

LFH - 3X continuous mini spools

Halogen Free, Flame retardant
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 extinguishing 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

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.

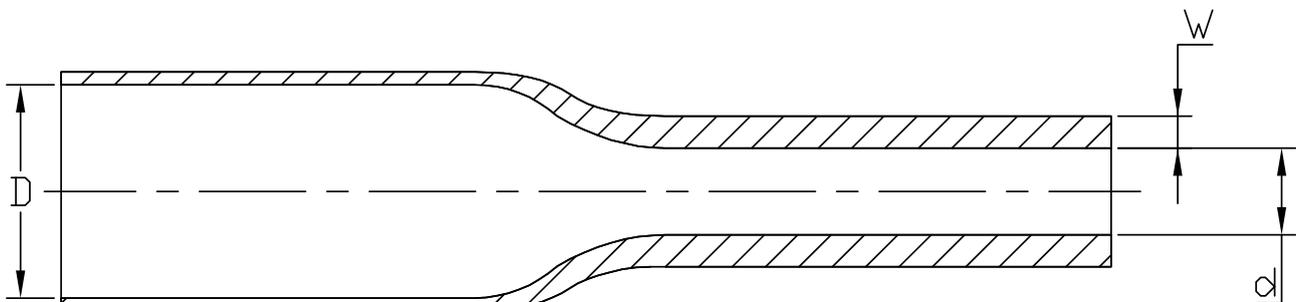
Product Dimensions

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/mm ² |
| 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 |

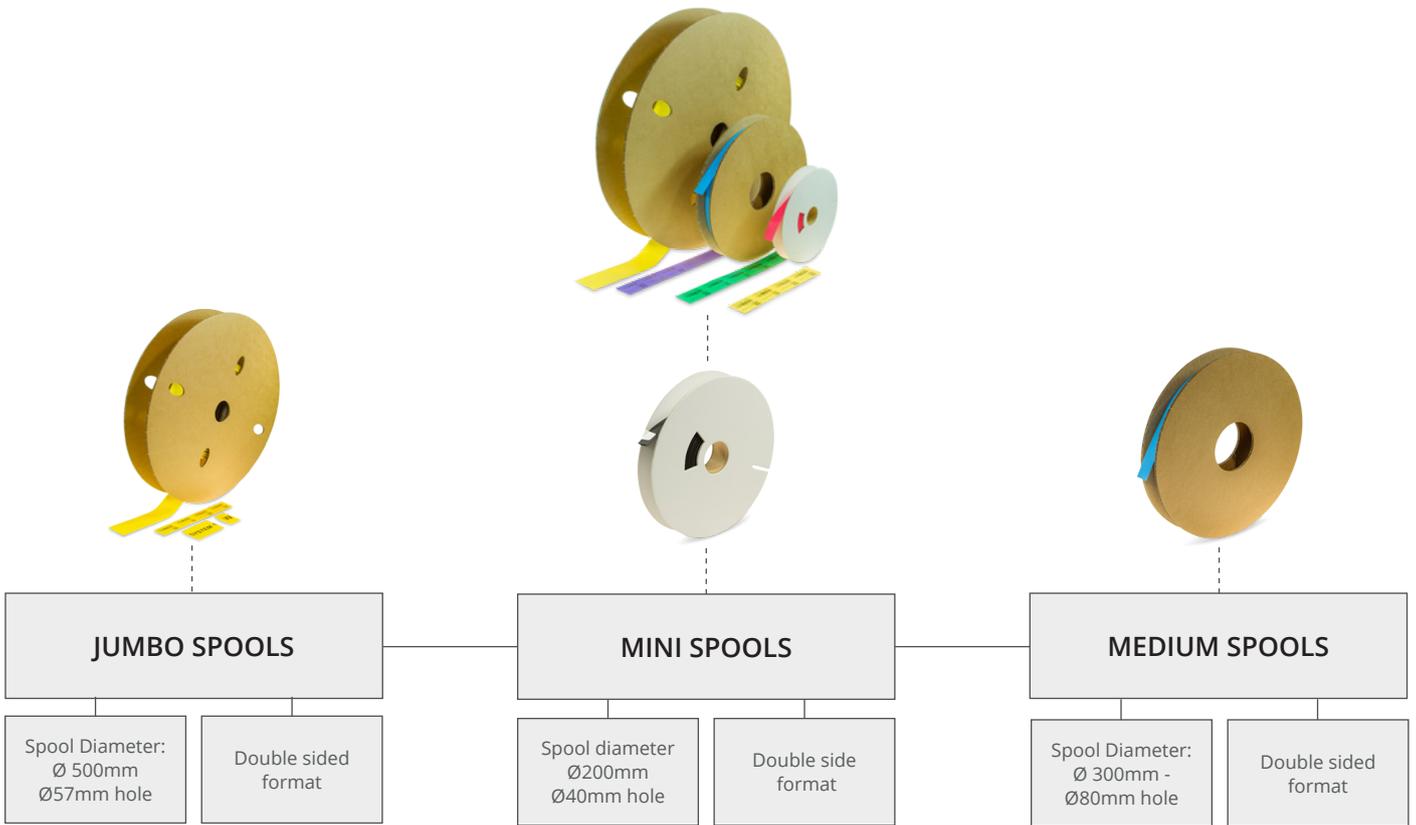
THERMAL

| 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



Product code

CON - ZH - 2X - 024 - 20M - YW



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 - *

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 |

This information and data is believed to be accurate and reliable. Although the information and recommendations set forth herein are presented in good faith and believed to be correct as of this date, Link Solutions makes no representations as to the completeness or accuracy thereof. We place at your disposal the technical information necessary for the correct use of our products. As conditions and methods of use are beyond our control, that the person receiving the same will make their own determination as to the suitability for their purpose. We reserve the right to modify characteristics with the aim of improving the product and adapting it to the requirements of the market.

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 |

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 | Longitudinal 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. |