LinkSolutions

AMD

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

TECHNICAL DATA SHEET
Revision Number. 1.3
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Laser Marking

The AMD 2X and 3X Heat Shrinkable Wire Markers are made of flame retardant, self-extinguising 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.

Industries

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 (FTI-X & FTI-HXX)
Recommended black ribbon:
FTI-X, FTI-HXX

Chemical Resistance to solvents:
AMS-DTL-23053/5
MIL-STD-202 Test method 215
(FTI-X & FTI-HXX)

ALTERNATIVE RIBBONS
FTI-HLD white

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 the industries marked to the left, cable harnesses, marking, insulation, wire bundling and mechanical protection. Can be used in other industries also.

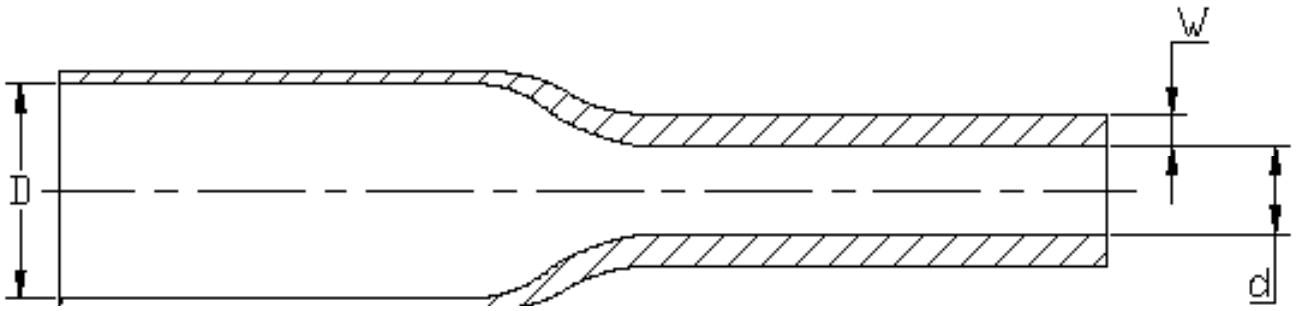
Product Dimensions

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 gravitty	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 occured
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

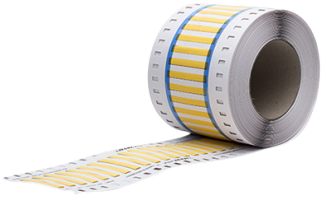
Compliance on fire behavior for Identification Products

		TEST METHOD	
STANDARDS	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



WM 89MM LINER

- WM 89mm without pin holes
- Single-sided format
- Double-sided format

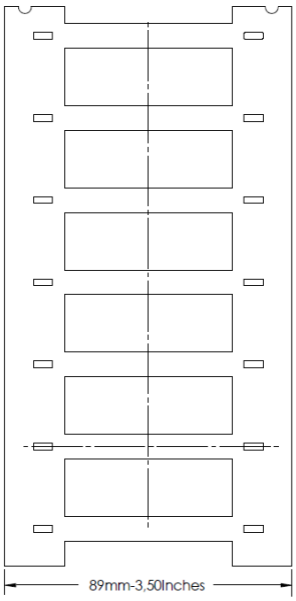
WMX LINER LAYOUT

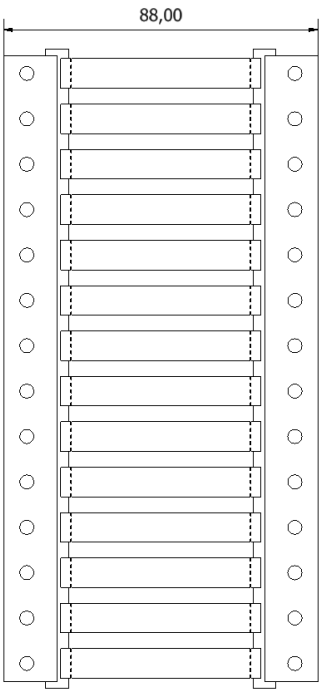
WMX LINER

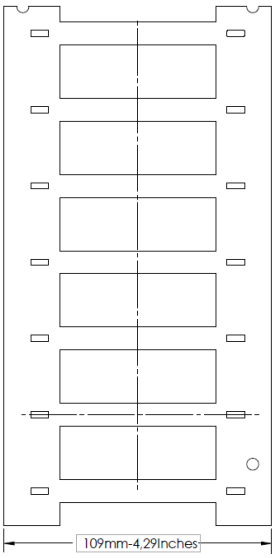
- Paper format
- Double-sided format

WM 109MM LINER

- Single-sided format
- Double-sided format







Product code

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

FAMILY
WM89 = 89 mm liner
WM109= 109mm liner
WMX= TMS Style

DOUBLE SIDED
Only shown if double sided

GRADE SLEEVES
See Page 8

SHRINK RATIO
If nothing shown its 2x shrink Ratio

DIAMETER
024 = 2.4mm
032 = 3.2mm

LENGTH
Length 125 = 12.5mm – 3 scores
Length 165 = 16.5mm – 2 scores
Length 250 = 25.0mm – 1 score
Length 038 = 38.0mm – 0 score

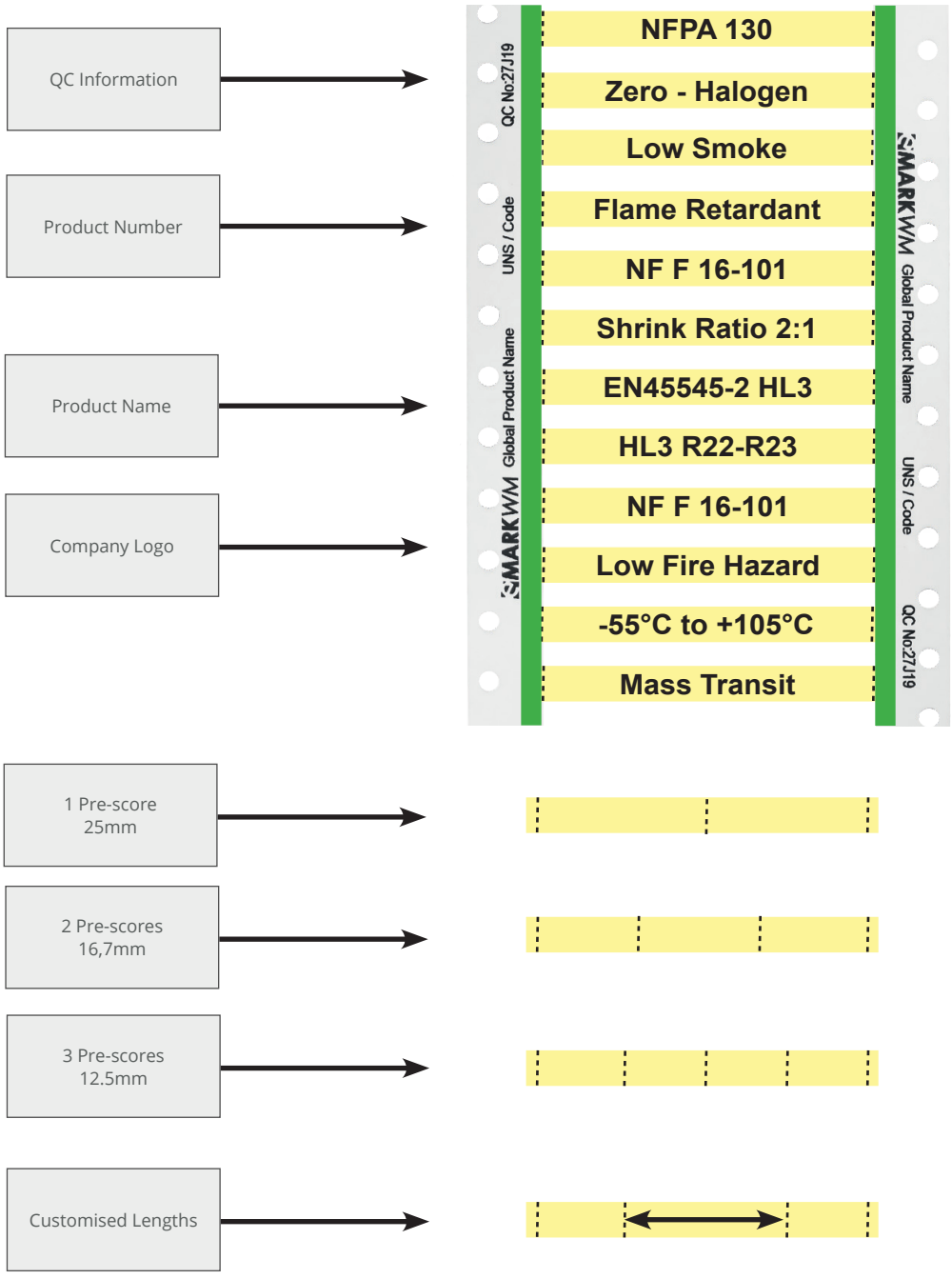
COLOR
WE= White
YW-Yellow

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 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 81531 / 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 and BS EN IEC 60684-3-216 . 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

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	Longtitudinal change- specificatiion
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 matrials, ($D_{s)}$ 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 Comsumption (Cone) Caloriemeter
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
BS IEC EN 60684-2-216	Flexible insulating sleeving - Part 3: Specifications for individual types of sleeving - Sheet 248: General purpose, heat-shrinkable, dual wall polyolefin sleeving, flame retarded, shrink ratios 2:1, 3:1, 4:1
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 tandard specifies fire protection and life saety requirements for underground, surface and elevated fixed guideway transit and passenger rail systems
SAE AS5942;2014	Marking og 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.