RAYCHEM

SWFR X2

Highly flame-retardant, zero halogen, low recovery temperature, metric-sized heat-shrinkable tubing

SWFR X2 heat-shrinkable tubing is a cost-effective, environmentally friendly choice for many commercial applications. X2 tubing is made from a specially formulated, crosslinked polyolefin with low recovery temperature, excellent flexibility, and high flame-retardance (VW-1).

Unlike other typical flame-retardant tubings, X2 tubing is halogen free.

Compared to noncrosslinked materials, X2 tubing has a higher temperature rating and exhibits better thermal stability and resistance to physical abuse.

X2 tubing performs a variety of functions in commercial applications:

- Electrically insulates and protects in-line components, disconnect terminals, and splices.
- Bundles wires for very flexible light-duty harnesses.
- Strain-relieves electrical wire connections for long-term reliability.

X2 tubing offers a faster, easier, more reliable replacement for molding in place, dip coating, and tape wrapping.

X2 is UL-recognized and CSA-certified at 125°C, 600 V, with UL VW-1 and CSA OFT flame-retardancy ratings.

Temperature rating

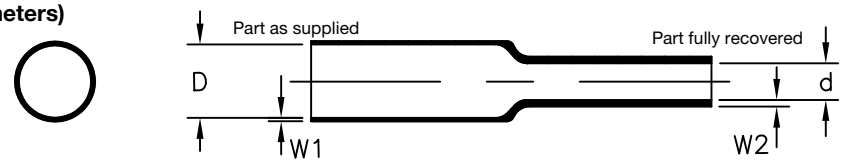
Minimum shrink temperature:	70°C
Full recovery temperature:	90°C
Continuous operating temperature:	−30°C to 125°C

*Specifications**

Type	Raychem	UL	CSA
SWFR X2	SWFR X2	E35586	LR31929

* When ordering, always specify latest issue.

Dimensions (millimeters)



Size	As supplied D Inside diameter	As supplied W1 Wall thickness (nominal)	Fully recovered d (max.) Inside diameter	Fully recovered W2 (min.) Wall thickness**
1.0	1.5 ± 0.2	0.2	0.5	0.44
1.5	2.1 ± 0.2	0.2	0.75	0.44
2.0	2.6 ± 0.2	0.25	1.0	0.44
2.5	3.1 ± 0.2	0.25	1.25	0.44
3.0	3.6 ± 0.2	0.25	1.5	0.44
3.5	4.1 ± 0.3	0.25	1.75	0.46
4.0	4.6 ± 0.3	0.25	2.0	0.46
5.0	5.6 ± 0.3	0.3	2.5	0.56
6.0	6.6 ± 0.3	0.3	3.0	0.56
7.0	7.6 ± 0.3	0.3	3.5	0.56

Size	As supplied D Inside diameter	As supplied W1 Wall thickness (nominal)	Fully recovered d (max.) Inside diameter	Fully recovered W2 (min.) Wall thickness**
8.0	8.6 ± 0.3	0.3	4.0	0.56
9.0	9.6 ± 0.3	0.3	4.5	0.56
10.0	10.4 ± 0.3	0.3	5.0	0.56
11.0	11.4 ± 0.3	0.3	5.5	0.56
12.0	12.7 ± 0.3	0.3	6.0	0.56
16.0	16.9 ± 0.4	0.35	8.0	0.69
18.0	19.0 ± 0.4	0.4	9.0	0.77
20.0	21.5 ± 0.5	0.4	10.0	0.77
25.0	27.0 ± 0.6	0.45	12.5	0.77
30.0	32.4 ± 0.8	0.45	15.0	0.89

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

Ordering information

Color	**Standard** Black
Size selection	Always order the largest size that will shrink snugly over the component being covered.
Standard packaging	On spools
Marking	Marked (standard types). UL, CSA, and Japan -F- Mark on labels.
Ordering description	Specify product name and size; for example, X2 2.0

Specification values

	Property	Unit	Requirement	Method of test
Physical	Dimensions	mm	See reverse	ASTM D 2671
	Longitudinal change ASTM D 2671 UL 224	 percent percent	 +1, –5 +3, –3	 ASTM D 2671 UL 224
	Eccentricity (recovered)	percent	30 maximum	ASTM D 2671
	Tensile strength	MPa *(psi)*	10.3 *(1500)* minimum	ASTM D 2671
	Ultimate elongation	percent	200 minimum	ASTM D 2671
	Secant modulus (as supplied)	MPa *(psi)*	172 *(2.5 x 10^4)* maximum	ASTM D 2671
	Low-temperature flexibility (1 hour at –30°C/*–22°F*)		No cracking	UL 224
	Heat shock (4 hours at 250°C/*482°F*)		No cracking	UL 224
	Heat aging (7 days at 158°C/*316°F*) Followed by tests for:			UL 224
	Tensile strength	MPa *(psi)*	70% minimum of unaged specimens	UL 224
	Ultimate elongation	percent	100 minimum	UL 224
	Flexibility		No cracking	UL 224
	Dielectric withstand at 2500 V	seconds	60 minimum	ASTM D 2671
	Dielectric breakdown	volts	50% minimum of unaged specimens	ASTM D 2671
	Dielectric strength	kV/mm *(volts/mil)*	19.7 *(500)* minimum	ASTM D 2671
	Restricted shrinkage		Pass	UL 224
Electrical	Dielectric withstand at 2500 V	seconds	60 minimum	ASTM D 2671
	Dielectric strength	kV/mm *(volts/mil)*	19.7 *(500)* minimum	ASTM D 2671
	Volume resistivity	ohm-cm	10^{14} minimum	ASTM D 2671
Chemical	Corrosive effect (7 days at 158°C/*316°F*)		No corrosion	ASTM D 2671
	Copper stability (7 days at 158°C/*316°F*) Followed by test for:		No brittleness, glazing, cracking, or severe discoloration of tubing. No pitting or blackening of copper.	ASTM D 2671
	Ultimate elongation	percent	100 minimum	ASTM D 2671
	Flammability		Pass	UL 224, VW-1

Note: Consult UL224 for specific details about test procedures.

Users should independently evaluate the suitability of the product for their application.

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