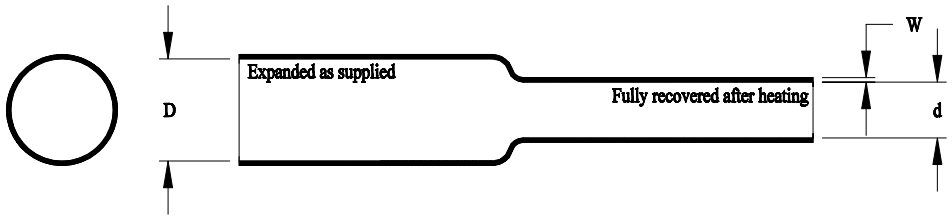
Altera™
MT-LWA
Flexible, Modified Polyolefin, Heat - Shrinkable Tubing



This specification covers the requirements for one type of single wall, electrical insulating, extruded tubing whose diameter will reduce to a predetermined size upon application of heat in excess of 110°C (230°F).

The tubing is fabricated from modified polyolefin crosslinked by irradiation. It shall be homogenous and essentially free from flaws, defects, pinholes, seams, cracks or inclusions.

The tubing is fabricated from materials which meet the requirements of U.S. Pharmacopeia Class VI Plastics. Color shall be clear unless otherwise specified.

Table 1: **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

Table 2: **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

Customer Drawing

Tyco Electronics	Tyco Electronics Corporation 300 Constitution Drive Menlo Park, CA 94025 USA	**Raychem Tubing**	**Title:** **Altera™ MT-LWA Flexible, Modified Polyolefin, Heat - Shrinkable Tubing**	
Tyco Electronics reserves the right to amend this drawing at any time. Users should evaluate the suitability of the product for their application		Document No : **MT-LWA**		
Cage Code: 06090	Scale: None	Size: A	Rev. Date: 8-Jan-10	Rev.: B	Sheet: 1 of 2

Table 3: **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

Table 4: **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.

Customer Drawing