

ZH Continuous Bulk Spools

Low Smoke 0-Halogen Flame-retardant Identification Sleeves

TECHNICAL DATA SHEET

Revision Number. 1.2
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The ZH heat Shrinkable Wire Markers are made of halogen-free, flame retardant and low smoke heat shrinkable polyolefin tubing with ideal printability properties where limited fire hazard and low smoke characteristics are required.

The zero halogen material coupled with low smoke and low toxic fume emissions makes this product ideal in enclosed spaces such as mass transit, marine and industrial installations.

ZH meets the NFPA 130 Standard and EN 60684-3-216. Test report available. The ZH material is classified with EN45545-2 Class HL3 requirement set R22 (interior) - R23 (exterior) and R24.

The ZH material can be used without any restriction for any railway application using the standards above.

Industries



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations



Petrochemical



Telecom

STANDARD TUBE COLORS



TUBE COLORS ON REQUEST



MATERIAL

Extruded, cross linked polyolefin.

SHRINK RATIO

2:1

OPERATING TEMPERATURE

-55°C up to +105°C
(-67°F to 221°F)

Shrink Temperature

≥90° (194°F)

COMPLIANCES

Mark Permanence:
SAE AS-5942 (FTI-X & FTI-HXX)
LUL 3349 (FTI-X)
Print Resistance to solvents:
MIL-STD-202
Test method 215
(FTI-X & FTI-HXX)

RECOMMENDED BLACK RIBBONS

FTI-X, FTI-HXX

ALTERNATIVE RIBBONS

FTI-Y, FTI-HX

RECOMMENDED WHITE RIBBON

FTI-HLD-CO-WE

LASER PRINT

UV lasers 355nm

INDUSTRY STANDARDS

EN 60684-3-216
EN45545-2 Class HL3 R22-23-R24
NFPA 130
NF F 16-101
London Underground
1-085 A3
BOEING BSS 7239
UNI CEI 11170-3 (LR4)
DIN 5510-2
BS6853: 1999 vehicle category 1a

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.

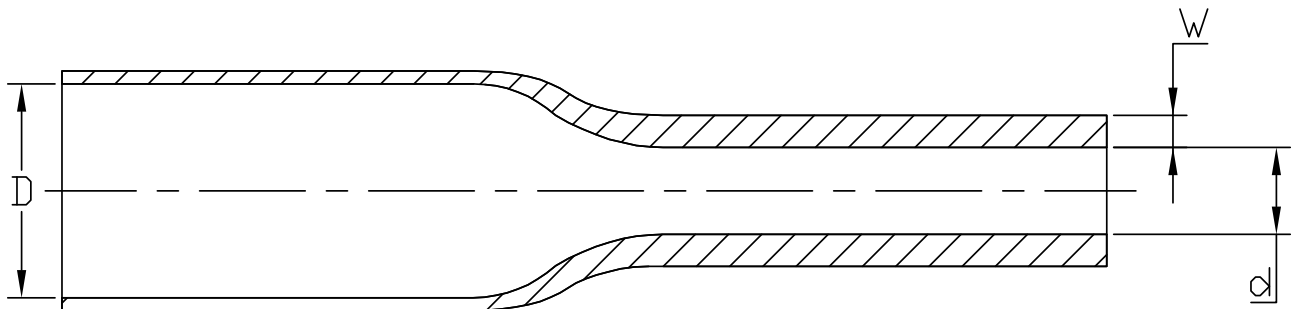
APPLICATIONS

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

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 | 2.5 (0.098) | 1.2 (0.047) | 0.43 (0.017) |
| 1/8 | 3.2 | 3.6 (0.142) | 1.6 (0.063) | 0.55 (0.022) |
| 3/16 | 4.8 | 5.2 (0.189) | 2.4 (0.094) | 0.55 (0.022) |
| 1/4 | 6.4 | 6.7 (0.263) | 3.2 (0.126) | 0.65 (0.025) |
| 3/8 | 9.5 | 10.0 (0.393) | 4.8 (0.189) | 0.65 (0.025) |
| 1/2 | 12.7 | 13.6 (0.53) | 6.4 (0.250) | 0.65 (0.025) |
| 3/4 | 19.1 | 20.4 (0.80) | 9.5 (0.374) | 0.70 (0.027) |
| 1 | 25.4 | 27.0 (1.06) | 12.7 (0.500) | 0.85(0.033) |
| 1 ½ | 38.1 | 40.0 (1.57) | 19.1 (0.750) | 0.90(0.035) |
| 2 | 50.8 | 50.8 (2) | 25.4 (1.0) | 0.90(0.035) |



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 D 638 | 10.0 N/mm ² . |
| Elongation at break | ASTM D 638 | ≥200% |
| Longitudinal change | ASTM D 2671 | -10% to +5% |
| Water absorption | ASTM D 570 | ≤ 0,15% |
| Specific gravity | ASTM D 792 | 1,40 |

ELECTRICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|-------------|-------------------------|
| Dielectric strength | ASTM D 2671 | 20.0 kV/mm ² |
| Volume resistivity | ASTM D 257 | ≥ 10 ¹⁴ Ω/cm |

CHEMICAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---------------------|---------------|-------------------------------|
| Chemical resistance | EN 60684-2-36 | Good - Pass |
| Copper corrosion | EN 60684-2-33 | No chemical interaction: PASS |
| Copper stability | N-A | N-A |

THERMAL

| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------|
| Heat shock 4 hours at 175°C | ASTM D 2671 | No dripping, cracking or flowing |
| Heat aging 168 hours at 150°C | ASTM D 638 | Elongation ≥ 100% |
| Flammability | ASTM D 2671 Procedure C | Pass » flame retardant |
| Low temperature flexibility / Bending | 1h at - 55°C EN 60684-2 | No cracking, no break, no detachment of coating |
| Optical density of smoke (D _s) | ASTM E 662 | Flaming mode 41 , non flaming mode 111 |
| Smoke index | NF F 16-101 | Smoke class F1 |
| Surface Flammability of Materials - Flame Spread Index - Tested on 19.1 mm sleeve. | ASTM E 162 | Specified Maximum = 35 |
| Heat and visible smoke release rate | ASTM E 1354 | Average Heat Release Rate & Average specific Extinguishing area M ² / kg at 3 minutes is measured |
| Generation of Toxic gases 3x3 inches sample burning in controlled settings | BSS 7239 | Toxicity for CO, HF, HCN, HCl, SO ₂ and NO _x in Combustion Gases |

FIRE PROPAGATION COMPARISON

| NORMATIVES | TOXICITY | LOW OXYGEN INDEX (LOI) | SMOKE DENSITY | FLAMMABILITY SPREAD INDEX | CAPACITY OF FORMING DROPS |
|----------------------|----------|------------------------|---------------|---------------------------|---------------------------|
| EN45545-2 | HL3 | HL3 | HL3 | - | - |
| NF F 16 101 | - | - | Class F1 | Class I4 | - |
| BS 6853 - Superseded | 1a | 1a | 1a | - | - |
| DIN 5510-2 | Pass | - | SR2 | - | ST1 |
| NFPA130 | Pass | - | Pass | Pass | - |
| UNI CEI 11170-3 | LR4 | LR4 | - | LR4 | - |

Fire behavior Standard Classification for Identification Products

| STANDARDS | CLASSIFICATION | USAGE |
|----------------------|----------------|----------------------------------------------|
| EN 45545-2 (R22:R23) | HL3 | Unlimited Usage All Vehicles |
| BS6853 | 1a | Unlimited Usage All Vehicles |
| UNI CEI 11170-3 | LR4 | Unlimited Usage All Vehicles |
| DIN 5510-2 | SR2, ST1 | Usage Limited |
| NF F 16-101 | F1 & I4 | Usage Limited to External Vehicles |
| NFPA 130 | - | Usage Permitted upon agreement with end user |

Compliance on fire behavior for Identification Products

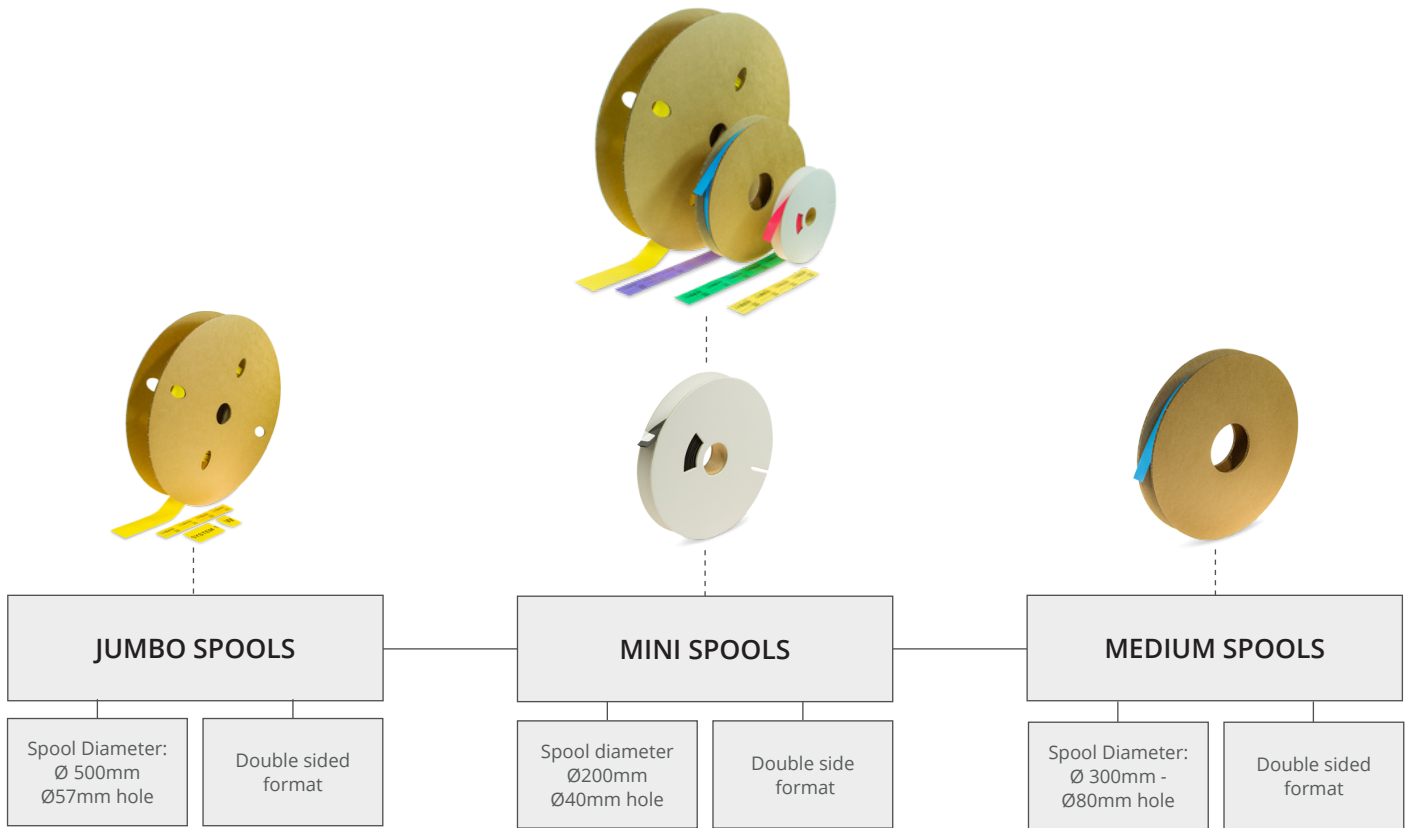
TEST METHOD

| STANDARDS | FLAME PROPAGATION | TOXICITY | SMOKE DENSITY | LOW OXYGEN INDEX |
|--------------------|-------------------|------------------------------------|-------------------|------------------|
| BS6853 | | BS 6853 appendix B1 or NF X-70-100 | BS 6853 D8.3 | ISO 4589-2 |
| NF F-16 101 | NF EN 60-695-2 | NF X 70-100 | NF X 10-702-1 & 2 | ISO 4589-2 |
| NFPA130 | ASTM E 162 | BSS 7239 | ASTM E 662 | |
| EN 45545-2 | | NF X 70-100 600°C | EN ISO 5659-2 | ISO 4589-2 |
| DIN 5510-2 | DIN 54837 | DIN ISO 5510-2 | DIN 54837 | |

Environmental UV Stability

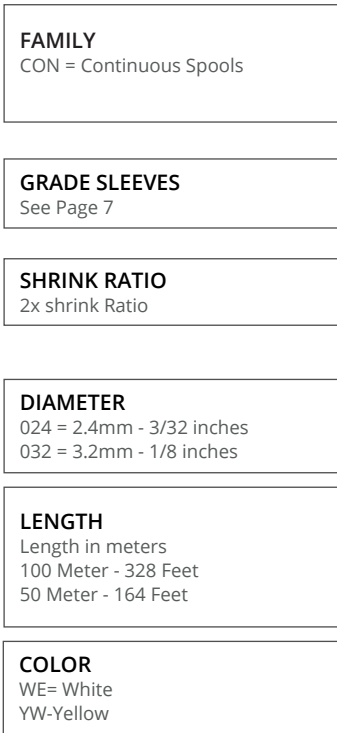
| PROPERTIES | TEST METHOD | TYPICAL VALUE |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| UV-A | 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 SAE-ASAS3349/ SAE AS 81531. |

Available Formats



Product code

CON - ZH - 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 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 215K | EN 60684-209 NFPA 130 UL224 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 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-202F method 215J 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 81531 / 5942 MIL-STD-202F method 215J 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 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 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 81531 / 5942 MIL-STD-202F method 215J |
| 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 81531 / 5942 MIL-STD-202F method 215J |
| 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 81531 / 5942 MIL-STD-202F method 215J |
| 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 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, 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-202F Method 215J Mark Permanence: EN50343 annex H (section 6.6) & SAE AS-5942 |

Ordering description example bulk spools ZH grade

| ORDERING DESCRIPTION EXAMPLES | STANDARD SPOOL SIZE | SUPPLIED DIAMETER | | RECOVERED DIAMETER | | RECOMMENDED USE RANGE (MIN-MAX) | |
|--------------------------------------|----------------------|-------------------|--------|--------------------|--------|---------------------------------|-------------|
| | Meter | mm | inches | mm | inches | mm | inches |
| Family-Tube Grade-2X-024-100M-Colour | 100 Meter - 328 Feet | 2,4 | 3/32 | 1,2 | 0.047 | 0.8-1.9 | 0.032-0.075 |
| Family-Tube Grade-2X-032-100M-Colour | 100 Meter - 328 Feet | 3,2 | 1/8 | 1.6 | 0.063 | 1.1-2.6 | 0.044-0.105 |
| Family-Tube Grade-2X-048-100M-Colour | 100 Meter - 328 Feet | 4,8 | 3/16 | 2,4 | 0.094 | 1.7-4.0 | 0.069-0.160 |
| Family-Tube Grade-2X-064-100M-Colour | 100 Meter - 328 Feet | 6,4 | 1/4 | 3,2 | 0,0126 | 2.3-5.4 | 0.091-0.215 |
| Family-Tube Grade-2X-095-100M-Colour | 100 Meter - 328 Feet | 9,5 | 3/8 | 4,8 | 0.189 | 3.4-8.1 | 0.137-0.320 |
| Family-Tube Grade-2X-127-50M-Colour | 50 Meter - 164 Feet | 12,7 | 1/2 | 6,4 | 0,250 | 4.6-10.7 | 0.183-0.425 |
| Family-Tube Grade-2X-190-50M-Colour | 50 Meter - 164 Feet | 19,0 | 3/4 | 9,5 | 0.374 | 6.9-16.2 | 0.275-0.640 |
| Family-Tube Grade-2X-254-50M-Colour | 50 Meter - 164 Feet | 25,4 | 1 | 12,7 | 0.500 | 9.2-21.5 | 0.366-0.850 |
| Family-Tube Grade-2X-381-50M-Colour | 50 Meter - 164 Feet | 38,1 | 1 1/2 | 19,1 | 0.750 | 20.9-33.0 | 0.825-1.300 |
| Family-Tube Grade-2X-508-50M-Colour | 50 Meter - 164 Feet | 50,8 | 2 | 25,4 | 1 | 27.9-44.9 | 1.100-1.750 |

Related Standard Test Methods And Documents

| Document | Description |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM D638 | Tensile strength and ultimate elongation |
| ASTM D638 | Heat aging 168 at 150°C |
| ASTM D2671 heat shock (section 26-30), procedure b | Heat shock 4 hours at 175°C |
| ASTM D2671 | Longitudinal change |
| ASTM D2671 (Section 79-80) ASTM D570 | Water absorption. 2 Maximum |
| ASTM D149 | Dialectrical strength. 20 minimum |
| ASTM D2671B replaced by EN 60684-2-33 | Copper corrosion (Section 93 procedure A) damaged area of copper mirror, |
| EN 60684-2-36 | Chemical resistance to selected fluids |
| ASTM D257 | Volume resistivity |
| ASTM D 635-HB - | Flamiability resistance - Fire propagation |
| ASTM D 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 D E 162 | Flame Spread Index . Surface Flammability of Materials Using a Radiant Heat Energy Source |
| ASTM D E 1354 | Heat and Visible Smoke Release Rates of Materials and Products using an Oxygen Consumption (Cone) Calorimeter |
| ASTM D792 Method A | Specific gravity |
| Boeing BS 7239 | Toxic gas generation M7. Gases produced for analysis are generated in a specified, calibrated smoke chamber during standard rate of smoke generation testing (ASTM E 662), in both flaming combustion and non-flaming pyrolytic decomposition test modes |
| 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 |
| BS 6853 (1999) vehicle catagory 1a | Code of practice for fire precautions in the design and construction of passenger carrying trains |
| DIN 54837 | DIN 54837 Testing of materials, small components and component sections for rail vehicles- determination of burning behaviour using a gas burner |
| DIN 5510-2 | German railway normative related to fire protection on railway vehicles |
| ISO 5659-2: 2017 | Optical density of smoke (D _m) measured in flaming mode and non flaming mode in single smoke chamber test. |
| EN45545-2 HL3 - HL 1 - HL 2 - HL 3 | Railway applications. Rolling stock fire protection on railway vehicles. - Part 2 requirements for fire behavior of materials and components. Fire hazard class. HL1,2 & 3 R22 (Interior) & R23 (exterior) R24 - PCB - EN ISO 4589-2 , burning behavior determined by LOI - Low Oxygen Index only |
| IEC 60684-3-216 | IEC 60684-3-216: 2019 gives the requirements for four types of heat-shrinkable, flame-retarded, limited-fire-hazard sleeving with a thermal endurance rating of 105 °C. |
| London Underground Standard 1-085 | Revision A3, Fire safety performance of materials |
| 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 |
| NF F 16-101: 1988 | Railway rolling stock fire behavior choice of materials Rolling stock classification A1. |
| NF X 70-100: 1986 | Fire tests analysis of pyrolysis and cumbustion gases tube furnace method |
| NF X 10-702-1/2 | Determination of the opacity of smoke in a non-renewed atmosphere. The resulting density /time curve is used to calculate the smoke index |
| NF T 51-071: 1999 | Oxygen index test. This test has been replaced by IEC 60695-2-11/EN 60965-2-11 |
| 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 solvents. Test methods for electronic and electrical component parts. |
| SAE AS5942;2014 | Marking og insulation materials- Print permanence testing using the mechanical crockmeter |

Abstract from IEC 60684-3-216:2019 Standard

IEC 60684-3-216:2019 is available as IEC 60684-3-216:2019 RLV which contains the International Standard and its Redline version, showing all changes of the technical content compared to the previous edition. IEC 60684-3-216: 2019 gives the requirements for four types of heat-shrinkable, flame-retarded, limited-fire-hazard sleeving with a thermal endurance rating of 105 °C as shown below. Class A: thin wall shrink ratio 2:1 internal diameter up to 102,0 mm Class B: medium wall shrink ratio 2:1 internal diameter up to 60,0 mm Class C: thick wall shrink ratio 2:1 internal diameter up to 51,0 mm Class D: medium wall shrink ratio 3:1 internal diameter up to 40,0 mm These sleeveings are normally supplied in the following colours: black, red, green, blue, white, yellow and green/yellow. Sizes or colors other than those listed in this document are available as custom items. These items are considered to comply with this document if they comply with the property requirements listed in Tables 5, 6, 7 and 8, excluding dimensions and mass. Materials which conform to this specification meet established levels of performance. However, the selection of a material by a user for a specific application will be based on the actual requirements necessary for adequate performance in that application and not based on this specification alone. This second edition cancels and replaces the first edition published in 2001, Amendment 1:2005 and Amendment 2:2013. This edition constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition: 1. the temperature at which the sleeving is shrunk in a forced-air circulation oven for (5 ± 1) min has been increased from (150 ± 5) °C to (200 ± 5) °C. Keywords: flexible insulating sleeving for electrical purposes