LINK SOLUTIONS

LFH - 2X-3X continuous mini spools

Halogen Free, self extinguising low smoke identification Sleeves

TECHNICAL DATA SHEET
Revision Number. 1.1
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The WM-LFH-2X and 3X Heat Shrinkable Wire Markers are made of halogen free, self extinguising and low smoke heat shrinkable polyolefin tubing with ideal printability properties for identification purposes, which provides fluid resistance as per EN50343 standard.

Ideal for applications where limited fire hazard characteristics are required. This product is designed for use in commercial and industrial sectors wire bundling and assemblies, panel building and industrial installations. Meets UL224 and CSA standard for flammability.

Industries

Industry
Marine
Wind power
Commercial
Aerospace
Construction
Railway
Military
Electrical installations
Petrochemical
Telecom
Laser Print

STANDARD TUBE COLOR

OTHER TUBE COLORS ON REQUEST

MATERIAL
Extruded, cross linked polyolefin.

SHRINK RATIO
2:1 & 3:1

OPERATING TEMPERATURE
-40°C to +125°C
(-40°F to 193°F)

SHRINK TEMPERATURE
>90°C (130°F)

COMPLIANCES
Mark Permanence:
SAE AS-5942 (FTI-X & FTI-HXX)
BS EN 50343:2014 Annex H
Section H.3
Recommended black ribbon:
FTI-X, FTI-HXX
Alternative black ribbon:
FTI-Y
Recommended white ribbon:
FTI-HLD-CO-WE
LASER PRINT
UV laser 355nm
Chemical Resistance to solvents:
MIL-STD-202
Test method 215
(FTI-X & FTI-HXX)

SPECIFICATION / APPROVALS
UL224File E361238
CSA File 220127

STORAGE
Cool and dry in original packaging. Recommended temperature at +10°C to +25°C and 45-55% relative humidity. Use within 2 years from date of manufacture.

APPLICATIONS
Specific developed for the industries marked in green to the left. Can also be used for insulation, wire bundling and mechanical protection.

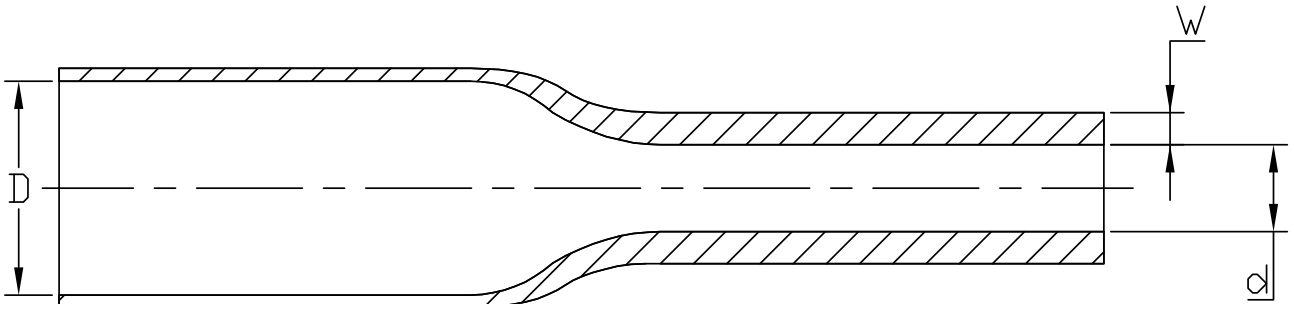
Product Dimensions

DIMENSIONS 2:1

SIZE, INCHES	SIZE, MM	MINIMUM ID (D), AS SUPPLIED MM (INCHES)	MAXIMUM ID, RECOVERED (D) MM (INCHES)	RECOVERED WALL THICKNESS (W), MM (INCHES)
3/32	2.4	2.79 (0.109)	1.18 (0.046)	0.49±0.06 (0,019 ± 0.002)
1/8	3.2	3.64 (0.143)	1.59 (0.063)	0.51±0.06 (0.02 ± 0.002)
3/16	4.8	5.26 (0.207)	2.36 (0.093)	0.54±0.06 (0.02 ± 0.002)
1/4	6.4	6.92 (0.272)	3.18 (0.125)	0.56±0.06 (0.022 ± 0.002)
3/8	9.5	10.2 (0.401)	4.75 (0.187)	0.59±0.06 (0.023 ± 0.002)
1/2	12.7	13.5 (0.531)	6.35 (0.250)	0.60±0.07 (0.024 ± 0.003)
3/4	19.1	20.1 (0.791)	9.53 (0.374)	0.62±0.07 (0.024 ± 0.003)
1	25.4	26.7 (1.05)	12.7 (0.500)	0.63±0.07 (0.025 ± 0.003)
1 ½	38.1	39.2 (1.54)	19.1 (0.750)	0.64±0.07 (0.025 ± 0.003)
2	50.8	53.0 (2)	25.4 (1.0)	0.64±0.08 (0.025 ± 0.003)
3	76.2	79.4 (3)	38.1 (1.5)	0.64±0.09 (0.025 ± 0.003)

DIMENSIONS 3:1

SIZE, INCHES	SIZE, MM	MINIMUM ID (D), AS SUPPLIED MM (INCHES)	MAXIMUM ID, RECOVERED (D) MM (INCHES)	RECOVERED WALL THICKNESS (W), MM (INCHES)
3/32	2.4	2.79 (0.109)	0.79 (0,031)	0.57±0.10 (0.022 ± 0.004)
1/8	3.2	3.64 (0.143)	1.0 (0.039)	0.61±0.10 (0.024 ± 0.004)
3/16	4.8	5.26 (0.207)	1.6 (0.063)	0.67±0.10 (0.0263 ± 0.004)
1/4	6.4	6.92 (0.272)	2.4 (0.094)	0.71±0.10 (0.0279 ± 0.004)
3/8	9.5	10.2 (0.401)	3.2 (0.126)	0.77±0.10 (0.030 ± 0.004)
1/2	12.7	13.5 (0.531)	4.75 (0.187)	0.80±0.10 (0.031 ± 0.004)
3/4	19.1	20.1 (0.791)	6.4 (0.250)	0.84±0.15 (0.0330 ± 0.006)
1	25.4	26.7 (1.05)	8.47(0.333)	0.86±0.15 (0.034 ± 0.006)
1 ½	38.1	39.8 (1.57)	12.9 (0.507)	0.89±0.15 (0.035 ± 0.006)
2	50.8	53.0 (2)	17.2 (0.677)	0.90±0.15 (0.035 ± 0.006)
3	76.2	79.4 (3)	25.8 (1.05)	0.92±0.15 (0.036 ± 0.006)



Heat Shrink Product in as supplied ”D” and fully recovered state ”d” with recovered wall ”W”

General Tests for Identification Products

PHYSICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Tensile strength	GB/T1040	10.3 Mpa (min.)
Elongation at break	GB/T1040	≥200%
Longitudinal change	UL224	+/-5%

ELECTRICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Dielectric strength	GB/T1408	15.8 kV/mm²
Volume resistivity	GB/T1408	≥ 10^{14} Ω/cm

CHEMICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Chemical resistance	AMS-DTL-23053/5	Good
Copper corrosion	UL224	No corrosion
Copper stability	UL224	No corrosion

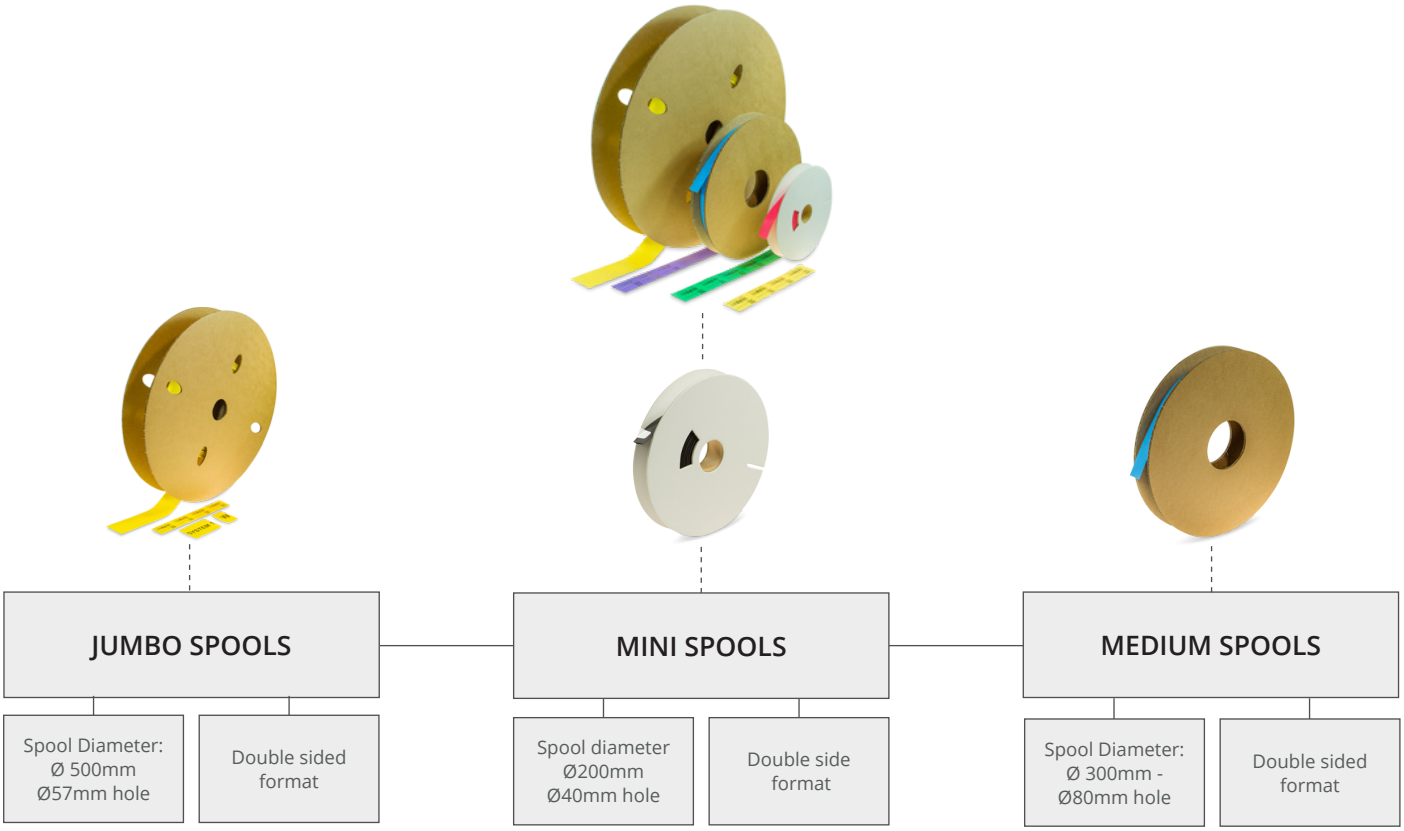
THERMAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Heat shock 4 hours at 250°C	ASTM D 2671	No dripping, cracking or flowing
Heat aging 168 hours at 158°C	ASTM D 638	Elongation 100%
Flammability	UL224	Pass » Flame retardant

Environmental UV Stability

PROPERTIES	TEST METHOD	TYPICAL VALUE
UV-A	ASTM G154 - Machine setup Temp 50-60°C (140°F) Cycle 8 h light 4h condensation UV wavelength 280-400nm Test duration 1000 h of exposure.	Pass - No damage to the marker and print legible after 10 rubs in accordance with BS EN 50343:2014 Annex H Section H.3.

Available Formats



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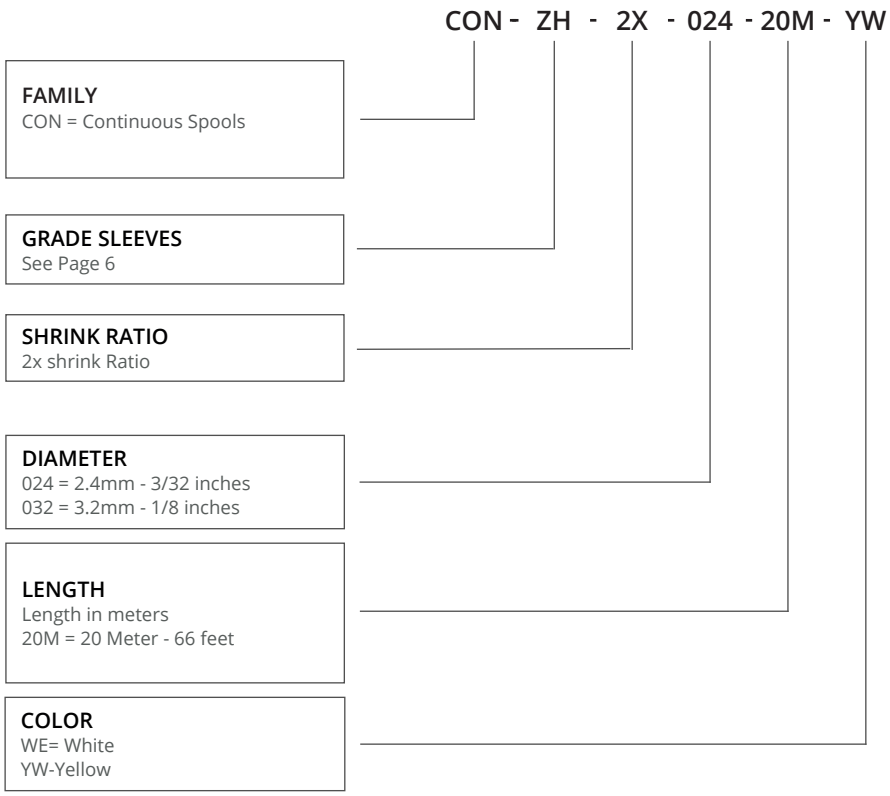
Product code



Available options -

SIZE MM	SIZE INCHES	MINI SPOOL LENGTH METER	MEDIUM SPOOL LENGTH METER	JUMBO SPOOL LENGTH METER
2,4 mm	3/32	20 Meter - 66 Feet	50 Meter - 164 Feet	100 Meter - 328 Feet
3,2 mm	1/8	20 Meter - 66 Feet	50 Meter - 164 Feet	100 Meter - 328 Feet
4,8 mm	3/16	20 Meter - 66 Feet	50 Meter - 164 Feet	100 Meter - 328 Feet
6,4 mm	1/4	20 Meter - 66 Feet	50 Meter - 164 Feet	100 Meter - 328 Feet
9,5 mm	3/8	15 Meter - 49 Feet	50 Meter - 164 Feet	100 Meter - 328 Feet
12,7 mm	1/2	15 Meter - 49 Feet	25 Meter - 82 Feet	50 Meter - 164 Feet
19,0 mm	3/4	15 Meter - 49 Feet	25 Meter - 82 Feet	50 Meter - 164 Feet
25,4 50 mm	1	15 Meter - 49 Feet	25 Meter - 82 Feet	50 Meter - 164 Feet
38,1 mm	1 1/2	10 Meter - 33 Feet	25 Meter - 82 Feet	50 Meter - 164 Feet
50,8 50 mm	2	10 Meter - 33 Feet	25 Meter - 82 Feet	50 Meter - 164 Feet

Other spool lengths on request - *

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Available Tube Grades

PRODUCT GROUP	TUBE GRADE	CHARACTERISTICS	COMPLIANCES
WMX-WM89-WM109	C3	The C3- 3:1 shrink ratio, heat shrinkable wire markers are made of flame retardant heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. C3 meets NFPA 130 requirements. The C3 material is fabricated to meet the material performance requirements of the AMS-DTL-23053/5 class 1 and meets the features in Airbus specification NSA 937201. The compound is also UL224 and CSA compliant. Ideal for aerospace, military, industrial and energy applications. The marker sleeves meets the mark permanence requirements of AS5942 and MIL 202 Method 215K	EN 60684-3-209 NFPA 130 UL224 CSA 22.2 No. 198- SAE-AMS-DTL-23053/5 SAE AS 5942 MIL-STD-202F method 215 AMS-DTL-23053/5 AIRBUS NSA937201
WMX-WM89-WM109	ZH	The ZH heatshrink tubing is made of halogen-free, flame retardant, heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. The compound of the tubing is excluded for halogens and offers excellent fire safety characteristics combined with minimal smoke emission. The material meets Boeing BS 7239 for toxic gas generation M7 specification, and is classified with EN45545-2 Class HL3 requirement set R22 (interior) and R23 (exterior). R24 by test method EN ISO 4589-2, burning behavior determined by Oxygen Index only and be used without any restriction for any application. NFPA 130 & EN 60684-3-216 test report are available on request	EN 45545-2 HL3, R22/R23/R24 NFPA 130 EN 60684-3-216 LUL 1-085 A3 compliant BS 6853 (1999) cat 1a DIN5510-2 UNI CEI 11170-3 NF F 16 101 ASTM E 662, BSS 7239 SAE 5942 MIL-STD-202 method 215
WMX-WM89-WM109	LFH	The LFH printable heatshrink tubing is made of halogen-free flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printing properties for identification purposes. The compound is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission.	UL224 CSA 22.2 No. 198- SAE AS 5942 MIL-STD-202 method 215 EN50343 Annex H Section H.3
WMX-WM89-WM109	LFH-3X	The LFH printable heatshrink tubing is made of halogen-free flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printing properties for identification purposes. The compound is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission.	UL224 CSA 22.2 No. 198- SAE AS 5942 MIL-STD-202 method 215 EN50343 Annex H Section H.3
WMX-WM89-WM109	HT	The HT printable heatshrink tubing is made of semi-flexible highly flame retardant polyvinylidene fluoride tubing. High-temperature rated thin wall markers with high transparency. Excellent chemical resistance to most industrial fuels, chemicals, solvents and high degree of mechanical strength properties suitable for aerospace, defense and mass transit applications. It is inherently flame retardant, semi-rigid and highly resistant to most industrial fuels, chemicals and solvents.	UL224 SAE-AMS-DTL-23053/8 SAE AS 5942 MIL-STD-202 method 215
WMX-WM89-WM109	DR	The DR printable is printable irradiated cross-linked, flame retardant, semi-rigid, diesel oil resistant heat shrinkable polyolefin tubing. Especially suitable for railway and complies with SNCF requirements NF F 00608 cat. A & H. Used where resistance to organic fluids, common fuels, lubricants and solvents properties are required for use in mass transit, aerospace, marine and industrial installations.	NF F 00-608 Class A & H UL224 SAE-AMS-DTL-23053/6 Class 1 SAE AS 5942 MIL-STD-202 method 215
WMX-WM89-WM109	AMD	The AMD printable heatshrink is made of highly flame retardant, self-extinguishing and very flexible heat shrinkable polyolefin tubing with ideal printability properties for identification purposes within aerospace, military and defence specified applications. UL VW1/CSA recognized and complies to AMS-DTL-23053/5 Class 1&3. This heatshrink are very versatile through excellent balance of chemical, electrical and mechanical properties.	NFPA 130 UL224 SAE-AMS-DTL-23053/5 Class 1 & 3 SAE AS 5942 MIL-STD-202 method 215
WMX-WM89-WM109	AMD-3X	The AMD printable heatshrink is made of highly flame retardant, self-extinguishing and very flexible heat shrinkable polyolefin tubing with ideal printability properties for identification purposes within aerospace, military and defence specified applications. UL VW1/CSA recognized and complies to AMS-DTL-23053/5 Class 1&3. This heatshrink is very versatile through excellent balance of chemical, electrical and mechanical properties.	NFPA 130 UL224 SAE-AMS-DTL-23053/5 SAE AS 5942 MIL-STD-202 method 215
WMX-WM89-WM109	3-1	The 3-1 flexible heatshrink tubing is made of flame retarded, heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. The 3-1 tubing meets the requirements of a wide range of industrial standards such as SAE-AMS-DTL 23053/5 class 1 & 3. Yellow green version available. Material: Irradiated cross-linked flexible flame-retarded polyolefin Shrink Temperature: Min 90 dgc.	SAE-AMS-DTL-23053/5 class 1&3 UL224 600V VW-1 rating CSA 22.2 No. 198.1-98 SAE AS 5942 MIL-STD-202 method 215
WMX-WM89-WM109	ZHR	ZHR-2X and 3X heat-shrinkable wire markers are made of halogen-free, flame retardant and low smoke heat shrinkable polyolefin tubing, which provides fluid resistance as per EN50343. The product meets rail standards EN50343 Appendix H and EN45545-2 requirement set R22/R23/24 hazard level classification 1 and 2. The compound of the tubing is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission.It can also be used for applications where limited fire hazard characteristics are necessary.	Diesel Resistance: EN50343 annex H (section 6.6) Fire Propagation: EN45545-1 HL3, R22-R23-R24 Chemical and Diesel Resistance: EN50343 annex H (section 6.6) MIL-STD-202 Method 215 Mark Permanence: EN50343 annex H (section 6.6) & SAE AS-5942

Ordering description LFH 3X shrink ratio

ORDERING DESCRIPTION EXAMPLES	STANDARD SPOOL SIZE	SUPPLIED DIAMETER		RECOVERED DIAMETER		RECOMMENDED USE RANGE (MIN-MAX)	
	Meter	mm	inches	mm	inches	mm	inches
Family-Tube Grade-3X-024-20-Colour	20 Meter - 66 Feet	2,4	3/32	0.79	0.031	0.8-1.9	0.032-0.075
Family-Tube Grade-3X-032-20-Colour	20 Meter - 66 Feet	3,2	1/8	1.0	0.039	1.1-2.6	0.044-0.105
Family-Tube Grade-3X-048-20-Colour	20 Meter - 66 Feet	4,8	3/16	1,6	0.063	1.7-4.0	0.069-0.160
Family-Tube Grade-3X-064-20-Colour	20 Meter - 66 Feet	6,4	1/4	2.4	0,094	2.3-5.4	0.091-0.215
Family-Tube Grade-3X-095-15-Colour	15 Meter - 49 Feet	9,5	3/8	3.2	0.126	3.4-8.1	0.137-0.320
Family-Tube Grade-3X-127-15-Colour	15 Meter - 49 Feet	12,7	1/2	4.75	0,187	4.6-10.7	0.183-0.425
Family-Tube Grade-3X-190-15-Colour	15 Meter - 49 Feet	19,0	3/4	6.4	0.250	6.9-16.2	0.275-0.640
Family-Tube Grade-3X-254-15-Colour	15 Meter - 49 Feet	25,4	1	8.47	0.333	9.2-21.5	0.366-0.850
Family-Tube Grade-3X-381-15-Colour	10 Meter - 33 Feet	38,1	1 1/2	12.9	0.507	20.9-33.0	0.825-1.300
Family-Tube Grade-3X-508-10-Colour	10 Meter - 33 Feet	50,8	2	17.2	0.677	27.9-44.9	1.100-1.750
Family-Tube Grade-3X-762-5-Colour	5 Meter - 16 Feet	76,2	3	25,8	1,05	45.0	1.75-3,54

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Related Standard Test Methods And Documents

Document	Description
ASTM D638 - ASTM G154 - ISO 37 -GB/T1040	Tensile strength and ultimate elongation
ASTM D638- ISO188	Heat aging 168 at 158°C
ASTM D 2671	Flammability testing. Heat shock 4 hours at 225°C
ASTM D2671 -UL224	Longtitudinal change
ASTM G154-GB/T1408	Dialectrical strength.
ASTM D2671B - UL224	Copper corrosion (Section 93 procedure A) damaged area of copper mirror,
AMS-DTL-23053/5	Chemical resistance - good
ASTM D257 -IEC 93	Volume resistivity Ω-cm
ASTM D 635-HB - SAE-AMS-DTL-23053/5	Flammability resistance - Fire propagation
GB/T 1040	Test Conditions for moulding and extrusion plastics
SAE AS5942;2014	Marking og insulation materials- Print permanence testing using the mechanical crockmeter
MIL 202 Method 215	Resistance to solvents. Test methods for electronic and electrical component parts.
BS EN 50343:2014 Annex H Section H.3	Railway applications. Rolling stock. Rules for installation of cabling- Mark Permanence
UL224	This Standard specifies the requirements for insulating tubing that is usually round in cross-section and that consists entirely of extruded compounds whose characteristic constituents are thermosetting, elastomeric, or thermoplastic polymers (see Table 1 for materials and ratings). These requirements also cover heat-shrinkable and crosslinked tubing.