



# HT Continuous mini spool

## High Temperature, heat shrink identification sleeves

### TECHNICAL DATA SHEET

Revision Number. 1  
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The WM-HT-2X Heat Shrinkable Wire Markers are made of flame retarded modified PVDF tubing with ideal printability properties for identification purposes.

Ideal for applications where high temperature and extreme fluid resistance characteristics are required.

This product is designed for use in Aerospace, Defence, and Mass Transit applications, wire bundling and assemblies, panel building and industrial installations.

Meets AMS-DTL-23053/18 UL224 VW-1 for vertical burn test / flammability. This product is not recommended where strain relief is required.

### STANDARD TUBE COLOR



### OTHER TUBE COLORS ON REQUEST



### MATERIAL

Extruded flame retarded polyvinylidene fluoride.

### SHRINK RATIO

2:1

### OPERATING TEMPERATURE

-55°C to +225°C  
(-67°F to 437°F)

### MIN RECOVERY TEMPERATURE

>200°C (392°F)

### MIN RECOVERY TEMPERATURE

>135°C (275°F)

### SPECIFICATION / APPROVALS

SAE-AMS-DTL-23053/18 class 1  
UL224 VW-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, Defence, Mass Transit, cable harnesses, Industrial marking, insulation, wire bundling and mechanical protection.

## Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations



Petrochemical



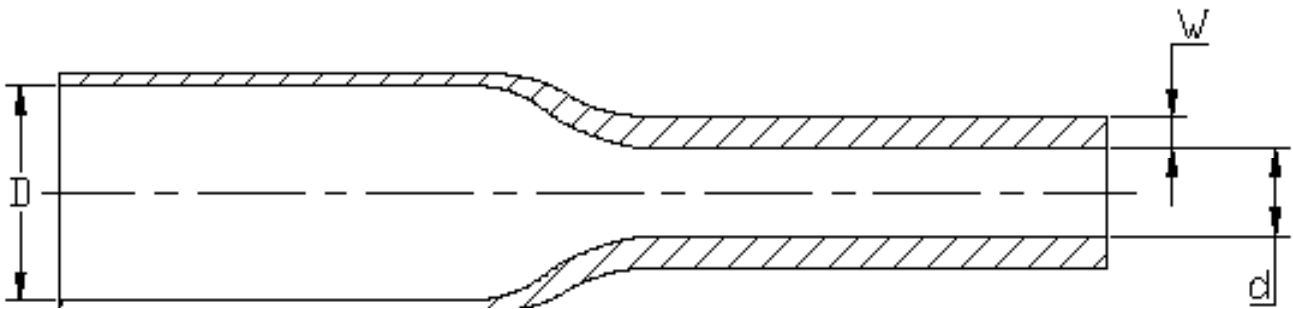
Telecom

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	2.36 (0.09)	1.18 (0.046)	0.49±0.06 (0.019 ± 0.002)
1/8	3.2	3.18 (0.125)	1.59 (0.063)	0.51±0.06 (0.02 ± 0.002)
3/16	4.8	4.75 (0.187)	2.36 (0.093)	0.54±0.06 (0.02 ± 0.002)
1/4	6.4	6.35 (0.252)	3.18 (0.125)	0.56±0.06 (0.022 ± 0.002)
3/8	9.5	9.53 (0.375)	4.75 (0.187)	0.59±0.06 (0.023 ± 0.002)
1/2	12.7	12.7 (0.50)	6.35 (0.250)	0.60±0.07 (0.024 ± 0.003)
3/4	19.1	19.05 (0.75)	9.53 (0.374)	0.62±0.07 (0.024 ± 0.003)
1	25.4	25.4 (1.00)	12.7 (0.500)	0.63±0.07 (0.025 ± 0.003)
1 ½	38.1	38.1 (1.50)	19.1 (0.750)	0.64±0.07 (0.025 ± 0.003)
2	50.8	50.8 (2)	25.4 (1.0)	0.64±0.08 (0.025 ± 0.003)
3	76.2	76.10 (3)	38.1 (1.5)	0.64±0.09 (0.025 ± 0.003)



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 D412	≥31,3 Mpa (min.)
Elongation at break	ASTM D421	≥330%
Longitudinal change	SAE-AMS-DTL-23053	+5%
Specific gravity	ASTM D 792	1,73 g/cm <sup>3</sup>
Secant Modulus	ASTM D882	≥730 MPA

### ELECTRICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Dielectric strength	ASTM D 2671	≥43 kV/mm
Volume resistivity	ASTM D 876	≥ 9,1 x 10 <sup>14</sup> Ω/cm
Voltage Rating		600 Volt

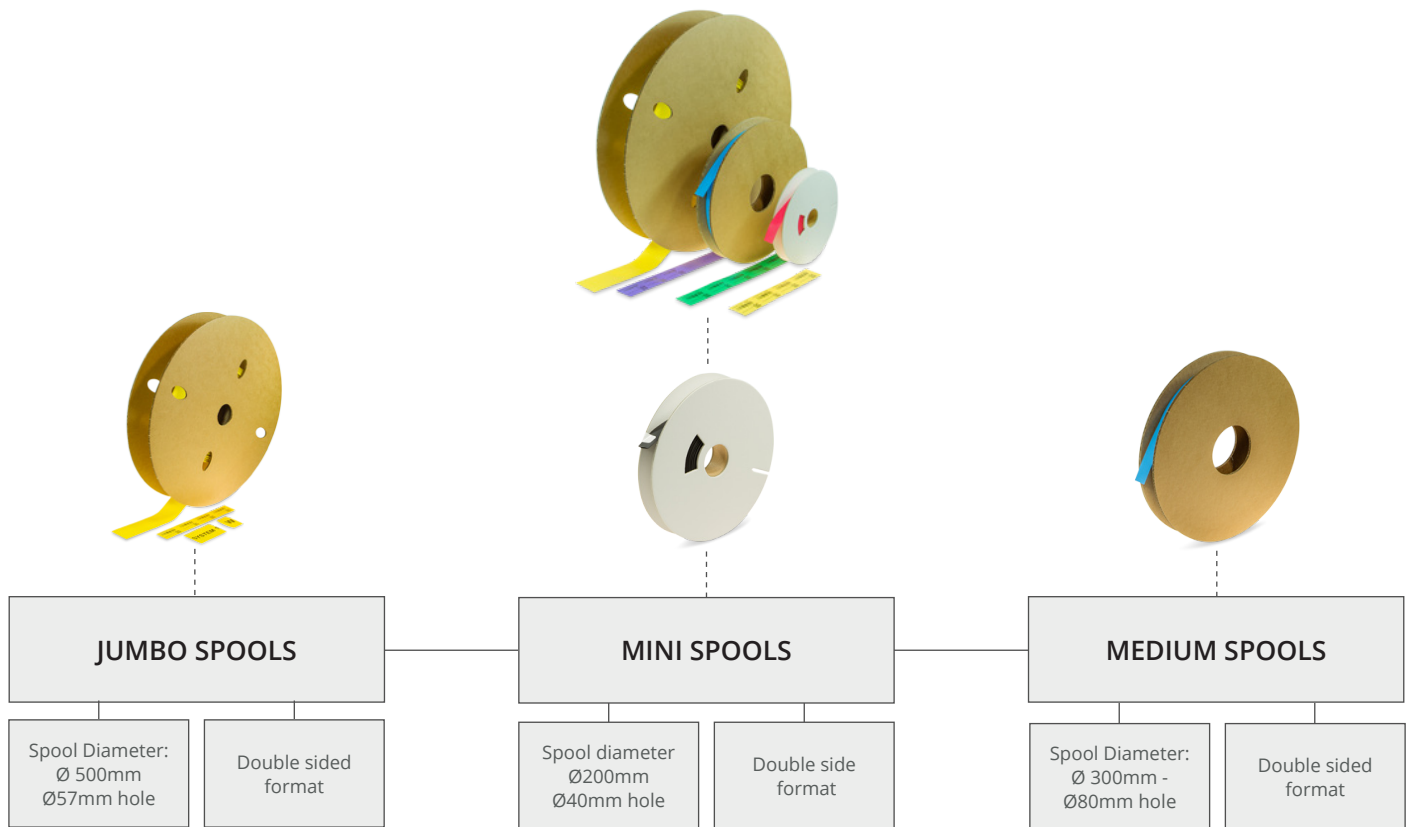
### CHEMICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Fluid resistance	AMS-DTL-23053/5	Good - Pass
Water absorption	ASTM D 570	≤ 0,2 %
Flammability	UL224 VW-1	Pass
Fungus resistance	ASTM G 21	Pass

### THERMAL

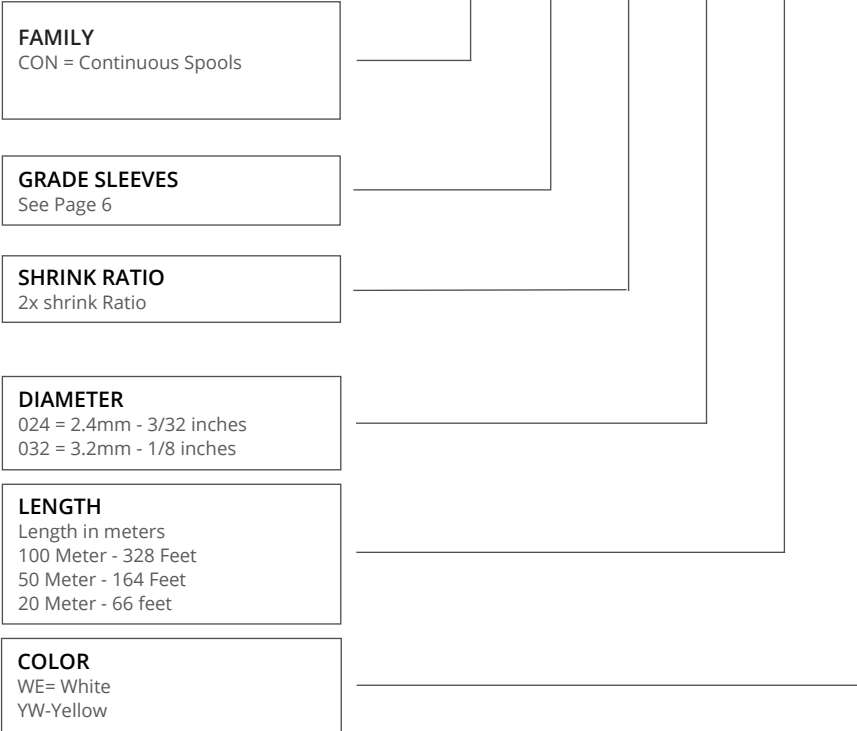
PROPERTIES	TEST METHOD	TYPICAL VALUE
Heat shock 4 hours at 250°C	SAE-AMS-DTL-23053	No dripping, cracking or flowing - Pass
Heat aging 168 hours at 225°C	SAE-AMS-DTL-23053	Elongation ≥200%
Copper corrosion (225°C x 16h)	SAE-AMS-DTL-23053	Pass
Low temperature flexibility (-55°C x4h)	SAE-AMS-DTL-23053	Pass
Copper corrosion (160°C x16h)	SAE-AMS-DTL-23053	Pass
Clairity stability (200°C x 24h)	SAE-AMS-DTL-23053	Pass

## Available Formats



## Product code

CON - HT - 2X - 024 -100M- 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	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	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 in inch sizes heat shrinkable polyolefin tubing with ideal printability properties for identification purposes. 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 A55942 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
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 (ASTM E 162, ASTM E 662, BSS 7239) 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
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.	UL224 SAE-AMS-DTL-23053/5 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.	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
WMX-WM89-WM109	3-1	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 EXAMPLES	STANDARD SPOOL SIZE	SUPPLIED DIAMETER		RECOVERED DIAMETER		RECOMMENDED USE RANGE (MIN-MAX)	
		mm	inches	mm	inches	mm	inches
Family-Tube Grade-2X-024-20-Colour	20 Meter - 66 Feet	2.36	3/32	1.18	(0.046)	0.8-1.9	0.032-0.075
Family-Tube Grade-2X-032-20-Colour	20 Meter - 66 Feet	3.18	1/8	1.59	(0.063)	1.1-2.6	0.044-0.105
Family-Tube Grade-2X-048-20-Colour	20 Meter - 66 Feet	4.75	3/16	2.36	(0.093)	1.7-4.0	0.069-0.160
Family-Tube Grade-2X-064-20-Colour	20 Meter - 66 Feet	6.35	1/4	3.18	(0.125)	2.3-5.4	0.091-0.215
Family-Tube Grade-2X-095-15-Colour	15 Meter - 49 Feet	9.53	3/8	4.75	(0.187)	3.4-8.1	0.137-0.320
Family-Tube Grade-2X-127-15-Colour	15 Meter - 49 Feet	12.7	1/2	6.35	(0.250)	4.6-10.7	0.183-0.425
Family-Tube Grade-2X-190-15-Colour	15 Meter - 49 Feet	19.05	3/4	9.53	(0.374)	6.9-16.2	0.275-0.640
Family-Tube Grade-2X-254-15-Colour	15 Meter - 49 Feet	25.4	1-2.0	12.7	(0.500)	9.2-21.5	0.366-0.850
Family-Tube Grade-2X-381-15-Colour	15 Meter - 49 Feet	38.1	1 1/2	19.1	(0.750)	20.9-33.0	0.825-1.300
Family-Tube Grade-2X-508-10-Colour	10 Meter - 33 Feet	50.8	2	25.4	(1.0)	27.9-44.9	1.100-1.750
Family-Tube Grade-2X-762-10-Colour	10 Meter - 33 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 - <b>good</b>
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
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.