



C3 Continuous Mini Spools

Military Grade Self Extinguishing Identification Sleeves

TECHNICAL DATA SHEET

Revision Number. 1.1
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The C3- 3:1 shrink ratio, continuous heat shrinkable wire markers are made of, flame retardant in inch sizes heat shrinkable polyolefin tubing with ideal printability properties for identification purposes.

The C3 material are fabrikated to meet the material performance requirements of the AMS-DTL -23053/5 class 1 and meet the features in Airbus specification NSA 937201. The compound is also UL224 and CSA compliant Ideal for Aerospace, military, industrial and energy applications.

Marker sleeves meet the mark permanence requirements of AS5942 and MIL 202 Method 215K.

Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations



Petrochemical



Telecom

STANDARD TUBE COLOR



OTHER COLORS



MATERIAL

Extruded, cross linked polyolefin.

SHRINK RATIO

3:1

OPERATING TEMPERATURE

-55°C up to +135°C

(-67°F to 275°F)

Shrink Temperature

≥90° (194°F)

COMPLIANCES

Mark Permanence:

SAE AS-5942

Print Resistance to solvents:

MIL-STD-202G

Test method 215K

RECOMMENDED BLACK RIBBON

FTI-Y, FTI-X , FTI-HXX

FIRE PROPAGATION

ASTM D2671 Procedure B

TOXICITY

N-A

AIRBUS STANDARD

NSA937201 Table 7

UL224 135°C

Certificate E228117

CSA-C22.2

No. 198.1-06

Material performance

AMS SAE DTL 23053/5 Class 1

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

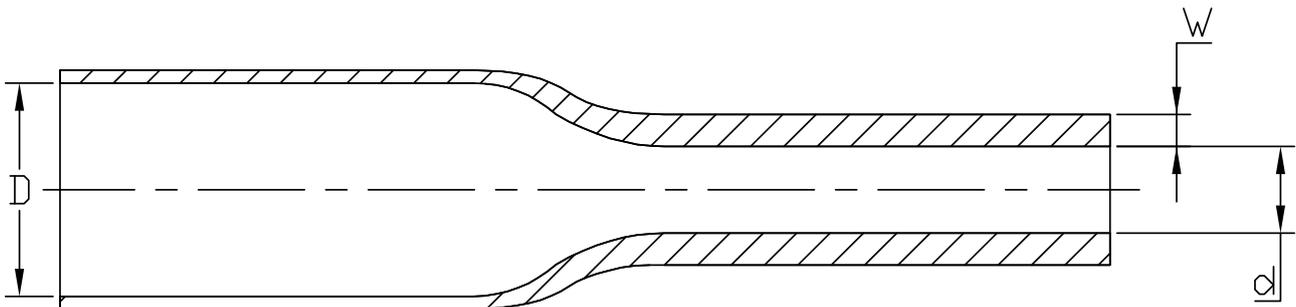
Specific developed to be used in Aerospace, Military, Industrial, energy marking, insulation, wire bundling and mechanical protection.

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.

Product Dimensions

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 | 2.5 (0.098) | 0.8 (0.031) | 0.43 (0.017) |
| 1/8 | 3.2 | 3.4 (0.134) | 1.0 (0.039) | 0.43 (0.017) |
| 3/16 | 4.8 | 5.0 (0.196) | 1.6 (0.063) | 0.43 (0.017) |
| 1/4 | 6.4 | 6.5 (0.255) | 2.0 (0.079) | 0.56 (0.022) |
| 3/8 | 9.5 | 10.0 (0.393) | 3.0 (0.118) | 0.56 (0.022) |
| 1/2 | 12.7 | 13.0 (0.511) | 4.0 (0.157) | 0.56 (0.022) |
| 3/4 | 19.1 | 19.3 (0.76) | 6.0 (0.236) | 0.80 (0.031) |
| 1 | 25.4 | 25.7 (1.01) | 8.0 (0.314) | 0.81 (0.031) |
| 1 ½ | 38.1 | 38.3 (1.50) | 12.7 (0.50) | 0.90 (0.035) |



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

Airbus NSA 937201 Material Compliance

| SIZE, INCHES | SIZE, MM | MINIMUM ID (D), AS SUPPLIED MM (INCHES) | MAXIMUM ID, RECOVERED (D) MM (INCHES) | RECOVERED WALL THICKNESS (W), MM (INCHES) | MAX MASS PER 1 METER (G) |
|--------------|----------|---|---------------------------------------|---|--------------------------|
| 3/32 | 2.4 | 2.5 (0.098) | 0.8 (0.031) | 0.43 (0.017) | 3.0 |
| 1/8 | 3.2 | 3.4 (0.134) | 1.0 (0.039) | 0.43 (0.017) | 3.7 |
| 3/16 | 4.8 | 5.0 (0.196) | 1.6 (0.063) | 0.43 (0.017) | 4.0 |
| 1/4 | 6.4 | 6.5 (0.255) | 2.0 (0.079) | 0.56 (0.022) | 6.1 |
| 3/8 | 9.5 | 10.0 (0.393) | 3.0 (0.118) | 0.56 (0.022) | 9.0 |
| 1/2 | 12.7 | 13.0 (0.511) | 4.0 (0.157) | 0.56 (0.022) | 11.0 |
| 3/4 | 19.1 | 19.3 (0.76) | 6.0 (0.236) | 0.80 (0.031) | 20.5 |
| 1 | 25.4 | 25.7 (1.01) | 8.0 (0.314) | 0.81 (0.031) | 27.7 |
| 1 ½ | 38.1 | 38.3 (1.50) | 12.7 (0.50) | 0.90 (0.035) | 59.0 |

General Tests for Identification Products

PHYSICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|-------------|---------------------------|
| Tensile strength | ASTM D 638 | >11.0 N/mm ² . |
| Elongation at break | ASTM D 638 | ≥200% |
| Longitudinal change | ASTM D 2671 | ≤+5% to ≤ -10% |
| Water absorption | ASTM D 570 | 0,20% |
| Specific gravity | ASTM D 792 | 1,40 g/cm ³ |

ELECTRICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|-------------|-------------------------|
| Dielectric strength | ASTM D 2671 | 20.0 kV/mm ² |
| Volume resistivity | ASTM D 257 | ≥ 10 ¹⁴ Ω/cm |

CHEMICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|-----------------|---------------|
| Chemical resistance | AMS-DTL-23053/5 | Good |
| Copper corrosion | ASTM D 2671 B | No corrosion |
| Fungus resistance | AMS-DTL-7444 | No Growth |

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 175°C | ASTM D638 | Elongation ≥ 200% |
| Flammability | ASTM D 635-HB | Pass » flame retardant |
| Low temperature flexibility | 1h at - 55°C ASTM D2671C | No cracking, no break, no detachment of coating |
| Optical density of smoke (D _m) | N-A | N-A |
| Smoke index | N-A | N-A |

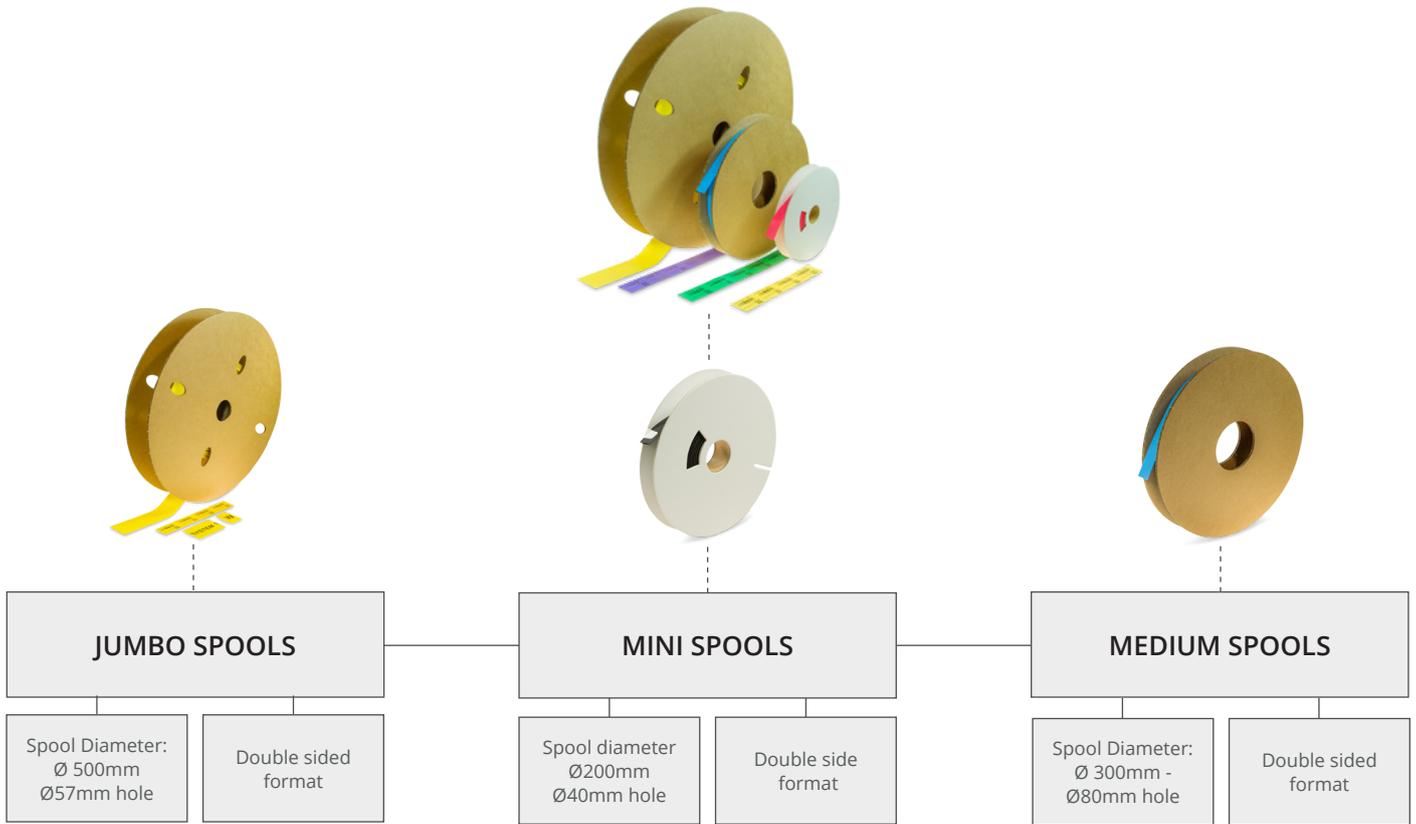
FIRE PROPAGATION

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|-----------------|-------------------------|---------------|
| Fire resistance | ASTM D 2671 procedure B | pass |
| Flammability | UL224 | pass |

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 20 rubs in accordance with AS3349/SAE AS 8153. |

Available Formats



Product code

CON - C3 - 3X - 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 - *

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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 in inch sizes heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. C3 meets NFPA 130 and EN 60684-3 requirements. Test report available upon request. The C3 material are fabricated to meet the material performance requirements of the AMS-DTL -23053/5 class 1 and meet the features in Airbus specification NSA 937201. The compound is also UL224 and CSA compliant. Ideal for Aerospace, military, industrial and energy applications. Marker sleeves meet the mark permanence requirements of AS5942 and MIL 202 Method 215K | NFPA 130 UL224 CSA 22.2 No. 198- SAE-AMS-DTL-23053/5 SAE AS 81531 / 5942 MIL-STD-202F method 215J AMS-DTL-23053/5 AIRBUS NSA937201 EN 60684-3 |
| WMX-WM89-WM109 | ZH | The ZH heatshrink tubing are 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. | EN 45545-2 - R22-R23-R24 BS 6853 DIN5510-2 UNI CEI 11170-3 NFPA130 SAE AS 81531 / 5942 MIL-STD-202F method 215J EN 60684-3 |
| WMX-WM89-WM109 | LFH | The LFH printable heatshrink tubing are made of halogen free, flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. The compound of the tubing is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission. | UL224 File E361238 CSA File 220127 SAE AS 81531 / 5942 MIL-STD-202F method 215J EN50343 Annex H Section H.3 |
| WMX-WM89-WM109 | LFH-3X | The LFH printable heatshrink tubing are made of halogen free, flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. The compound of the tubing is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission. | UL224 File E361238 CSA File 220127 SAE AS 81531 / 5942 MIL-STD-202F method 215J EN50343 Annex H Section H.3 |
| WMX-WM89-WM109 | HT | The HT printable heatshrink tubing are 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 81531 / 5942 MIL-STD-202F method 215J |
| 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 railways 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 81531 / 5942 MIL-STD-202F method 215J |
| WMX-WM89-WM109 | AMD | The AMD printable heatshrink are 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 81531 / 5942 MIL-STD-202F method 215J |
| WMX-WM89-WM109 | AMD-3X | The AMD printable heatshrink are 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 81531 / 5942 MIL-STD-202F method 215J |
| WMX-WM89-WM109 | 3-1 | The 3-1 heatshrink tubing are made of halogen free, flame retarded, 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. Material: Irradiated cross-linked flexible flame-retarded polyolefin Shrink Temperature: Min 90 deg. | SAE-AMS-DTL-23053/5 class 1&3 UL224 600V VW-1 rating CSA 22.2 No. 198.1-98 SAE AS 81531 / 5942 MIL-STD-202F method 215J |
| 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 with ideal printability properties for identification purposes, which provides fluid resistance as per EN50343. This product meets rail standards EN50343 Appendix H and EN45545-2 requirement set R22/R23/R24 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-202F Method 215J Mark Permanence: EN50343 annex H (section 6.6) & SAE AS-5942 |

Ordering description example mini spools c3 grade

| 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-024-20M-Colour | 20 Meter - 66 feet | 2,4 x 50mm | 3/32-2.0 | 0.7 | 0.031 | 0.8-1.9 | 0.032-0.075 |
| Family-Tube Grade-3X-032-20M-Colour | 20 Meter - 66 feet | 3,2 x 50mm | 1/8-2.0 | 1.0 | 0.042 | 1.1-2.6 | 0.044-0.105 |
| Family-Tube Grade-3X-048-20M-Colour | 20 Meter - 66 feet | 4,8 x 50mm | 3/16-2.0 | 1,5 | 0.062 | 1.7-4.0 | 0.069-0.160 |
| Family-Tube Grade-3X-064-20M-Colour | 20 Meter - 66 feet | 6,4 x 50mm | 1/4-2.0 | 2.3 | 0,095 | 2.3-5.4 | 0.091-0.215 |
| Family-Tube Grade-3X-095-15M-Colour | 15 Meter - 49 feet | 9,5 x 50mm | 3/8-2.0 | 3.1 | 0.125 | 3.4-8.1 | 0.137-0.320 |
| Family-Tube Grade-3X-127-15M-Colour | 15 Meter - 49 feet | 12,7 x 50mm | 1/2-2.0 | 4.75 | 0,187 | 4.6-10.7 | 0.183-0.425 |
| Family-Tube Grade-3X-190-15M-Colour | 15 Meter - 49 feet | 19,0 x 50mm | 3/4-2.0 | 6.35 | 0.250 | 6.9-16.2 | 0.275-0.640 |
| Family-Tube Grade-3X-254-15M-Colour | 15 Meter - 49 feet | 25,4 x 50mm | 1-2.0 | 8.47 | 0.33 | 9.2-21.5 | 0.366-0.850 |
| Family-Tube Grade-3X-381-10M-Colour | 10 Meter -33 feet | 38,1 x 50mm | 1 1/2-2.0 | 12.9 | 0.51 | 20.9-33.0 | 0.825-1.300 |
| Family-Tube Grade-3X-508-10M-Colour | 10 Meter - 33 feet | 50,8 x 50mm | 2-2.0 | 17.2 | 0.68 | 27.9-44.9 | 1.100-1.750 |

| 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 | 2.5 (0.098) | 1.2 (0.047) | 0.43 (0.017) |
| 1/8 | 3.2 | 3.6 (0.142) | 1.6 (0.063) | 0.55 (0.022) |
| 3/16 | 4.8 | 5.2 (0.189) | 2.4 (0.094) | 0.55 (0.022) |
| 1/4 | 6.4 | 6.7 (0.263) | 3.2 (0.126) | 0.65 (0.025) |
| 3/8 | 9.5 | 10.0 (0.393) | 4.8 (0.189) | 0.65 (0.025) |
| 1/2 | 12.7 | 13.6 (0.53) | 6.4 (0.250) | 0.65 (0.025) |
| 3/4 | 19.1 | 20.4 (0.80) | 9.5 (0.374) | 0.70 (0.027) |
| 1 | 25.4 | 27.0 (1.06) | 12.7 (0.500) | 0.85(0.033) |
| 1 ½ | 38.1 | 40.0 (1.57) | 19.1 (0.750) | 0.90(0.035) |
| 2 | 50.8 | 50.8 (2) | 25.4 (1.0) | 0.90(0.035) |

Related Standard Test Methods And Documents

| Document | Description |
|--|---|
| AMS-DTL-23053/5 | Insulation Sleeving, Electrical, Heatshrinkable, Polyolefin, Flexible Crosslinked. Chemical resistance |
| ASTM D638 | Tensile strength and ultimate elongation |
| ASTM D638 | Heat aging 168 at 150°C |
| ASTM D2671 heat shock (section 26-30), procedure b | Flammability testing. Heat shock 4 hours at 175°C |
| ASTM D2671 | Longitudinal change |
| ASTM D2671 (Section 79-80) ASTM D570 | Water absorption. 2 Maximum |
| ASTM D2671 (Section 20-25) | Dielectric strength. 20 minimum |
| ASTM D2671B | Copper corrosion (Section 93 procedure A) damaged area of copper mirror, |
| AMS-DTL-23053/5 | Chemical resistance - good |
| ASTM D257 | Volume resistivity |
| ASTM D 635-HB - | Flammability resistance - Fire propagation |
| ASTM D E 662 | Optical density of smoke (D _m) measured in flaming mode and non flaming mode in single smoke chamber test. |
| ASTM D792 Method A ?- | Specific gravity |
| ASTM G154 | UV resistance test method |
| AIRBUS 937201 | This standard specifies the dimensions, tolerances, required characteristics and the mass of an identification sleeve for electric cable. |
| BS EN ISO 4589-1: 1999 - Oxygen Index | Limited Oxygen Index- flammability hazard rating. Determination of burning behavior by oxygen index - part 2: ambient temperature test. 32% minimum |
| DIN 54837 | DIN 54837 Testing of materials, small components and component sections for rail vehicles- determination of burning behaviour using a gas burner |
| IEC 60684-2 | Low temperature flexibility |
| NF C 20-455 | Fire hazard testing glowin/hot-wire based test methods. Glow-wire apparatus and common test procedure.c Replaced by EN ISO 60695-2-11 |
| MIL 202 Method 215 | Resistance to-of solvents. Test methods for electronic and electrical component parts |
| SAE AS5942;2014 | Marking og insulation materials- Print permanence testing using the mechanical crockmeter |
| UL224 and CSA-C22.2 | Extruded tubing, Insulation, Electrical, Flexible, Heat Shrinkable Poleolefin Tubing produced to flammability ratings |