



AMD

Flame retardant self-extinguishing identification Sleeves 2X - 3X

TECHNICAL DATA SHEET

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The AMD 2X and 3X Heat Shrinkable Wire Markers are made of flame retardant, self-extinguishing flexible heat shrinkable polyolefin tubing with ideal printability properties for identification purposes.

This product is designed for aerospace, military, defense and marine applications where UL224 and SAE-AMS-DTL-23053/5 class 1 & 3 characteristics are required.

For use in wire bundling and assemblies, panel building.

AMD grade identification sleeves meets UL224 VW-1/CSA and AMS-DTL-23053/5 class 1 & 3.

AMD meets the NFPA 130 Standard.

The AMD grade identification sleeves are very versatile through excellent balance of chemical, electrical and mechanical properties.

Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military /
Defence



Electrical
installations



Petrochemical



Telecom

STANDARD TUBE COLOR



OTHER TUBE COLORS ON REQUEST

BACKING TAPE COLORS



MATERIAL

Extruded, cross linked polyolefin.

SHRINK RATIO

2:1 & 3:1

OPERATING TEMPERATURE

-55°C to +135°C
(-67°F to 275°F)

SHRINK TEMPERATURE

>90°C (130°F)

COMPLIANCES

Mark Permanence:

SAE AS-5942 Superceeds

SAE 81531:1998, point 4.6.2

Recommended black ribbon:

FTI-Y, FTI-X

Chemical Resistance to solvents:

AMS-DTL-23053/5

MIL-STD-202G

Test method 215j

INDUSTRY STANDARDS

SAE-AMS-DTL-23053/5 class 1 & 3

NFPA 130

FLAMMABILITY

UL224 125°C 600 VW-1

File E203950

CSA 125°C 600V VW-1

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 to be used in aerospace, military, defense, marine cable harnesses, 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.

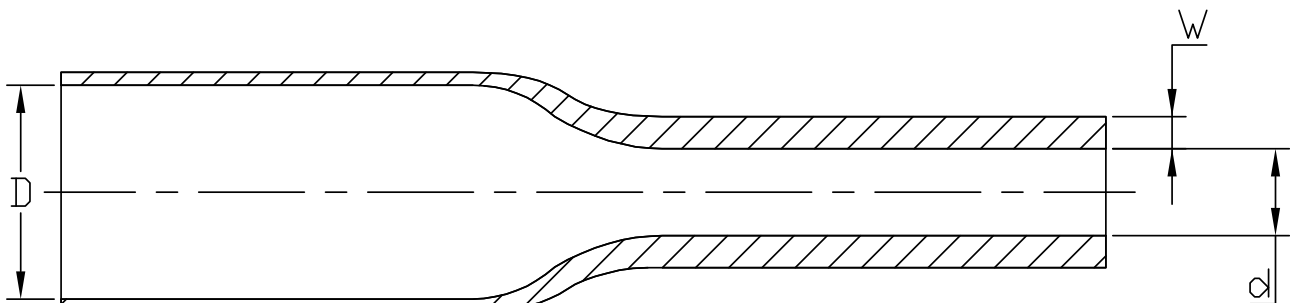
Product Dimensions

DIMENSIONS 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 | 39.8 (1.57) | 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 | ASTM D638 | 10.3 Mpa (min.) |
| Elongation at break | ASTM D638 | ≥200% |
| Longitudinal change | UL224 | +/-5% |
| 2% Secant Modulus | SAE-AMS-DTL-23053/5 | 118MPa |
| Water absorption | SAE-AMS-DTL-23053/5 | 0.09 % |
| Specific gravity | ASTM D 792 | 1.34g/ cm ³ |

ELECTRICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|-------------|-----------------------------------------------------------------------|
| Dielectric strength | ASTM D876 | 19.7 kV/mm ² no flashover or dielectric breakdown occurred |
| Volume resistivity | ASTM D876 | ≥ 10 ¹⁴ Ω/cm |
| Voltage Rating | UL224 | 600 Volt |

CHEMICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|--------------------------------------------|---------------------|---------------|
| Chemical resistance | AMS-DTL-23053/5 | Good |
| Copper corrosion | SAE-AMS-DTL-23053/5 | No corrosion |
| Copper stability | SAE-AMS-DTL-23053/5 | No corrosion |
| Fluid resistance (23°C, 24h) AMS-DTL-23053 | ASTM D638 | 6.9 Min |

THERMAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|------------------------------------------------|------------------------------------------------------------|----------------------------------|
| Heat shock 4 hours at 250°C | AMS-DTL-23053/5 | No dripping, cracking or flowing |
| Elongation after heat aging 168 hours at 175°C | ASTM D 638 | Elongation 100% |
| Flammability | UL224 VW-1 - ASTM2671-13 Section 68 - SAE-AMS-DTL 23053/5A | Pass » Flame retardant |
| Low temperature flexibility / bending | ASTM D2671- SAE-AMS-DTL-230537/5 | No cracking - pass |

Fire behavior Standard Classification for Identification Products

| STANDARDS | CLASSIFICATION | USAGE |
|-----------|--------------------------------------|----------------------------------------------|
| NFPA 130 | National Fire Protection Association | Usage Permitted upon agreement with end user |

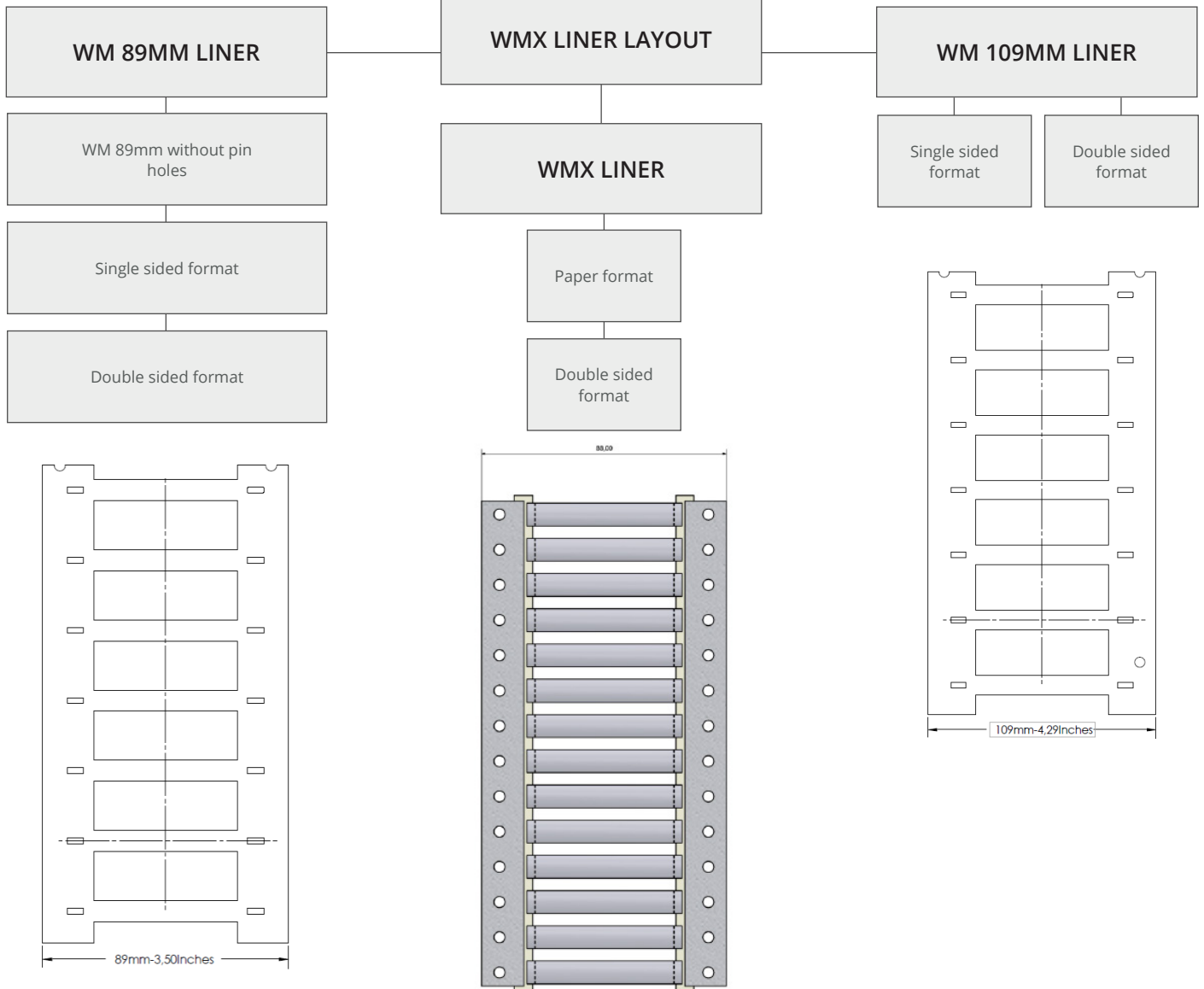
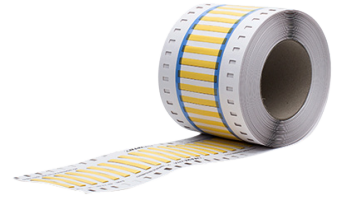
Compliance on fire behavior for Identification Products

| STANDARDS | TEST METHOD | | |
|-----------|--------------------------------------|-----------------------|-------------------------------------------|
| | FLAME PROPAGATION FLAME SPREAD INDEX | SMOKE OPTICAL DENSITY | HEAT AND VISIBLE SMOKE RELEASE / TOXICITY |
| NFPA130 | ASTM E 162 | ASTM E 662 | ASTM E 1354 |

FIRE PROPAGATION

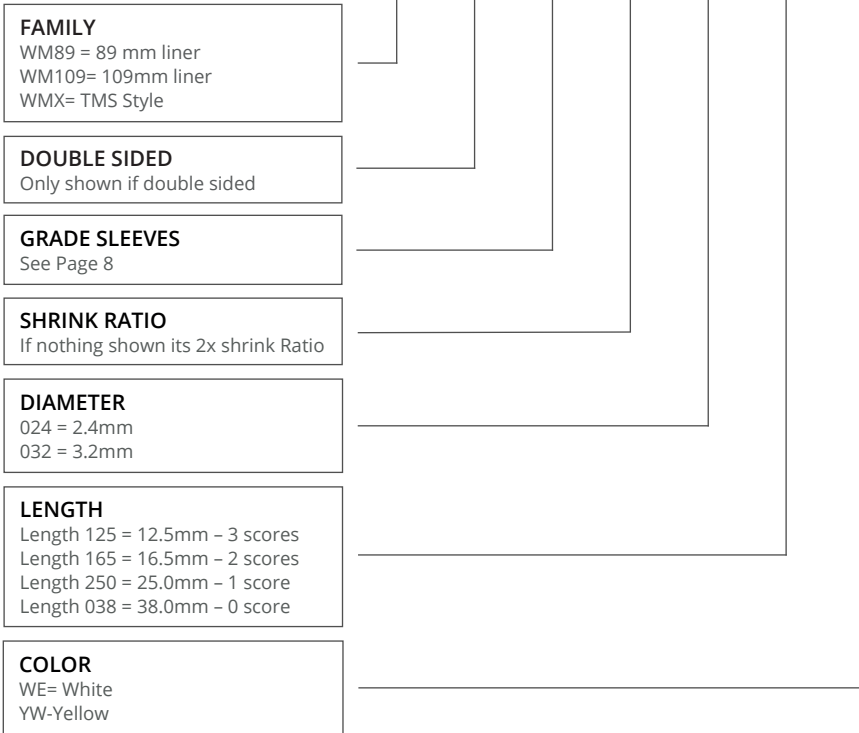
| NORMATIVES | FLAMMABILITY SPREAD INDEX | SMOKE OPTICAL DENSITY | HEAT AND VISIBLE SMOKE RELEASE / TOXICITY |
|------------|---------------------------|-----------------------|-------------------------------------------|
| NFPA130 | Pass | Pass | Pass |

Available Formats



Product code

WMX- DS -AMD- 3X - 024 - 125 - YW

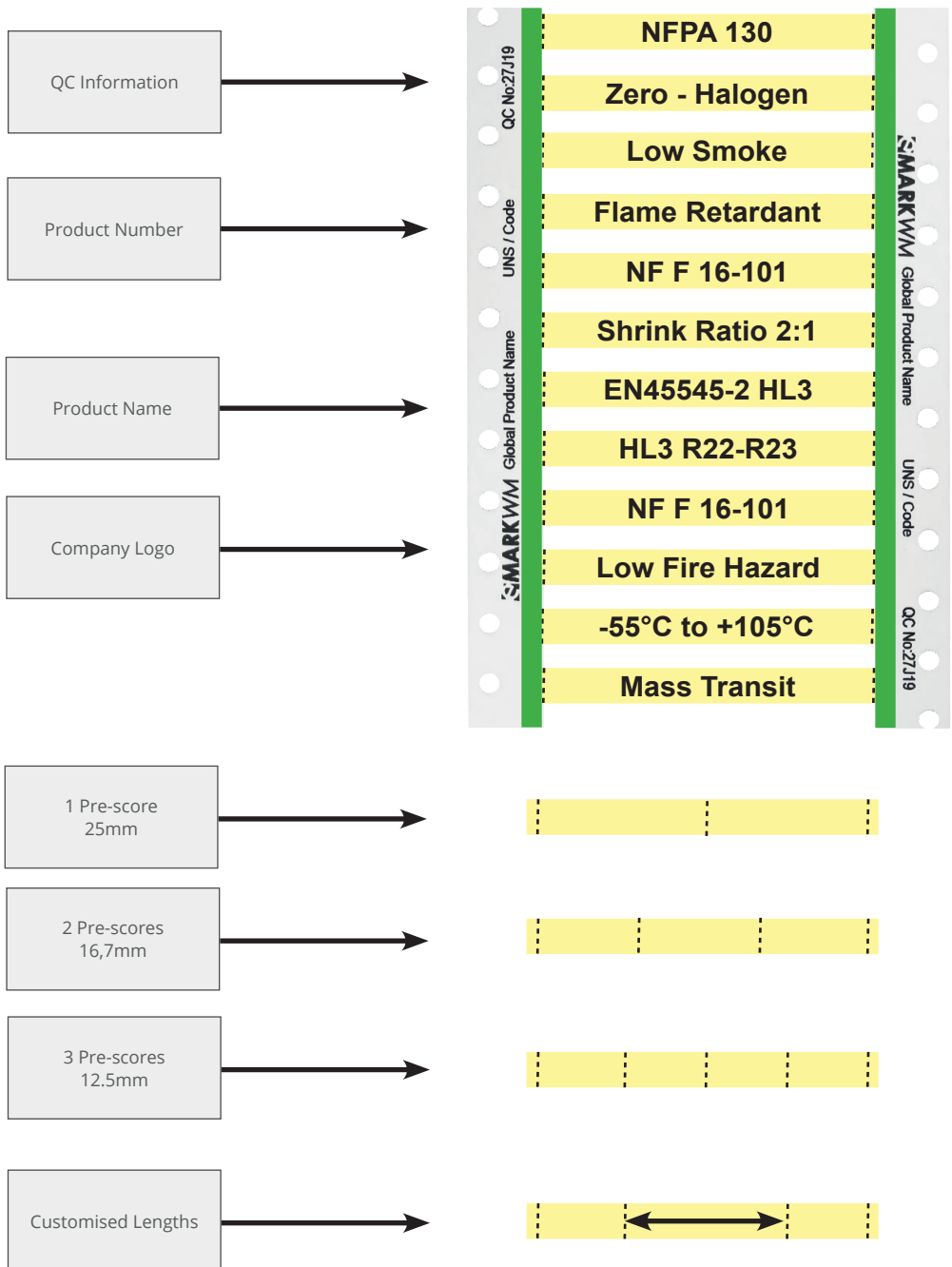


Available options -

| SIZE MM | SIZE INCHES | STANDARD | BULK | JUMBO |
|--------------|-------------|----------|-------|--------|
| 2,4 x 50 mm | 3/32 - 2.0 | 1.000 | 5.000 | 10.000 |
| 3,2 x 50 mm | 1/8 - 2.0 | 1.000 | 5.000 | 10.000 |
| 4,8 x 50 mm | 3/16 - 2.0 | 1.000 | 5.000 | 10.000 |
| 6,4 x 50 mm | 1/4 - 2.0 | 1.000 | 3.000 | 6.000 |
| 9,5 x 50 mm | 3/8 - 2.0 | 500 | 2.000 | 4.000 |
| 12,7 x 50 mm | 1/2 - 2.0 | 500 | 1.500 | 3.000 |
| 19,0 x 50 mm | 3/4 - 2.0 | 500 | 1.500 | 3.000 |
| 25,4 x 50 mm | 1 - 2.0 | 300 | 1.000 | 2.000 |
| 38,1 x 50 mm | 1 1/2 - 2.0 | 100 | 600 | 1.200 |
| 50,8 x 50 mm | 2 - 2.0 | 100 | 600 | 1.200 |

Other Spool sizes on request -

Customised Liner Information Example



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 requirements. 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 | SAE-AMS-DTL-23053/5 Class 1 SAE AS 81531 / 5942 MIL-STD-202F method 215J NFPA 130 AIRBUS NSA937201 UL224 CSA |
| 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. The material meet Boeing BS 7239 for toxic gas generation M7 specification- The ZH material is classified with EN45545-2 Class HL3 requirement set R22 (interior) and R23 (exterior) and be used without any restriction for any application. | EN 45545-2 (R22-R23) BS 6853 DIN5510-2 UNI CEI 11170-3 NFPA130 SAE AS 81531 / 5942 MIL-STD-202F method 215J |
| 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 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 dgc. | 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 |

Ordering description

| ORDERING DESCRIPTION EXAMPLES | STANDARD PACK SIZE | SUPPLIED DIAMETER | | RECOVERED DIAMETER | | RECOMMENDED USE RANGE (MIN-MAX) | |
|------------------------------------|-----------------------|----------------------|-----------|-----------------------|--------|------------------------------------|-------------|
| | pcs | mm | inches | mm | inches | mm | inches |
| Family-Tube Grade-3X-024-50-Colour | 1.000 | 2,4 x 50mm | 3/32-2.0 | 0.7 | 0.031 | 0.8-1.9 | 0.032-0.075 |
| Family-Tube Grade-3X-032-50-Colour | 1.000 | 3,2 x 50mm | 1/8-2.0 | 1.0 | 0.042 | 1.1-2.6 | 0.044-0.105 |
| Family-Tube Grade-3X-048-50-Colour | 1.000 | 4,8 x 50mm | 3/16-2.0 | 1,5 | 0.062 | 1.7-4.0 | 0.069-0.160 |
| Family-Tube Grade-3X-064-50-Colour | 1.000 | 6,4 x 50mm | 1/4-2.0 | 2.3 | 0,095 | 2.3-5.4 | 0.091-0.215 |
| Family-Tube Grade-3X-095-50-Colour | 500 | 9,5 x 50mm | 3/8-2.0 | 3.1 | 0.125 | 3.4-8.1 | 0.137-0.320 |
| Family-Tube Grade-3X-127-50-Colour | 500 | 12,7 x 50mm | 1/2-2.0 | 4.75 | 0,187 | 4.6-10.7 | 0.183-0.425 |
| Family-Tube Grade-3X-190-50-Colour | 500 | 19,0 x 50mm | 3/4-2.0 | 6.35 | 0.250 | 6.9-16.2 | 0.275-0.640 |
| Family-Tube Grade-3X-254-50-Colour | 300 | 25,4 x 50mm | 1-2.0 | 8.47 | 0.33 | 9.2-21.5 | 0.366-0.850 |
| Family-Tube Grade-3X-381-50-Colour | 100 | 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-508-50-Colour | 100 | 50,8 x 50mm | 2-2.0 | 17.2 | 0.68 | 27.9-44.9 | 1.100-1.750 |

Related Standard Test Methods And Documents

| Document | Description |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM D638 - | Tensile strength and ultimate elongation specification |
| ASTM D638- | Heat aging 168 at 158°C specification |
| ASTM D 2671 | Flammability testing. Heat shock 4 hours at 225°C - specification |
| ASTM D2671 -UL224 | Longitudinal change- specification |
| ASTM D 792 | Specific gravity specification |
| ASTM D876 | Dialectrical strength - Volume resistivity- specification |
| ASTM D2671B - UL224 | Copper corrosion (Section 93 procedure A) damaged area of copper mirror, |
| ASTM E 162 | Flame Spread Index . Surface Flammability of Materials Using a Radiant Heat Energy Source |
| ASTM E 662 | Optical density of smoke generated by solid materials, (D _s) measured in flaming mode and non flaming mode in single smoke chamber test. |
| ASTM E 1354 | Heat and Visible Smoke Release Rates of Materials and Products using an Oxygen Consumption (Cone) Calorimeter |
| AMS-DTL-23053/5 | Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible, Crosslinked specification |
| ASTM D876 | Volume resistivity Ω-cm |
| ASTM D 635-HB - SAE-AMS-DTL-23053/5 | Flammability resistance - Fire propagation |
| MIL 202 Method 215 | Resistance to-of solvents. Test methods for electronic and electrical component parts |
| NFPA 130 | National Fire Protection Association. Standard for fixed guideway transit and passenger rail systems This standard specifies fire protection and life safety requirements for underground, surface and elevated fixed guideway transit and passenger rail systems |
| SAE AS5942;2014 | Marking of insulation materials- Print permanence testing using the mechanical crockmeter |
| 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. |