

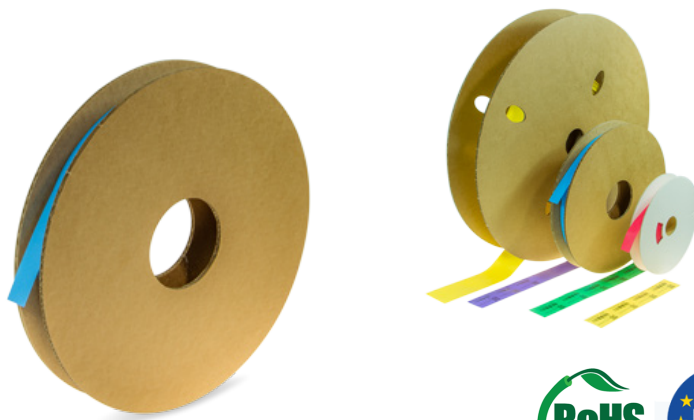


# C3 Continuous Medium Spools

## Military Grade Self Extinguishing Identification Sleeves

### TECHNICAL DATA SHEET

Revision Number. 1.2  
Last Edited 27. april 2022



Continuous heat shrinkable tubing made of, flame retardant inch sizes heat shrinkable polyolefin tubing with ideal printability properties for identification purposes.

The C3 material is 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.  
C3 meets the NFPA 130 Standard and EN 60684-3-209.  
Test reports available upon request.

Ideal for Aerospace, Military, Rail, Industrial and other applications.

Marker sleeves meets the mark permanence requirements of SAE AS-5942 and MIL 202 Method 215K. Test report available upon request.

### Industries



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations



Petrochemical



Telecom



Laser printable

### STANDARD TUBE COLOR



### NON STANDARD COLORS

Available on request

### 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-202

Test method 215

### RECOMMENDED BLACK RIBBONS

FTI-X, FTI-HXX

### ALTERNATIVE BLACK RIBBON

FTI-Y

### LASER PRINT

UV lasers 355nm

### FIRE PROPAGATION

ASTM D2671 Procedure B

NFPA 130

### TOXICITY

BSS-7239

### UL224

125°C Certificate E228117

### CSA-C22.2

No. 198.1-06

### Material performance

AMS SAE DTL 23053/5 Class 1

### AIRBUS STANDARD

NSA937201 Table 7

### 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

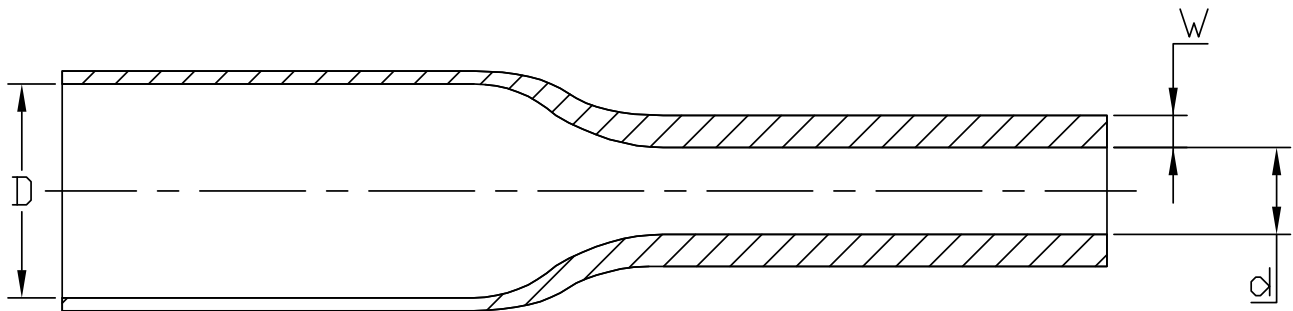
Specific developed for the industries marked in green to the left. can also be used for insulation, wire bundling and mechanical protection.

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 <sup>2</sup> .
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 <sup>3</sup>

## ELECTRICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Dielectric strength	ASTM D 2671	20.0 kV/mm <sup>2</sup>
Volume resistivity	ASTM D 257	≥ 10 <sup>14</sup> 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 - Flame spread index	ASTM E 162-16	Pass » rounded average = 10 - specified max = 35
Low temperature flexibility	1h at - 55°C ASTM D2671C	No cracking, no break, no detachment of coating
Optical density of smoke (D <sub>m</sub> )	ASTM E-662	Pass
Smoke index - visible smoke release	ASTM E 1354	MJ/m <sup>2</sup> = 38,10

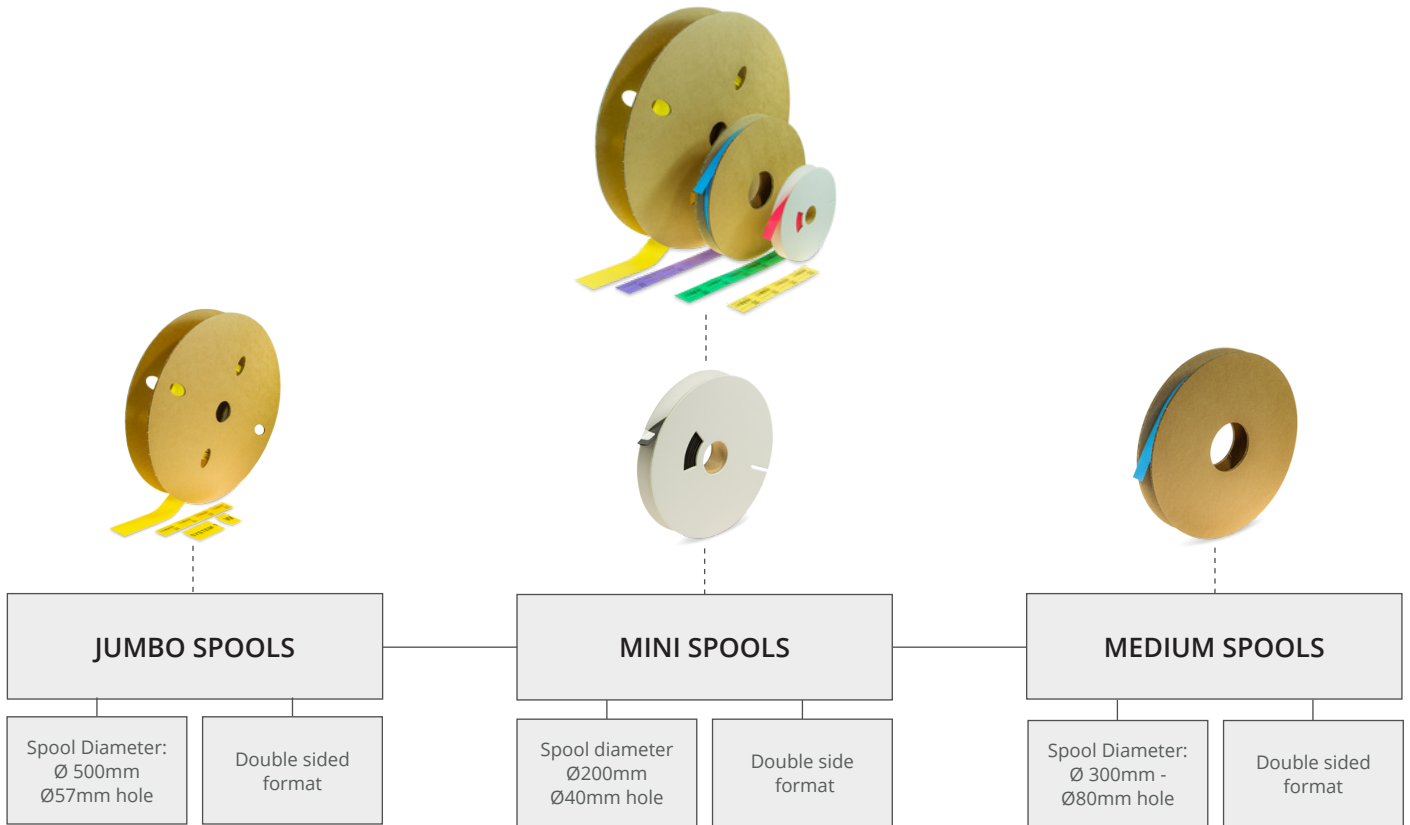
## FIRE PROPAGATION

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

## ENVIRONMENTAL UV STABILITY

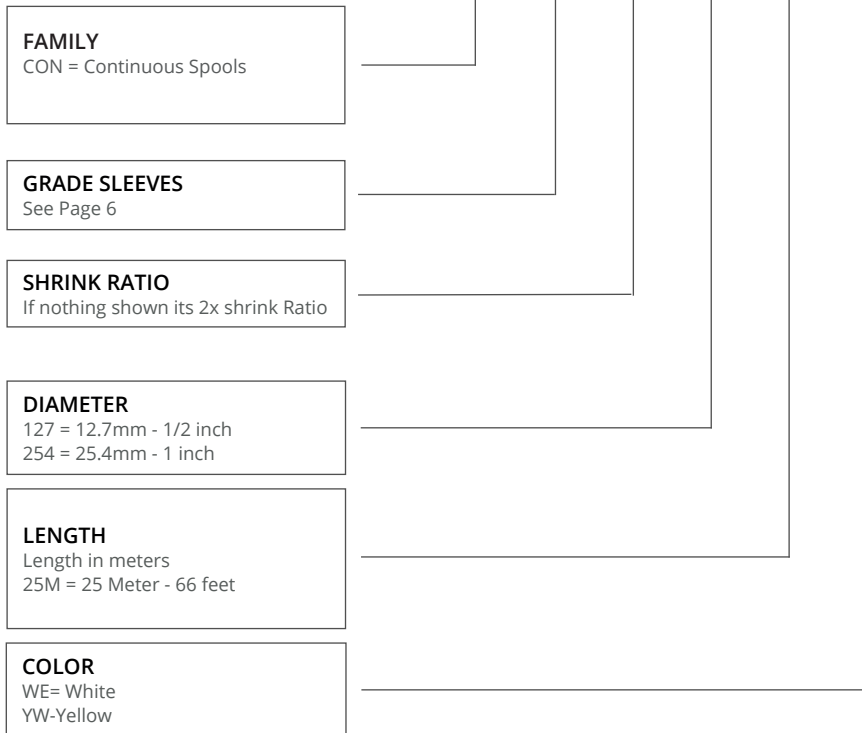
PROPERTIES	TEST METHOD	TYPICAL VALUE
UV-B	ASTM G154 - Machine setup Temp 50-60°C (140°F) Cycle 8 h light 4h condensation UV wavelength 280-400nm Test duration 1000 h of exposure.	Pass - No damage to the marker and print legible after 20 rubs in accordance with AS3349/SAE AS 81531.

# Available Formats



## Product code example

CON - C3 - 3X - 024 - 25M - 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 -

# 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 meet the mark permanence requirements of AS5942 and MIL 202 Method 215	EN 60684-3-209 NFPA 130 UL224 CSA 22.2 No. 198- SAE-AMS-DTL-23053/5 SAE AS 5942 MIL-STD-202 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 deg.	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. 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

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## Ordering description example medium spools c3 grade

ORDERING DESCRIPTION EXAMPLES	STANDARD PACK SIZE	SUPPLIED DIAMETER		RECOVERED DIAMETER		RECOMMENDED USE RANGE (MIN-MAX)	
	Meter	mm	inches	mm	inches	mm	inches
Family-Tube Grade-3X-024-50M-Colour	50 Meter - 164 Feet	2,4	3/32	0.7	0.031	0.8-1.9	0.032-0.075
Family-Tube Grade-3X-032-50M-Colour	50 Meter - 164 Feet	3,2	1/8	1.0	0.042	1.1-2.6	0.044-0.105
Family-Tube Grade-3X-048-50M-Colour	50 Meter - 164 Feet	4,8	3/16	1,5	0.062	1.7-4.0	0.069-0.160
Family-Tube Grade-3X-064-50M-Colour	50 Meter - 164 Feet	6,4	1/4	2.3	0,095	2.3-5.4	0.091-0.215
Family-Tube Grade-3X-095-50M-Colour	50 Meter - 164 Feet	9,5	3/8	3.1	0.125	3.4-8.1	0.137-0.320
Family-Tube Grade-3X-127-25M-Colour	25 Meter - 82 Feet	12,7	1/2	4.75	0,187	4.6-10.7	0.183-0.425
Family-Tube Grade-3X-190-25M-Colour	25 Meter - 82 Feet	19,0	3/4	6.35	0.250	6.9-16.2	0.275-0.640
Family-Tube Grade-3X-254-25M-Colour	25 Meter - 82 Feet	25,4	1	8.47	0.33	9.2-21.5	0.366-0.850
Family-Tube Grade-3X-381-25M-Colour	25 Meter - 82 Feet	38,1	1 1/2	12.9	0.51	20.9-33.0	0.825-1.300
Family-Tube Grade-3X-508-25M-Colour	25 Meter - 82 Feet	50,8	2	17.2	0.68	27.9-44.9	1.100-1.750

## 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 - <b>good</b>
ASTM D257	Volume resistivity
ASTM D 635-HB -	Flammability resistance - Fire propagation
ASTM E 162	Flame Spread Index . Surface Flammability of Materials Using a Radiant Heat Energy Source
ASTM D E 662	Optical density of smoke (D <sub>m</sub> ) measured in flaming mode and non flaming mode in single smoke chamber test. Flame Spread Index . Surface Flammability of Materials Using a Radiant Heat Energy Source
ASTM E 1354	Heat and Visible Smoke Release Rates of Materials and Products using an Oxygen Consumption (Cone) Calorimeter
ASTM D792 Method A 2-	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 -3	Low temperature flexibility. 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
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
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
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 Polyolefin Tubing produced to flammability ratings