm	in (min)	mm (min)	in (max)	mm (max)	in (min)	mm (mim.)	in (max)	mm (max)	in	mm	AWG/MCM 600/1000 V
1500	12	305	5.7	145	1.13	28.6	2.36	59.8	0.75	19.1	1.14	29.0	0.50 - 1.00	13 - 25	#2/0 - 350
2000	12	305	7.3	185	1.13	28.6	3.14	79.8	1.00	25.4	1.64	41.7	0.70 - 1.50	18 - 38	250 - 500
2700	12	305	9.5	241	1.20	30.5	4.24	107.7	1.35	34.3	2.32	58.9	1.00 - 2.00	25 - 58	600 - 1000

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www.lapptannehill.com

PTFE - Polytetrafluoroethylene

Background:

- Originally discovered in the 1930's by DuPont® scientist Dr. Roy Plunkett, PTFE was first used in the top secret Manhattan Project during WWII. DuPont® commercialized PTFE under the tradename Teflon® in the late 1940's. Extrudable grades of PTFE were commercialized later and in 1966 ZEUS was founded and began development of advanced manufacturing processes for PTFE.

- The unique properties of PTFE has made it the polymer of first choice for many advanced applications. With the lowest coefficient of friction of any polymer and an extremely broad working temperature range, PTFE has been designed into products from advanced medical devices to high temperature industrial equipment. Because of it's unparalleled chemical resistance and extreme chemical inertness, PTFE has become a choice plastic for the chemical and analytical sciences industries.

Key Properties:

- Very lubricious – Lowest coefficient of friction of any polymer
- Working temperature range -454°F (-270°C) to 500°F (260°C)
- Chemically resistant (all common solvents, acids and bases)
- Chemically inert
- Low extractables
- Excellent dielectric insulation properties

Additional Properties:

- Biocompatible – Certified USP Class VI
- Flame resistant: UL 94 VO
- Limiting oxygen index greater than 95
- ETO and autoclave sterilizable

FEP - Fluorinatedethylenepropylene

Background:

- The development of PTFE was a significant breakthrough in polymer sciences. The special processing requirements of PTFE led researchers to develop a melt-processable version of PTFE resulting in FEP. This new resin was compatible with existing processing methods and equipment. Melt processability also allowed for long continuous extrusions of FEP in applications such as wire and cable.

Key Properties:

- Excellent coefficient of friction
- Chemically resistant and inert
- Gamma, ETO, e-beam and autoclave sterilizable
- Maximum working temperature 400°F (204°C)
- Excellent transmission of ultraviolet rays
- Lower gas and vapor permeability than PTFE
- Low absorption of solvents (less than 1%)
- Increased translucence compared to most plastics

Additional Properties:

- Excellent dielectric insulation properties
- Melt weldable and thermoformable
- Biocompatible – Certified USP Class VI
- Environmentally stable
- Flame Rating: UL 94 VO
- Limiting oxygen index greater than 95

PFA/MFA - Perfluoroalkoxy

Background:

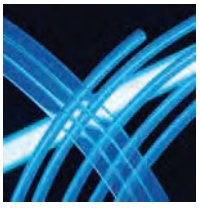
- PFA was developed to increase the continuous service temperature of FEP resin. Melt processability allows PFA to be processed in longer continuous lengths than PTFE.

Key Properties:

- Excellent clarity and flexibility
- Maximum working temperature 500°F (260°C)
- Combines attributes of PTFE and FEP
- Chemically resistant to all common solvents
- Maintains a mechanical strength at high temperatures
- Available in high purity grades
- Chemically inert

Additional Properties:

- Excellent solvent resistance
- Low gas permeability
- Smoother surface texture
- Ultra-low levels of ionic extractables
- ETO, e-beam and autoclave sterilizable
- Flame resistant: UL 94 VO



ETFE - Ethylenetetrafluoroethylene

Background:

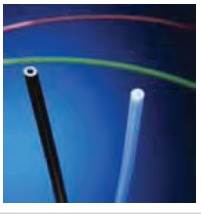
- ETFE is used in applications requiring excellent impact resistance and good resistance to stress cracking. The resin maintains these properties up to its continuous working temperature of over 300°F (149°C). ETFE is the resin of choice for applications requiring a fluoropolymer with superior mechanical properties.

Key Properties:

- Excellent impact resistance
- Increased durability and stiffness over other fluoropolymers
- Higher pressure rating than other fluoropolymers
- Higher tensile strength and creep resistance than other fluoropolymers
- Greater crush resistance than other fluoropolymers

Additional Properties:

- Gamma, ETO and e-beam sterilizable
- Maximum working temperature 302° F (150°C)
- Chemical resistant
- Flame rating: UL 94 VO
- Limiting oxygen index 30



PTFE, FEP, PFA, ETFE Extruded Tubing

Dimensions (Inches)

INSIDE DIAMETER				WALL DIMENSIONS					
				Standard Wall		Thin Wall		Lightweight Wall	
AWG Size	Min.	Nom.	Max.	Nom.	Tol.	Nom.	Tol.	Nom.	Tol.
*32	0.008	0.010	0.012	0.005	±.002	0.005	±.002	–	–
30	0.010	0.012	0.015	0.009	±.002	0.009	±.002	0.006	±.002
28	0.013	0.015	0.018	0.009	±.002	0.009	±.002	0.006	±.002
26	0.016	0.018	0.021	0.009	±.002	0.009	±.002	0.006	±.002
24	0.020	0.022	0.026	0.012	±.002	0.010	±.003	0.006	±.002
23	0.023	0.026	0.029	0.012	±.002	0.010	±.003	0.006	±.002
22	0.025	0.028	0.032	0.012	±.002	0.010	±.003	0.006	±.002
21	0.029	0.032	0.035	0.012	±.002	0.010	±.003	0.006	±.002
20	0.032	0.034	0.038	0.016	±.003	0.012	±.003	0.006	±.002
19	0.036	0.038	0.042	0.016	±.003	0.012	±.003	0.006	±.002
18	0.040	0.042	0.046	0.016	±.003	0.012	±.003	0.006	±.002
17	0.045	0.047	0.052	0.016	±.003	0.012	±.003	0.006	±.002
16	0.051	0.053	0.058	0.016	±.003	0.012	±.003	0.006	±.002
15	0.057	0.059	0.065	0.016	±.003	0.012	±.003	0.006	±.002
14	0.064	0.066	0.072	0.016	±.003	0.012	±.003	0.008	±.002
13	0.072	0.076	0.081	0.016	±.003	0.012	±.003	0.008	±.002
12	0.081	0.085	0.091	0.016	±.003	0.012	±.003	0.008	±.002
11	0.091	0.095	0.101	0.016	±.003	0.012	±.003	0.008	±.002
10	0.102	0.106	0.112	0.016	±.003	0.012	±.003	0.008	±.002
9	0.114	0.118	0.124	0.020	±.004	0.015	±.003	0.008	±.002
8	0.129	0.133	0.139	0.020	±.004	0.015	±.003	0.008	±.002
7	0.144	0.148	0.155	0.020	±.004	0.015	±.003	0.008	±.002
6	0.162	0.166	0.174	0.020	±.004	0.015	±.003	0.010	±.003
5	0.182	0.186	0.195	0.020	±.004	0.015	±.003	0.010	±.003
4	0.204	0.208	0.218	0.020	±.004	0.015	±.003	0.010	±.003
3	0.229	0.234	0.244	0.020	±.004	0.015	±.003	0.010	±.003
2	0.258	0.263	0.273	0.020	±.004	0.015	±.003	0.010	±.003
1	0.289	0.294	0.305	0.020	±.004	0.015	±.003	0.010	±.003
0	0.325	0.330	0.342	0.020	±.004	0.015	±.003	0.012	±.003

"Material and dimensions comply with ASTM 3295, 3296; AMS 3653, 3654, 3655 and MIL-I-22129. Annual testing data provided. Lot to lot testing available upon request."
*AWG 32 not covered under ASTM or MIL standards.

On all cases of military or commercial specifications, latest revisions apply. Supplied in natural unless otherwise specified. Custom Pantone colors or ZEUS standard colors available on request.

Dimensions (Inches)

INSIDE DIAMETER				WALL DIMENSIONS					
				Standard Wall		Thin Wall		Lightweight Wall	
Frac. Sizes Spec'd by ID	Min.	Nom.	Max.	Nom.	Tol.	Nom.	Tol.	Nom.	Tol.
1/8	0.120	0.125	0.130	0.020	±.004	0.015	±.003	—	—
1/8	0.125	0.130	0.135	—	—	—	—	0.008	±.002
3/16	0.188	0.192	0.198	0.020	±.004	0.015	±.003	0.010	±.003
1/4	0.250	0.255	0.260	0.020	±.004	0.015	±.003	0.010	±.003
5/16	0.313	0.321	0.332	0.020	±.004	0.015	±.003	0.012	±.003
3/8	0.375	0.387	0.394	0.025	±.005	0.015	±.003	0.015	±.005
7/16	0.438	0.451	0.458	0.025	±.005	0.018	±.004	0.018	±.005
1/2	0.500	0.515	0.520	0.025	±.005	0.018	±.004	0.018	±.005
5/8	0.625	0.643	0.650	0.025	±.005	0.020	±.004	0.020	±.005
3/4	0.750	0.772	0.775	0.030	±.006	0.025	±.005	0.020	±.005
7/8	0.875	0.902	0.927	0.035	±.007	—	—	—	—
1	1.000	1.030	1.060	0.035	±.007	—	—	—	—
1-1/4	1.250	1.287	1.325	0.040	±.007	—	—	—	—
1-1/2	1.500	1.550	1.580	0.045	±.007	—	—	—	—

INDUSTRIAL SPECIFICATION TUBING

Frac. Sizes Spec'd by ID & OD	I.D.	O.D.	Nominal Wall
1/32	0.031±.004	0.063±.004	.015
1/16	0.063±.005	0.125±.005	.030
3/32	0.094±.005	0.156±.005	.030
1/8	0.125±.005	0.188±.005	.030
3/16	0.188±.005	0.250±.005	.030
1/4	0.250±.005	0.313±.005	.030
5/16	0.313±.005	0.375±.005	.030
3/8	0.375±.005	0.438±.005	.030
7/16	0.438±.005	0.500±.006	.030
1/2	0.500±.006	0.563±.006	.030

"Material and dimensions comply with ASTM 3295, 3296; AMS 3653, 3654, 3655 and MIL-I-22129. Annual testing data provided. Lot to lot testing available upon request."

INDUSTRIAL SPECIFICATION TUBING

Frac. Sizes Spec'd by ID & OD	I.D.	O.D.	Nominal Wall
9/16	0.563±.006	0.625±.006	.030
5/8	0.625±.006	0.688±.006	.030
11/16	0.688±.006	0.750±.006	.032
3/4	0.750±.006	0.830±.006	.040
7/8	0.875±.006	0.965±.006	.045
1	1.000±.010	1.10±.010	.050
1-1/8	1.125±.015	1.215±.015	.045
1-1/4	1.250±.015	1.340±.015	.040
1-1/2	1.500±.015	1.580±.015	.040

On all cases of military or commercial specifications, latest revisions apply. Supplied in natural unless otherwise specified. Custom Pantone colors or ZEUS standard colors available on request.

PTFE Heat Shrink 2:1

Dimensions (inches) Approximate Ratio of Expanded I.D. to Recovered I.D. – AWG Sizes

STANDARD WALL, Class 2					THIN WALL, Class 3					LIGHTWEIGHT WALL, Class 4				
Ordered as AWG Size No.	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.	Ordered as AWG Size No.	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.	Ordered as AWG Size No.	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.
30*	0.034	0.015	0.009	±.002	30	0.034	0.015	0.009	±.002	30*	0.034	0.015	0.006	±.002
28*	0.038	0.018	0.009	±.002	28	0.038	0.018	0.009	±.002	28*	0.038	0.018	0.006	±.002
26*	0.046	0.022	0.010	±.002	26	0.046	0.022	0.010	±.002	26*	0.046	0.022	0.006	±.002
24	0.050	0.027	0.012	±.002	24	0.050	0.027	0.010	±.002	24	0.050	0.025	0.006	±.002
22	0.055	0.032	0.012	±.002	22	0.055	0.032	0.012	±.003	22	0.055	0.031	0.006	±.002
20	0.060	0.039	0.016	±.003	20	0.060	0.039	0.012	±.003	20	0.060	0.038	0.006	±.002
19	0.065	0.043	0.016	±.003	19	0.065	0.043	0.012	±.003	19	0.065	0.043	0.006	±.002
18	0.076	0.049	0.016	±.003	18	0.076	0.049	0.012	±.003	18	0.076	0.046	0.006	±.002
17	0.085	0.054	0.016	±.003	17	0.085	0.054	0.012	±.003	17	0.085	0.054	0.006	±.002
16	0.093	0.061	0.016	±.003	16	0.093	0.061	0.012	±.003	16	0.093	0.057	0.006	±.002
15	0.110	0.067	0.016	±.003	15	0.110	0.067	0.012	±.003	15	0.110	0.063	0.006	±.002
14	0.120	0.072	0.016	±.003	14	0.120	0.072	0.012	±.003	14	0.120	0.072	0.008	±.002
13	0.140	0.080	0.016	±.003	13	0.140	0.080	0.012	±.003	13	0.140	0.080	0.008	±.002
12	0.150	0.089	0.016	±.003	12	0.150	0.089	0.012	±.003	12	0.150	0.089	0.008	±.002
11	0.170	0.101	0.016	±.003	11	0.170	0.101	0.012	±.003	11	0.170	0.099	0.008	±.002
10	0.191	0.112	0.016	±.003	10	0.191	0.112	0.012	±.003	10	0.191	0.110	0.008	±.002
9	0.205	0.124	0.020	±.004	9	0.205	0.124	0.015	±.004	9	0.205	0.122	0.008	±.002
8	0.240	0.141	0.020	±.004	8	0.240	0.141	0.015	±.004	8	0.240	0.139	0.008	±.002
7	0.270	0.158	0.020	±.004	7	0.270	0.158	0.015	±.004	7	0.270	0.154	0.008	±.002
6	0.302	0.178	0.020	±.004	6	0.302	0.178	0.015	±.004	6	0.302	0.172	0.010	±.003
5	0.320	0.198	0.020	±.004	5	0.320	0.198	0.015	±.004	5	0.320	0.192	0.010	±.003
4	0.370	0.224	0.020	±.004	4	0.370	0.224	0.015	±.004	4	0.370	0.214	0.010	±.003
3	0.390	0.249	0.020	±.004	3	0.390	0.249	0.015	±.004	3	0.390	0.241	0.010	±.003
2	0.430	0.278	0.020	±.004	2	0.430	0.278	0.015	±.004	2	0.430	0.270	0.010	±.003
1	0.450	0.311	0.020	±.004	1	0.450	0.311	0.015	±.004	1	0.450	0.301	0.010	±.003
0	0.470	0.347	0.020	±.004	0	0.470	0.347	0.015	±.004	0	0.470	0.347	0.012	±.003

AMS-DTL-23053/12

*AWG 30, 28, 26 SW and LW are not covered under AMS-DTL-23053/12.

On all cases of military or commercial specifications, latest revisions apply. Supplied in natural unless otherwise specified. Custom Pantone colors or ZEUS standard colors available on request.

Dimensions (inches) Approximate Ratio of Expanded I.D. to Recovered I.D. – Fractional Inch Sizes

STANDARD WALL, Class 2					THIN WALL, Class 3					INDUSTRIAL WALL, Class 1				
Ordered as ID	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.	Ordered as ID	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.	Ordered as ID	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.
1/8	0.215	0.130	0.020	±.004	1/8	0.215	0.130	0.015	±.003	1/8	0.166	0.130	0.030	±.005
1/4	0.410	0.260	0.020	±.004	1/4	0.410	0.260	0.015	±.003	3/16	0.250	0.193	0.030	±.005
5/16	0.470	0.329	0.020	±.004	5/16	0.470	0.329	0.015	±.003	1/4	0.333	0.257	0.030	±.005
3/8	0.560	0.399	0.025	±.006	3/8	0.560	0.399	0.015	±.003	5/16	0.415	0.320	0.030	±.005
7/16	0.655	0.462	0.025	±.006	7/16	0.655	0.462	0.018	±.004	3/8	0.498	0.383	0.030	±.005
1/2	0.750	0.524	0.025	±.006	1/2	0.750	0.524	0.018	±.004	7/16	0.580	0.448	0.030	±.006
5/8	0.930	0.655	0.030	±.006	5/8	0.930	0.655	0.020	±.004	1/2	0.666	0.510	0.030	±.006
3/4	1.125	0.786	0.035	±.008	3/4	1.125	0.786	0.025	±.005	9/16	0.748	0.572	0.030	±.006
7/8	1.310	0.911	0.035	±.008	7/8	1.310	0.911	0.030	±.006	5/8	0.830	0.637	0.030	±.006
1	1.500	1.036	0.035	±.008	1	1.500	1.036	0.030	±.006	11/16	0.915	0.700	0.032	±.006
										3/4	1.000	0.764	0.040	±.007
										7/8	1.170	0.891	0.045	±.007
										1	1.330	1.020	0.050	±.008

LIGHTWEIGHT WALL, Class 4				
Ordered as ID	Expanded I.D. Min.	Recovered I.D. Max.	Recovered Wall Thickness Nom.	Tol.
1/8	0.215	0.130	0.008	±.002
1/4	0.410	0.260	0.010	±.003
5/16	0.470	0.329	0.012	±.003

AMS-DTL-23053/12

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

FEP Heat Shrink 1.3:1

Dimensions (inches)

Approximate Ratio of Expanded I.D. to Recovered I.D. – AWG/Fractional Inch Sizes

Ordered as AWG Size	As Supplied Inside Diameter Min.	Recovered – After Shrinking I.D. Will Shrink to at Least	Wall Thickness Min.	Wall Thickness Nom.	Wall Thickness Max.
24	0.031	0.027	0.006	0.008	0.010
22	0.036	0.032	0.006	0.008	0.010
20	0.045	0.039	0.006	0.008	0.010
18	0.060	0.049	0.006	0.008	0.010
16	0.075	0.061	0.007	0.009	0.011
14	0.092	0.072	0.007	0.009	0.011
12	0.115	0.089	0.007	0.009	0.011
10	0.141	0.114	0.007	0.010	0.013
9	0.158	0.124	0.007	0.010	0.013
8	0.180	0.143	0.007	0.010	0.013
7	0.197	0.158	0.007	0.011	0.015
6	0.225	0.180	0.007	0.011	0.015
5	0.248	0.198	0.007	0.011	0.015
4	0.290	0.226	0.007	0.011	0.015
3	0.310	0.249	0.007	0.011	0.015
2	0.365	0.280	0.008	0.012	0.016
1	0.400	0.311	0.008	0.012	0.016
0	0.440	0.349	0.008	0.012	0.016

Fractional Inch (decimal) Tubing

Size	As Supplied Inside Diameter Min.	Recovered – After Shrinking I.D. Will Shrink to at Least	Wall Thickness Min.	Wall Thickness Nom.	Wall Thickness Max.
3/8 (0.375)	0.500	0.383	0.011	0.015	0.019
7/16 (0.438)	0.580	0.448	0.016	0.020	0.024
1/2 (0.500)	0.666	0.510	0.016	0.020	0.024
5/8 (0.625)	0.830	0.637	0.021	0.025	0.029
3/4 (0.750)	1.000	0.764	0.026	0.030	0.034
7/8 (0.875)	1.170	0.891	0.031	0.035	0.039
1 (1.000)	1.330	1.020	0.031	0.035	0.039
1-1/8 (1.125)	1.500	1.145	0.031	0.035	0.039
1-1/4 (1.250)	1.666	1.270	0.031	0.035	0.039
1-3/8 (1.375)	1.833	1.390	0.031	0.035	0.039
1-1/2 (1.500)	2.000	1.570	0.031	0.035	0.039

COMPLIES WITH: AMS-DTL-23053/11

COLOR: Supplied in natural unless otherwise specified. Custom Pantone colors or ZEUS standard colors available on request.

PFA quoted upon request

Class 1.

FEP Heat Shrink 1.6:1

Dimensions (inches)

Size Fractional	Size Decimal	Expanded I.D. Minimum	Recovered I.D. Maximum	Wall Thickness Nom.	Wall Thickness Tol.
3/32	0.093	0.093	0.056	0.008	±0.003
1/8	0.125	0.125	0.075	0.010	±0.003
3/16	0.188	0.188	0.115	0.010	±0.003
1/4	0.250	0.250	0.150	0.010	±0.003
3/8	0.375	0.375	0.225	0.012	±0.003
1/2	0.500	0.500	0.300	0.015	±0.004
3/4	0.750	0.750	0.450	0.020	±0.004
1	1.000	1.000	0.600	0.025	±0.005
1-1/2	1.500	1.500	0.900	0.030	±0.005
2	2.000	2.000	1.200	0.030	±0.005

Metric Dimensions (mm)

Size Fractional	Size mm	Expanded I.D. Minimum	Recovered I.D. Maximum	Wall Thickness Nom.	Wall Thickness Tol.
3/32	2.36	2.36	1.42	0.20	±0.08
1/8	3.18	3.18	1.91	0.25	±0.08
3/16	4.78	4.78	2.92	0.25	±0.08
1/4	6.35	6.35	3.81	0.25	±0.08
3/8	9.53	9.53	5.72	0.31	±0.08
1/2	12.70	12.70	7.62	0.38	±0.10
3/4	19.05	19.05	11.43	0.51	±0.10
1	25.40	25.40	15.24	0.64	±0.13
1-1/2	38.10	38.10	22.86	0.76	±0.13
2	50.80	50.80	30.48	0.76	±0.13

COMPLIES WITH: AMS-DTL-I-23053/11

COLOR: Supplied in natural unless otherwise specified. Custom Pantone colors or ZEUS standard colors available on request.

CUT PIECES: QUOTED ON REQUEST

CUSTOM SPECIFICATIONS AND TOLERANCES QUOTED UPON REQUEST

Class 2

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PTFE/FEP Dual-Shrink® Tubing

Heat Shrink Tubing Offering a Tight, Moisture-Resistant, Wear-Proof Encapsulation

- Outer tubing of PTFE shrinks for tight fit when heat is applied.
- Inner layer of FEP melts and flows to encapsulate parts.

ZEUS Dual-Shrink® tubing of fluoropolymer PTFE/FEP is constructed with an exterior of heat shrink PTFE and an inner layer of FEP. It is easy to apply, and is designed to provide a tight, moisture-proof bond over wires, cables, connectors, splices, terminals, etc. The PTFE shrinks tightly over inserted parts when the covered section is heated, while the FEP melts and flows into a solid or near-solid encapsulation with a fit so tight that it can withstand the most severe stresses involving pull or vibration. ZEUS Dual-Shrink tubing provides all the outstanding electrical, chemical, and mechanical properties of PTFE including a service temperature up to 450°F/232°C. Custom specifications and tolerances quoted upon request.

Dimensions (inches)

STANDARD WALL				LIGHTWEIGHT WALL			
Item No.	As Supplied I.D. Min.	Recovered Dim. I.D. Will Shrink To at Least	After Shrinking Total Wall Thickness-Norm.	Item No.	As Supplied I.D. Min.	Recovered Dim. I.D. Will Shrink To at Least	After Shrinking Total Wall Thickness-Norm.
ZDS-S-036	0.036	0.000	N/A	ZDS-L-065	0.065	0.000	N/A
ZDS-S-060	0.060	0.000	N/A	ZDS-L-115	0.115	0.045	0.015
ZDS-S-130	0.130	0.000	N/A	ZDS-L-130	0.130	0.060	0.015
ZDS-S-160	0.160	0.000	N/A	ZDS-L-180	0.180	0.065	0.015
ZDS-S-190	0.190	0.062	0.035	ZDS-L-190	0.190	0.070	0.015
ZDS-S-250	0.250	0.125	0.035	ZDS-L-240	0.240	0.150	0.020
ZDS-S-350	0.350	0.190	0.035	ZDS-L-350	0.350	0.210	0.025
ZDS-S-450	0.450	0.312	0.055	ZDS-L-480	0.480	0.315	0.032
ZDS-S-700	0.700	0.440	0.055	ZDS-L-700	0.700	0.500	0.040
ZDS-S-950	0.950	0.630	0.065	ZDS-L-1000	1.000	0.700	0.045

Metric Dimensions (mm)

STANDARD WALL				LIGHTWEIGHT WALL			
Item No.	As Supplied I.D. Min.	Recovered Dim. I.D. Will Shrink To at Least	After Shrinking Total Wall Thickness-Norm.	Item No.	As Supplied I.D. Min.	Recovered Dim. I.D. Will Shrink To at Least	After Shrinking Total Wall Thickness-Norm.
ZDS-S-036	0.91	0.000	N/A	ZDS-L-065	1.65	0.000	N/A
ZDS-S-060	1.52	0.000	N/A	ZDS-L-115	2.92	1.14	0.38
ZDS-S-130	3.30	0.000	N/A	ZDS-L-130	3.30	1.52	0.38
ZDS-S-160	4.06	0.000	N/A	ZDS-L-180	4.57	1.65	0.38
ZDS-S-190	4.83	1.57	0.89	ZDS-L-190	4.83	1.78	0.38
ZDS-S-250	6.35	3.18	0.89	ZDS-L-240	6.10	3.81	0.51
ZDS-S-350	8.89	4.83	0.89	ZDS-L-350	8.89	5.33	0.64
ZDS-S-450	11.43	7.92	1.40	ZDS-L-480	12.19	8.00	0.81
ZDS-S-700	17.78	11.18	1.40	ZDS-L-700	17.78	12.70	1.02
ZDS-S-950	24.13	16.00	1.65	ZDS-L-1000	25.40	17.78	1.14

Dual-Shrink Tubing is a ZEUS registered trademark

Please contact your sales representative for detailed information at sales@lapptannehill.com

PEEK™ - Polyetheretherketone

Background:

• PEEK™ is a high performance engineered polymer with amazing strength and heat resistant properties. PEEK™ has become a popular replacement for metal in applications such as aerospace where weight is a primary concern. It has also become the gold standard for HPLC analytical science applications due to its purity, high burst pressure, and chemical resistance. In medical applications PEEK's biocompatibility, high tensile strength, and lubricity have made it an ideal replacement for stainless steel. PEEK™ is a very rigid plastic with excellent lubricity and is tan in its natural color.

Key Properties:

• Ideal replacement for stainless steel for weight and chemical compatibility
• Exceptional torsional stability
• Thermoformable
• Resistant to gamma radiation
• High burst pressure
• High repeat autoclavability

Additional Properties:

• High strength
• High temperature resistance
• Outstanding resistance to chemicals and solvents
• Excellent impact and wear resistance
• Low flammability value
• Excellent creep and fatigue resistance
• Excellent hydrolysis resistance

All PEEK™ is custom ordered

Now available in Sub-Lite-Wall® configurations with wall thicknesses down to .002 on many sizes. +/-.001" (.025mm) tolerances available in most sizes. Call us for more details.

Dimensions (Inches)

I.D.	O.D.	Pressure Rating*
.003	.020	2000 psi
.005	.020	2000 psi
.010	.020	2000 psi
.003	.062	5000 psi
.005	.062	5000 psi
.007	.062	5000 psi
.010	.062	5000 psi
.020	.062	5000 psi
.030	.062	5000 psi
.040	.062	5000 psi
.055	.062	5000 psi
.062	.125	5000 psi
.080	.125	3000 psi

The dimensions and tolerances shown here are only a guide.

Metric Dimensions (mm)

I.D.	O.D.	Pressure Rating*
.076	.508	2000 psi
.127	.508	2000 psi
.254	.508	2000 psi
.076	1.575	5000 psi
.127	1.575	5000 psi
.178	1.575	5000 psi
.254	1.575	5000 psi
.508	1.575	5000 psi
.762	1.575	5000 psi
1.016	1.575	5000 psi
1.397	1.575	5000 psi
1.575	3.175	5000 psi
2.032	3.175	3000 psi

* Suggested maximum safe operating pressure

Specifications subject to change. For complete specifications and availability visit www.lapptannehill.com

STEINEL® Heat Guns

Construction: German quality made in Europe.

Features:
Precision control, versatility, longevity and great performance.
- LOC Lockable Override Control
- LCD Display
- DuraTherm™ Heating Element
- Soft Grip Handle
- Variable Temperature and Airflow Control
- Rubber Power Cord

HG #2310 LCD

Applications:
- Applying shrink tubing and connectors
- Plastic welding and repair
- Fitting or smoothing prosthetic devices
- Shaping and bending plastic pipes and parts
- Soldering and desoldering
- Packaging
- Dental and optical labs
- Stripping paint
- Vehicle graphics or wraps
- Window tinting
- Aerospace
- Loosening seized fasteners

Additional information:
This is just a small sampling of heat guns and products offered by STEINEL. Please visit our website at www.lapptannehill.com for more product information.

HG 2310 LCD	
Item No.	**HG 2310 LCD 34870** **HG 2310 BB 34885** **HG 2510 ESD 34890**
Temperature	120°F - 1200°F (49°C - 649°C)
Airflow	Continuously variable 3.6 - 17.6 cfm
Switch	Cool air stage, variable temperature & airflow
Programs	Four customizable pre-set temperature/airflow programs
Output	1600 watts
Voltage	120 VAC / 60 Hz
Amps	12.5
Power Cord	Industrial grade rubber, length: 6 ft
Nozzle Diameter	1.30" (33.02 mm)
Dimensions	10.20" x 3.50" x 8.00" (l x w x h)
Net Weight	HG 2310 LCD 2.20 lbs (35.20 oz) HG 2310 BB 2.58 lbs (41.28 oz) HG 2510 ESD 2.30 lbs (36.08 oz)
Single Sell Pack	Dimension: 11.40" x 9.50" x 3.70" Weight: HG 2310 LCD 2.72 lbs (43.52 oz) HG 2310 BB 3.09 lbs (49.44 oz) HG 2510 ESD 2.79 lbs (44.64 oz)
Warranty	One year limited

Technical Data:

Temperature:
Varies by gun models

Rated Voltage:
Varies by gun models

Heat Gun Accessories

Construction: Spreader, Reflector and Deflector Nozzles.

Features:
- Reduction nozzles provide a concentrated stream of hot air for precision welding or soldering. May be used as a base for specialized attachments.
- Reflector nozzles direct hot air around pipes and tubing for even heating, while deflector nozzles protect adjoining surfaces (such as panes of glass and corners) from overheating.
- A variety of heat gun stands and holders offer the flexibility of hands free operation, optimum efficiency and maximized safety for most of STEINEL's heat guns.

Part Number	Description	Net Weight	
07461	14mm Reflector nozzle 2.30" x 1.50" x 1.50"	0.04 lb	
07051	39 mm Reflector nozzle 2.50" x 1.40" x 1.40"	0.04 lb	
01410	Metal Heat Gun Stand 7.50" x 5.00" x 5.00"	0.94 lb	

STEINEL® German Quality

TMS-SCE Military grade heat shrinkable wire identification sleeves

Construction: Made from durable, flame retardant, radiation-crosslinked heat-shrinkable polyolefin.

Features:
Both 2:1 and 3:1 shrink ratios are available. The 2:1 products provide a thick, rugged sleeve wall and are particularly easy to handle. The lightweight 3:1 products provide extremely fast shrinking and cover a wider range of wire diameters, thus simplifying inventory. Permanent identification sleeves. Computer-printable. Lightweight for aerospace applications. Military specification material and print performance. Quick recovery for heat sensitive areas.

Technical Data:
See below

Temperature:
-55°C to 135°C

Rated Voltage: N/A

Color Code:
Standard: Yellow and White

Approvals:
CSA Certified.
UL Recognized,
VW all flame tubing test rated.

Temperature rating

Operating temperature range	−55°C to +135°C	−67°F to +275°F
Minimum recovery temperature	+85°C	+185°F
Maximum storage temperature	+40°C	+104°F

Specifications/approvals

Tyco Electronics	RW-2511
Military	SAE-AMS-DTL-23053/5 classes1 and 3,
	SAE AS81531 4.6.2, MIL-STD-202F Method 215J
Industry	UL Recognized – Standard 224, file E35586
	CSA Certified – File 31929

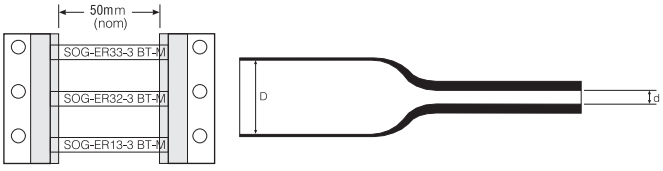
Printer information

Tyco Electronics printer	AM6310 (dot matrix)
	T200 Series (thermal transfer, low volume)
	T312M (thermal transfer)
Tyco Electronics ribbon	1892BK04-RIBBON (dot matrix)
	TMS-101-RIBBON-4RPSCE (thermal transfer for T208M)
	TMS-RJS-RIBBON-4RPSCE (thermal transfer for T312M))

Part numbering system

TMS-SCE - 2X - 1K-$^{1}/_{8}$ - 2.0-S1-9

- Color
- Scoring (optional)
- Sleeve length (2.0" nominal) (omit for 2X)
- Inside diameter, as supplied (in inches)
- Standard Pack (1,000 pieces)
- 2X is optional (2:1 shrink ratio: if left out, product will be 3:1) will be 3:1)
- Product family



Available sizes and formats

Ordering description	Inside diameter Expanded D (minimum) mm	*inches*	Recovered d (maximum) mm	*inches*	Recommended use range mm	*inches*	Recovered wall thickness mm	*inches*	Weight (g/10 pcs.)
TMS-SCE-1K-$^{3}/_{32}$-2.0-<color>	2.36	*0.093*	0.79	*0.031*	0.81 - 1.90	*0.032 - 0.075*	0.53 ± 0.08	*0.021 ± 0.003*	1.50
TMS-SCE-2X-1K-$^{3}/_{32}$-<color>	2.36	*0.093*	1.17	*0.046*	1.27 - 1.90	*0.050 - 0.075*	0.64 ± 0.08	*0.025 ± 0.003*	2.04
TMS-SCE-1K-$^{1}/_{8}$-2.0-<color>	3.18	*0.125*	1.07	*0.042*	1.11 - 2.66	*0.044 - 0.105*	0.58 ± 0.08	*0.023 ± 0.003*	2.03
TMS-SCE-2X-1K-$^{1}/_{8}$-<color>	3.18	*0.125*	1.58	*0.062*	1.75 - 2.66	*0.069 - 0.105*	0.64 ± 0.08	*0.025 ± 0.003*	2.75
TMS-SCE-1K-$^{3}/_{16}$-2.0-<color>	4.75	*0.187*	1.57	*0.062*	1.75 - 4.06	*0.069 - 0.160*	0.58 ± 0.08	*0.023 ± 0.003*	2.68
TMS-SCE-2X-1K-$^{3}/_{16}$-<color>	4.75	*0.187*	2.36	*0.093*	2.54 - 4.06	*0.100 - 0.160*	0.64 ± 0.08	*0.025 ± 0.003*	3.62
TMS-SCE-1K-$^{1}/_{4}$-2.0-<color>	6.35	*0.250*	2.11	*0.083*	2.31 - 5.46	*0.091 - 0.215*	0.58 ± 0.08	*0.023 ± 0.003*	3.51
TMS-SCE-2X-1K-$^{1}/_{4}$-<color>	6.35	*0.250*	3.18	*0.125*	3.81 - 5.46	*0.150 - 0.215*	0.64 ± 0.08	*0.025 ± 0.003*	5.94
TMS-SCE-1K-$^{3}/_{8}$-2.0-<color>	9.53	*0.375*	3.18	*0.125*	3.47 - 8.12	*0.137 - 0.320*	0.61 ± 0.08	*0.024 ± 0.003*	5.04
TMS-SCE-2X-1K-$^{3}/_{8}$-<color>	9.53	*0.375*	4.75	*0.187*	5.59 - 8.12	*0.220 - 0.320*	0.64 ± 0.08	*0.025 ± 0.003*	8.50
TMS-SCE-1K-$^{1}/_{2}$-2.0-<color>	12.70	*0.500*	4.22	*0.166*	4.64 - 10.79	*0.183 - 0.425*	0.61 ± 0.08	*0.024 ± 0.003*	6.81
TMS-SCE-2X-1K-$^{1}/_{2}$-<color>	12.70	*0.500*	6.35	*0.250*	6.99 - 10.79	*0.275 - 0.425*	0.64 ± 0.08	*0.025 ± 0.003*	11.45
TMS-SCE-1K--$^{3}/_{4}$-2.0-<color>	19.05	*0.750*	6.35	*0.250*	6.99 - 16.25	*0.275 - 0.640*	0.61 ± 0.08	*0.024 ± 0.003*	12.03
TMS-SCE-2X-1K-$^{3}/_{4}$-<color>	19.05	*0.750*	9.53	*0.375*	10.16 - 16.25	*0.400 - 0.640*	0.76 ± 0.08	*0.030 ± 0.003*	20.63
TMS-SCE-1K-1-2.0-<color>	25.40	*1.000*	8.46	*0.333*	9.29 - 21.59	*0.366 - 0.850*	0.64 ± 0.08	*0.025 ± 0.003*	15.35
TMS-SCE-1K-1$^{1}/_{2}$-2.0-<color>	38.10	*1.500*	19.05	*0.750*	20.95 - 33.02	*0.825 - 1.300*	0.51 ± 0.08	*0.020 ± 0.003*	27.51
TMS-SCE-1K-2-2.0-<color>	50.80	*2.000*	25.40	*1.000*	27.94 - 44.95	*1.100 - 1.750*	0.64 ± 0.08	*0.025 ± 0.003*	47.27
TMS-SCE-1K-2$^{1}/_{4}$-2.0-<color>	57.15	*2.250*	19.05	*0.750*	22.32 - 50.80	*0.880 - 2.000*	0.76 ± 0.08	*0.030 ± 0.003*	42.06

Total width as supplied 90.18 mm (3.550 inches) including tape and carrier width.

Options

Prescoring	Perforated score to produce multiple markers from each sleeve.								
	Number of prescores		1 prescore		2 prescores		3 prescores		
	Code		S1		S2		S3		
Package sizes	Standard		1K - 1000-piece packs						
	Nonstandard		Smaller and larger pack sizes are available. Please contact Tyco Electronics.						
	Fanfolded		Fanfolded option available for use with dot matrix printers						
Colors	Standard	Yellow	White						
	Code	4	9						
	Nonstandard	Red	Pink	Orange	Green	Blue	Violet	Gray	Black
	Code	2	2L	3	5	6	7	8	0
	Note: print contrast.		2X products meet the color requirements of MIL-STD-104 class 1; otherwise colors are pastel for						

Ordering information: Specify product name, pack size, sleeve size, prescore format, and color. Ordering example: TMS-SCE-1K-$^{1}/_{8}$-2.0-S1-9 (scored once)

CM-SCE Military grade tie-on cable marker tags

Features:
Side entry provides access to big size and wire bundles as well as retrofit and repair capability. Highly flame-retardant. Highly resistant to abrasion, mechanical abuses, fluids, lubricants and solvents. Ease of use: markers can be easily removed from the carrier. Easy installation: only standard cable tie-wraps are needed to install markers. No extra steps required. Excellent print permanence when printing on the rough side of the marker.

Applications:
CM-SCE markers are flat, rigid, non-adhesive labels that can be used to identify large cables and wire bundles in environments such as military and aerospace. Marker tags are applied to cables or wire bundles with cable ties.

Technical Data:
See below

Temperature:
-55°C to 135°C

Rated Voltage: N/A

Color Code:
Standard: White,
Non-standard Yellow

Approvals:
See below

Temperature rating

Operating temperature range	−55°C to +135°C	−67°F to +275°F

Specifications/approvals

Tyco Electronics	RW 2513 TTDS-021
Military	Mark permanence: SAE AS81531 4.6.2 Solvent resistance: MIL-STD-202 Method 215J
Industry	UL MH26328 Group PG1S2

Printer information

Tyco Electronics printer	AM6310 (dot matrix) T312M (thermal transfer)
Tyco Electronics ribbon	1892BK04-RIBBON (dot matrix) (dot matrix) 1966-RIBBON (thermal transfer)

Part numbering system

CM-SCE - 2.5K - 1/4 - 4H - 9

- 9 — Color
- 4H — Tie-wrap holes
- 1/4 — Markable height of marker (inches)
- 2.5K — Pack size
- CM-SCE — Product family

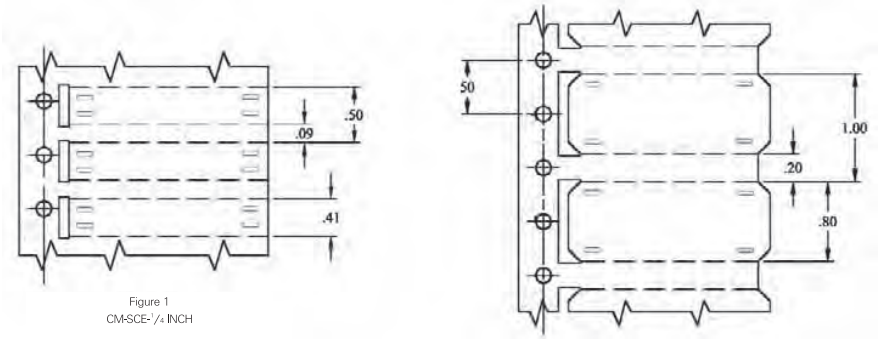


Figure 1
CM-SCE-1/4 INCH

Available sizes and formats

Ordering description	Size	Markable height mm	Markable height *inches*	Markable length mm	Markable length *inches*	Recommended use range mm	Recommended use range *inches*
CM-SCE-1/4-6H- <color>	1/4	6.40	*0.250*	50.80	*2.000*	5.08 – 12.50	*0.200 – 0.492*
CM-SCE-1/4-4H- <color>	1/4	6.40	*0.250*	50.80	*2.000*	5.08 – 12.50	*0.200 – 0.492*
CM-SCE-TP-1/4-4H- <color>*	1/4	6.40	*0.250*	50.80	*2.000*	5.08 – 12.50	*0.200 –0.492*
CM-SCE-1/2-4H- <color>	1/2	12.70	*0.500*	50.80	*2.000*	12.50 and up	*0.492 and up*
CM-SCE-TP-1/2-4H- <color>*	1/2	12.70	*0.500*	50.80	*2.000*	12.50 and up	*0.492 and up*
CM-SCE-1/2-6H- <color>	1/2	12.70	*0.500*	50.80	*2.000*	12.50 and up	*0.492 and up*
CM-SCE-TP-1/2-6H- <color>*	1/2	12.70	*0.500*	50.80	*2.000*	12.50 and up	*0.492 and up*

* for thermal transfer printing

Options

Tie-wrap holes	1/4-inch tags	Four holes standard	
	1/2-inch tags	Four holes	Six holes
	Code	4H	6H
Fanfold	Code	Fx (substitute package size code for "x")	
Package sizes	Standard	250 pieces	
Colors	Standard	White	
	Code	9	
	Nonstandard	Yellow	
	Code	4	

Ordering information: Specify product name, markable height of marker, pack size, number of tie wraps and color.
Ordering example: CM-SCE–2.5K-1/4-4H-9

RPS Commercial grade wire identification sleeves

Construction: **Insulation:** Polyolefin. When RPS is printed with Tyco Electronics recommended printers and ink ribbons, the marks remain legible, without any post printing process, even when exposed to abrasion, aggressive cleaning solvents, and industrial fluids.

Features:
Permanent identification sleeves. Computer printable. Excellent print performance. Configured for ease of kitting. Good chemical and solvent resistance. 3:1 shrink ratio. CSA Certified, UL Recognized.

Applications:
RPS markers are designed to meet the wire identification needs of commercial and industrial customers.

Technical Data:

Temperature: -30°C to 105°C

Rated Voltage: N/A

Color Code: Standard: White and Yellow

Approvals: See below

Temperature rating

Operating temperature range	−30°C to +105°C	−22°F to +221°F
Minimum recovery temperature	+85°C	+185°F
Maximum storage temperature	+40°C	+104°F

Specifications/approvals

Tyco Electronics	RW 2510
Military	SAE AS81531 4.6.2
	MIL-STD-202F Method 215J
Industry	UL Recognized – standard 224, file E35586
	CSA Certified – file 31929

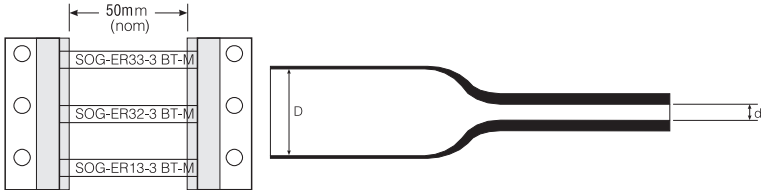
Printer information

Tyco Electronics printer	AM6310 (dot matrix)
	T208M (thermal transfer – low volume)
	T312M (thermal transfer)
Tyco Electronics ribbon	1892BK04-RIBBON (dot matrix)
	TMS-101-RIBBON-4RPSCE (thermal transfer for T208M)
	TMS-RJS-RIBBON-4RPSCE (thermal transfer for T312M)

Part numbering system

RPS-1K-22-18/2.0-S1-9

- Color
- Scoring (optional)
- Sleeve length (in)
- US wire gauge size
- Pack size
- Product family



Available sizes and formats

Ordering description	Inside diameter D (min) as supplied mm	*inches*	d (max) after recovery mm	*inches*	Recommended use range mm	*inches*
RPS-1K-22-18/2.0- <color>	3.18	*0.125*	1.07	*0.042*	1.17 - 2.66	*0.046 - 0.105*
RPS-1K-18-12/2.0- <color>	4.75	*0.187*	1.57	*0.062*	1.75 - 4.06	*0.069 - 0.160*
RPS-1K-16-10/2.0- <color>	6.35	*0.250*	2.11	*0.083*	2.31 - 5.46	*0.091 - 0.215*
RPS-1K-8-4/2.0- <color>	9.53	*0.375*	3.18	*0.125*	3.47 - 8.12	*0.137 - 0.320*
RPS-1K-10-2/2.0- <color>	12.70	*0.500*	4.22	*0.166*	4.64 - 10.79	*0.183 - 0.425*
RPS-1K-6-250/2.0- <color>	19.05	*0.750*	6.35	*0.250*	6.99 - 16.25	*0.275 - 0.640*
RPS-1K-1-400/2.0- <color>	25.40	*1.000*	8.46	*0.333*	9.29 - 21.59	*0.366 - 0.850*
RPS-1K-400-1000/2.0- <color>	38.10	*1.500*	19.05	*0.750*	20.95 - 33.02	*0.825 - 1.300*

Total width as supplied 90.18 mm (3.550 inches) including tape and carrier width.

Options

Prescoring	Perforated score to produce multiple marker sleeves from each RPS sleeve.			
	Number of prescores	1 prescore	2 prescores	3 prescores
	Code	S1	S2	S3
Package sizes	Standard	1K-1000 piece packs		
	Nonstandard	Smaller and larger pack sizes are available. Please contact Tyco Electronics.		
Colors	Standard	White	Yellow	
	Code	9	4	

Ordering information: Specify product name, pack size, sleeve size, prescore, format and color.
Ordering example: RPS-1K-22-18/2.0-S2-9

Not finding what you are looking for?
Please contact us at sales@lapptannehill.com, or visit our website at: www.lapptannehill.com