



# LFH - 2X - 3X

## 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, flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printability properties for identification purposes, which provides fluid resistance as per EN50343.

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

### Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



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

-40°C to +125°C  
(-40°F to 193°F)

### SHRINK TEMPERATURE

>90°C (130°F)

### COMPLIANCES

Mark Permanence:  
SAE AS-5942  
BS EN 50343:2014 Annex H  
Section H.3  
Recommended black ribbon:  
FTI-Y, FTI-X

Chemical Resistance to solvents:

MIL-STD-202G  
Test method 215j

### 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 to be used in commercial , cable harnesses, Industrial marking, insulation, wire bundling and mechanical protection.

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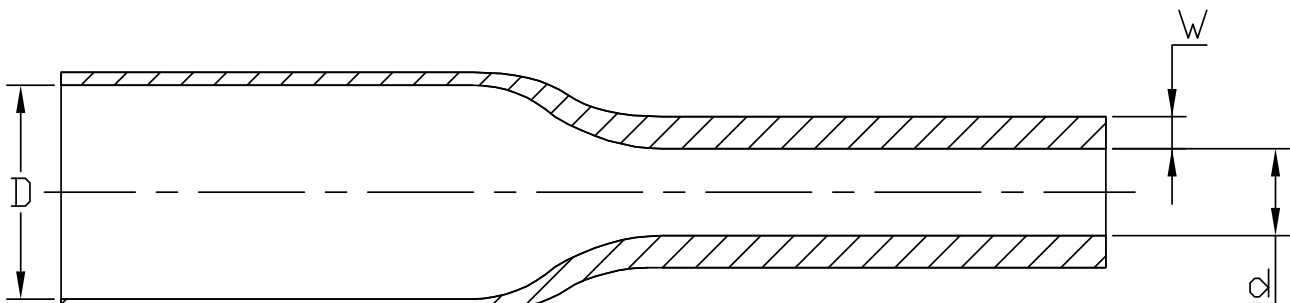
# Product Dimensions

## 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 <sup>2</sup> |
| Volume resistivity  | GB/T1408    | ≥ 10 <sup>14</sup> 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  |

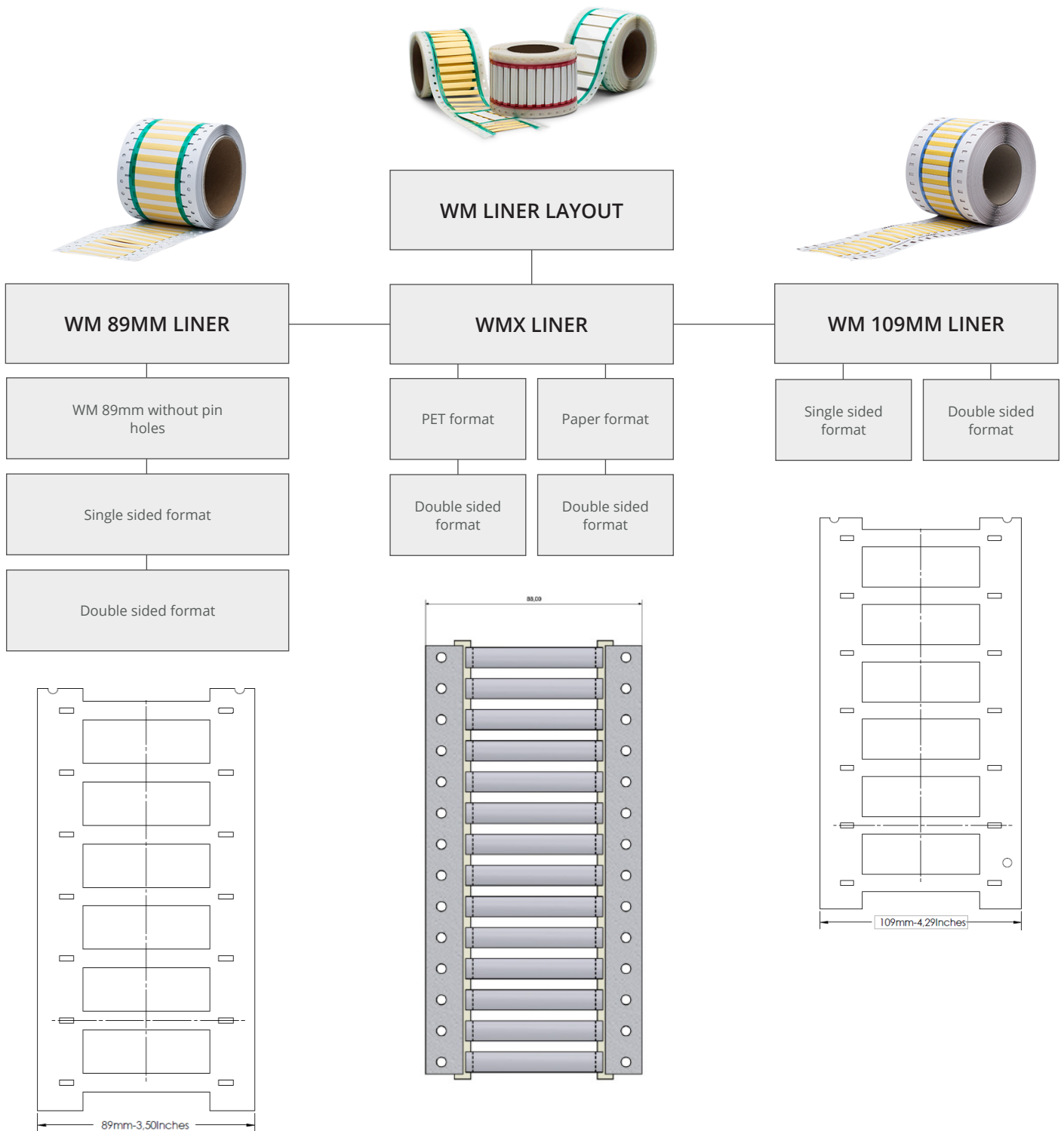
## THERMAL

| 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

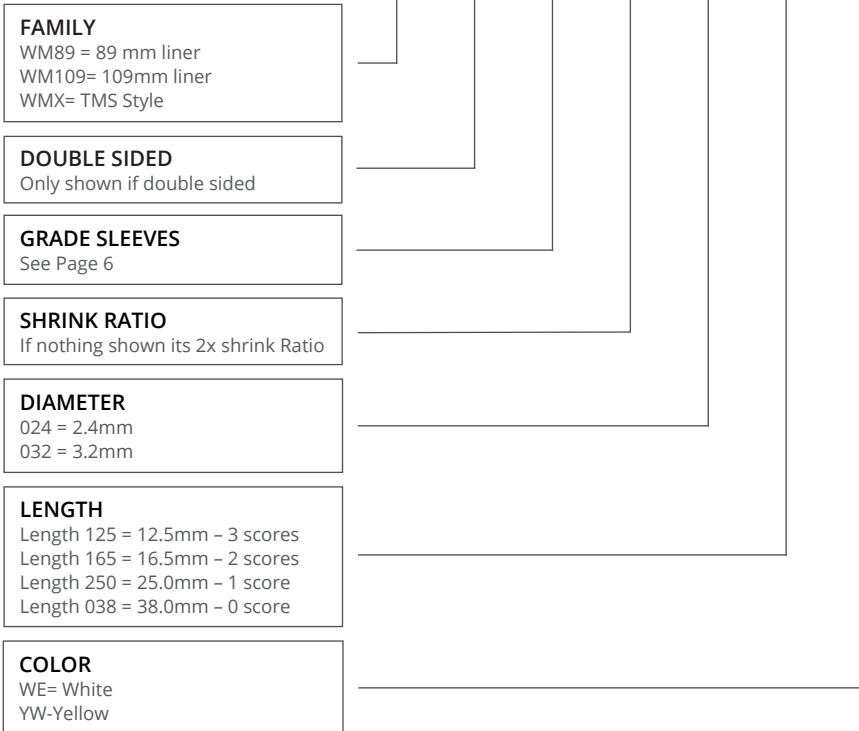
| PROPERTIES | TEST METHOD  | TYPICAL VALUE   |
|------------|--|---|
| UV-A       | ASTM G154 - Machine setup Temp 50-60°C (140°F)<br>Cycle 8 h light 4h condensation UV wavelength<br>280-400nm Test duration 1000 h of exposure. | Pass - No damage to the marker and print legible<br>after 10 rubs in accordance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

# Available Formats



## Product code

WM - DS - LFH - 3X - 024 - 125 - YW

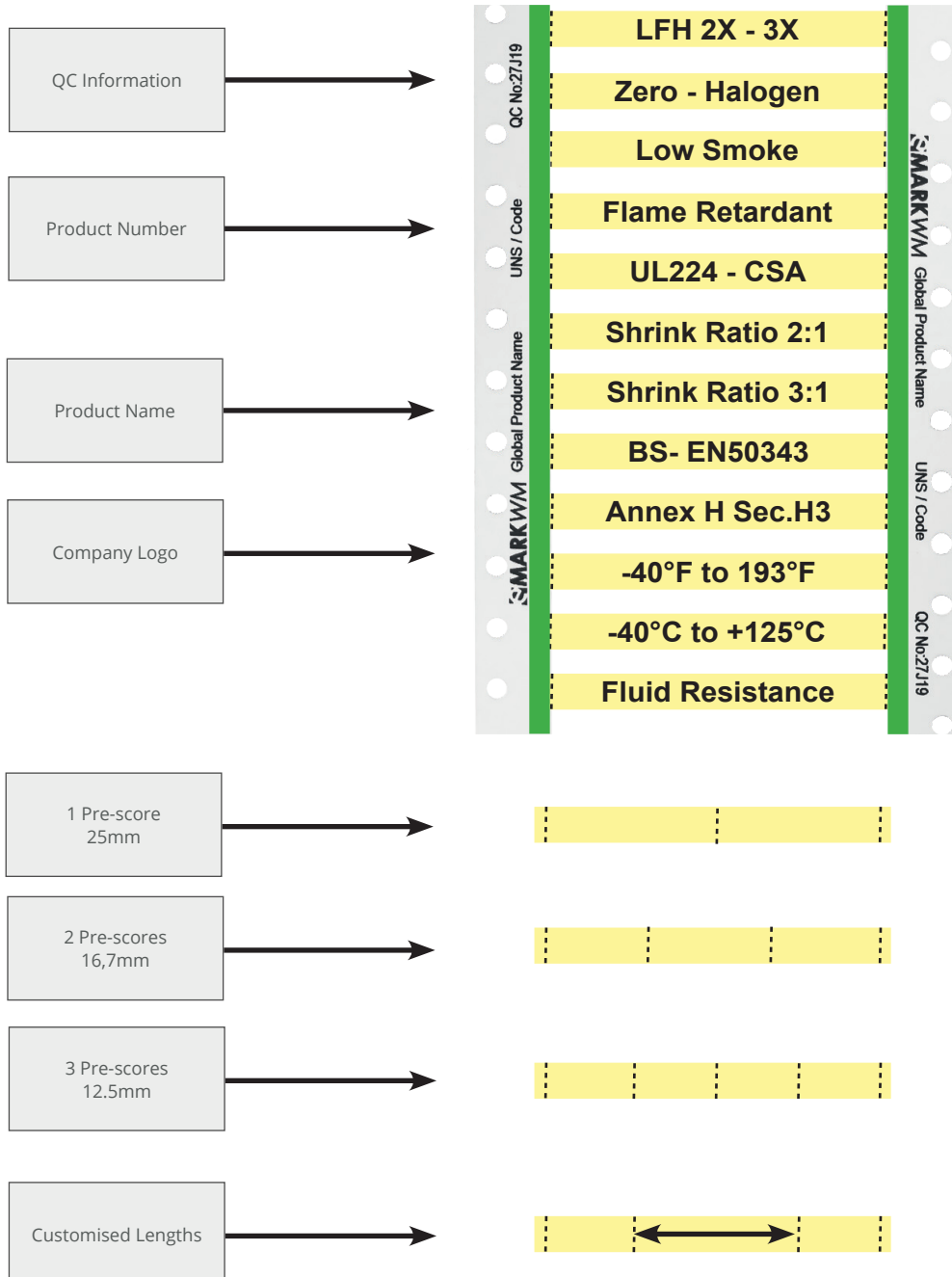


## Available options -

| 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



| 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. Meets NFPA 130 Standard. 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                       | 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 NFPA 130  |
| 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 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. Meets NFPA 130 Standard  | UL224 SAE-AMS-DTL-23053/5 SAE AS 81531 / 5942 MIL-STD-202F method 215J NFPA 130   |
| 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. Meets NFPA 130 Standard   | UL224 SAE-AMS-DTL-23053/5 SAE AS 81531 / 5942 MIL-STD-202F method 215J NFPA 130   |
| 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 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 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

| ORDERING DESCRIPTION<br>EXAMPLES   | STANDARD<br>PACK SIZE | SUPPLIED<br>DIAMETER |           | RECOVERED<br>DIAMETER |        | RECOMMENDED USE<br>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 - 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 - <b>good</b>   |
| ASTM D257 -IEC 93                        | Volume resistivity $\Omega$ -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   |
| 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. |