ZHR 3X

Low Fire Hazard And Fluid Resistant Identification Sleeves

TECHNICAL DATA SHEET

Revision Number. 1.7
Last Edited 16. januar 2026

Key features

Permanent Print
•Excellent Printability
•Halogen-Free, Low Smoke & Flame Retardant
•Highest Safety Class in Rail (EN45545-2, HL3)
•Excellent Fluid Resistance
•Excellent Abrasion & Rub Resistance
•Weather & UV Resistant
•Withstands Heat Shock (250°C) & Low-Temperatures

The ZHR 3X Heat Shrinkable Wire Markers are made of halogen-free heat shrink polyolefin combined with superior fire safety performance with mechanical strength, flexible properties gives safety with highest impact for application and people.
The compound features a specially formulated surface designed for high-performance printing. The resulting print mark offers outstanding resistance to heat and low temperatures, diesel on the print, mineral oil and chemicals, and other contaminants, ensuring long-term legibility in demanding environments.

The legibility of the print is certified according to key industry standards including EN 50343 and MIL-STD-202 Method 215. The print also demonstrates exceptional durability, passing abrasion tests per SAE AS 5942 and remaining legible after heat shock (4 hours at 250°C) and low-temperature bending (-40°C).

The material also meets the most stringent fire safety requirements, achieving EN45545-2, Hazard Level 3 (HL3).
The highest classification for passenger rail vehicles.

Industries

Industry
Marine
Wind power
Commercial
Aerospace
Construction
Railway
Military
Electrical installations
Petrochemical
Telecom

STANDARD TUBE COLOR

TUBE COLORS ON REQUEST

BACKING TAPE COLORS

MATERIAL
Extruded, cross linked polyolefin

SHRINK RATIO
3:1

OPERATING TEMPERATURE
-55°C up to +105°C

SHRINK TEMPERATURE
>90°C -

COMPLIANCES
Mark Permanence:
SAE AS-5942 (FTI-HXX)
EN50343 Annex H (section 6.6)
Diesel resistance on print (FTI-HXX)

Resistance to solvents
MIL-STD-202
Test method 215 (FTI-HXX)

Diesel Resistance
EN 50343:2014 Annex H

Resistance to selected fluids
BS IEC60684-3-216 tab.7

Material compliance
BS IEC60684-3-216

Recommended black ribbon
FTI-HXX

ALTERNATIVE RIBBONS
FTI-X

RECOMMENDED WHITE RIBBON
To be confirmed

FIRE PROPAGATION
EN45545-2 HL3, R22/23/R24

TOXICITY
NF X 70 - 100

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

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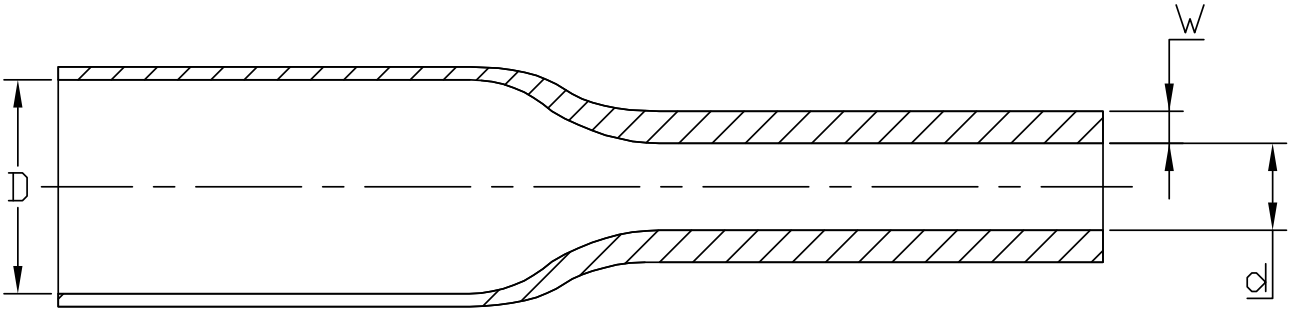
Product Dimensions



Heat Shrink Product in as supplied "D" and fully recovered state "d" with recovered wall "W"

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	2.4 (0.094)	0.8 (0,031)	0.43-0,63 (0.016 - 0.024)
1/8	3.2	3.2 (0.126)	1.2 (0.047)	0.43-0,63 (0.016 - 0.024)
3/16	4.8	4.8 (0.189)	1.6 (0.063)	0.43-0,63 (0.016 - 0.024)
1/4	6.4	6.4 (0.250)	2.4 (0.094)	0.56-0,71 (0,0220-0,028)
3/8	9.5	9.5 (0.374)	3.2 (0.126)	0.56-0,71 (0,0220-0,028)
1/2	12.7	12.7 (0.5)	4.7 (0.157)	0.56-0.8 (0.022 - 0.031)
3/4	19.1	19.1 (0.750)	6.4 (0.250)	0.81-1.00 (0.031 - 0.039)
1	25.4	25.4 (1.0)	8.5 (0.334)	0.81-1,15 (0.031 ± 0.045)
1 ½	38.1	38.1 (1.5)	13.5 (0.53)	0.90-1.25 (0.035 ± 0.049)

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General Tests for Identification Products

PHYSICAL PROPERTIES

PROPERTIES	TEST METHOD	REQUIREMENT	TEST RESULT
Tensile strength	EN 60684-2	Min 7Mpa (min.)	11.4 Mpa
Elongation at break	EN 60684-2	≥200%	230%
Color fastness to light	EN60684-2	Fastness Standard 5	Pass
Secant Modulus 2%	EN60684-2	40-130 Mpa	121 Mpa
Longtitudinal change	EN60684-2	-10 to +5%	Pass
Water absorbtion	EN60684-2	max 1%	Pass
Density	EN60684-2	1.4	Pass
UV stability	ASTM G154	1000 hours	Pass

ELECTRICAL

PROPERTIES	TEST METHOD	REQUIREMENT	TEST RESULT
Dielectric strength	EN60684-2	7 kV/mm²	22 kV/mm²
Volume resistivity at room temperature	EN60684-2	≥ 10^{10} Ω/m	3,7x10^{10} Ω/m
Volume resistivity at damp heat conditions	EN60684-2	≥ 10^{10} Ω/m	7,1x1010 Ωm

THERMAL

PROPERTIES	TEST METHOD	REQUIREMENT	TEST RESULT
Heat shock 4 hours at 150°C	EN60684-2	No dripping, cracking or flowing	No dripping, cracking or flowing
Tensile strength	EN60684-2	Min 6 Mpa	13 Mpa
Elongation at break	EN60684-2	Min. 100 %	225%
Heat ageing 168 hours at 135°C	EN60684-2		
Tensile strength	EN60684-2	Min. 5 Mpa	12 Mpa
Elongation at break	EN60684-2	Min. 150 %	210 %
Flammability	EN60684-2		
Horizoltal flammability	ASTM D635-HB	burning rate ≤40mm/min	Pass
Vertical flammability - Flame propagation	EN 60684-2 met. A1	time of burning ≤60s no burning or charring of indicator flag and no ignition of cotton	Pass ≥ 1inch
Low temperature flexibility - bending around mandrel	1h at - 55°C EN60684-2	No cracking	Pass

1)The applied testing procedure is largely consistent with the UL224 pt. 5.11 Flame test – all tubing, ASTM D2671-13 procedure B and ASTM D2671-21 method C. The products are tested in their shrunk form, i.e., as they are intended to be applied on final application

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General Tests for Identification Products

CHEMICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE	TEST RESULT
Chemical resistance to selected fluids	EN60684-3-216 tab. 7	Good - Pass	Pass
Tensile Strength	EN60684-2	Min 6 Mpa	Pass
Elongation at break	c	min. 100 %	Pass
Tested Fluids	EN60684-3-216 tab. 7	Tested	Pass
ISO 1818 liquid B (Reference mineral oil)	EN60684-3-216 tab. 7	Tested	Pass
ISO 1817 – Liquid F (Hydraulic fluid, phosphate ester type)	EN60684-3-216 tab. 7	Tested	Pass
ISO 1817 – Liquid 101 (Fuel surrogate, aromatic content)	EN60684-3-216 tab. 7	Tested	Pass
ISO 1817 – Liquid 103 (Fuel surrogate, low aromatic content)	EN60684-3-216 tab. 7	Tested	Pass
Oil No. 2 (Petroleum-based lubricating oil)	EN60684-3-216 tab. 7	Tested	Pass
S-1714 (Skydrol-type hydraulic fluid)	EN60684-3-216 tab. 7	Tested	Pass
H-520 (Hydraulic fluid, synthetic ester type)	EN60684-3-216 tab. 7	Tested	Pass
O-1176 (Lubricating oil, synthetic base)	EN60684-3-216 tab. 7	Tested	Pass
O-142 (Cleaning fluid)	EN60684-3-216 tab. 7	Tested	Pass
Runway De-icers (Glycol-based)	EN60684-3-216 tab. 7	Tested	Pass
Aircraft De-icers (Glycol-based)	EN60684-3-216 tab. 7	Tested	Pass
Acid gas generation	EN 60754-2	3,5-10,5 - max. 10 µS/mm	Pass
Copper mirror corrosion	EN60684-2	No corrosion of mirrors	Pass

FIRE PROPAGATION

DESCRIPTION	TEST METHOD	REQUIREMENT	TEST RESULT
Oxygen index	EN 4589-2	≥ 32% - EN45545-2 R22\R23\R24	Pass
Toxicity	EN 5659-2	EN45545-2 R22\R23	Pass
Toxic gas generation	NF X70-100	EN45545-2 R22\R23	Pass

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Available Formats

WM 89MM LINER

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

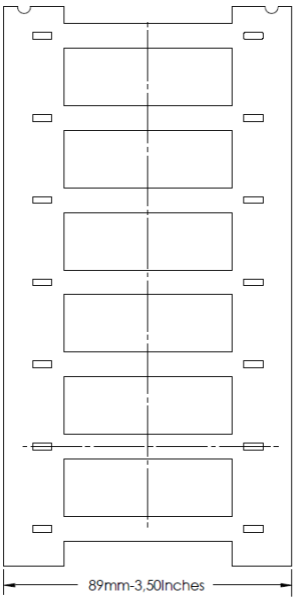
WMX LINER LAYOUT

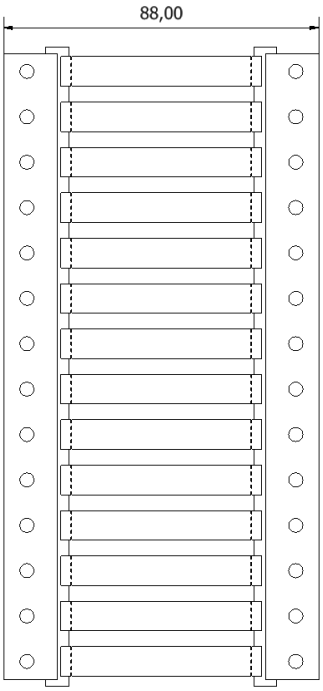
WMX LINER

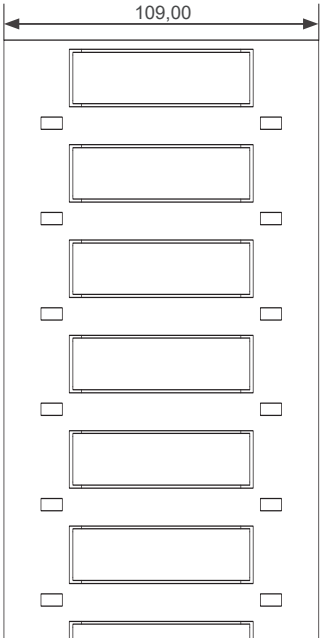
- Paper format
- Double-sided format

WM 109MM LINER

- Single-sided format
- Double-sided format







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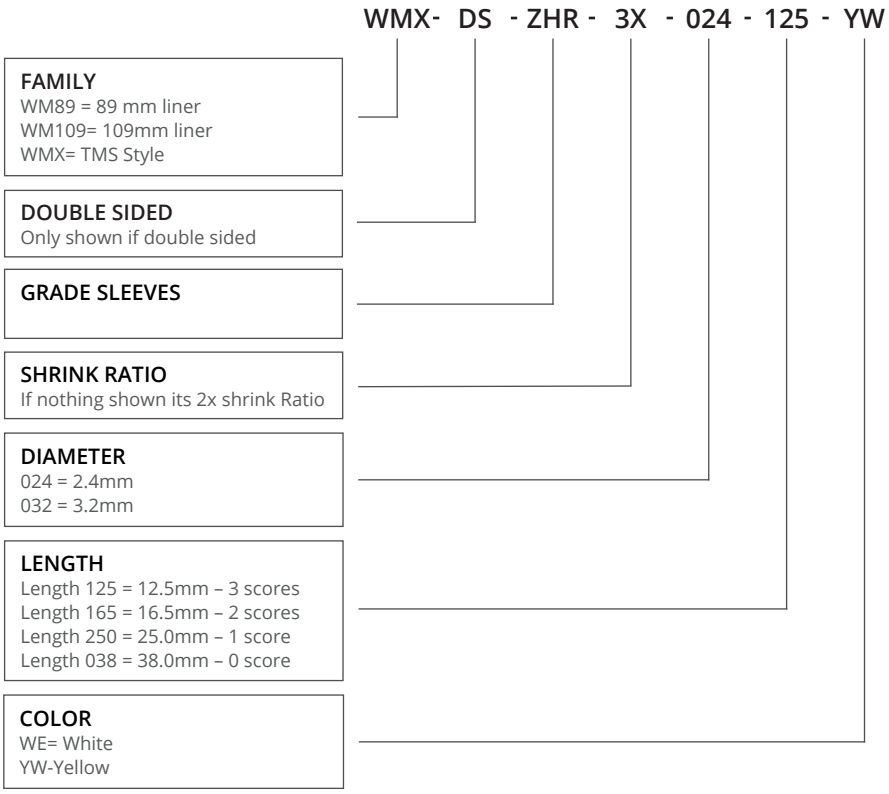
Product code



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 -

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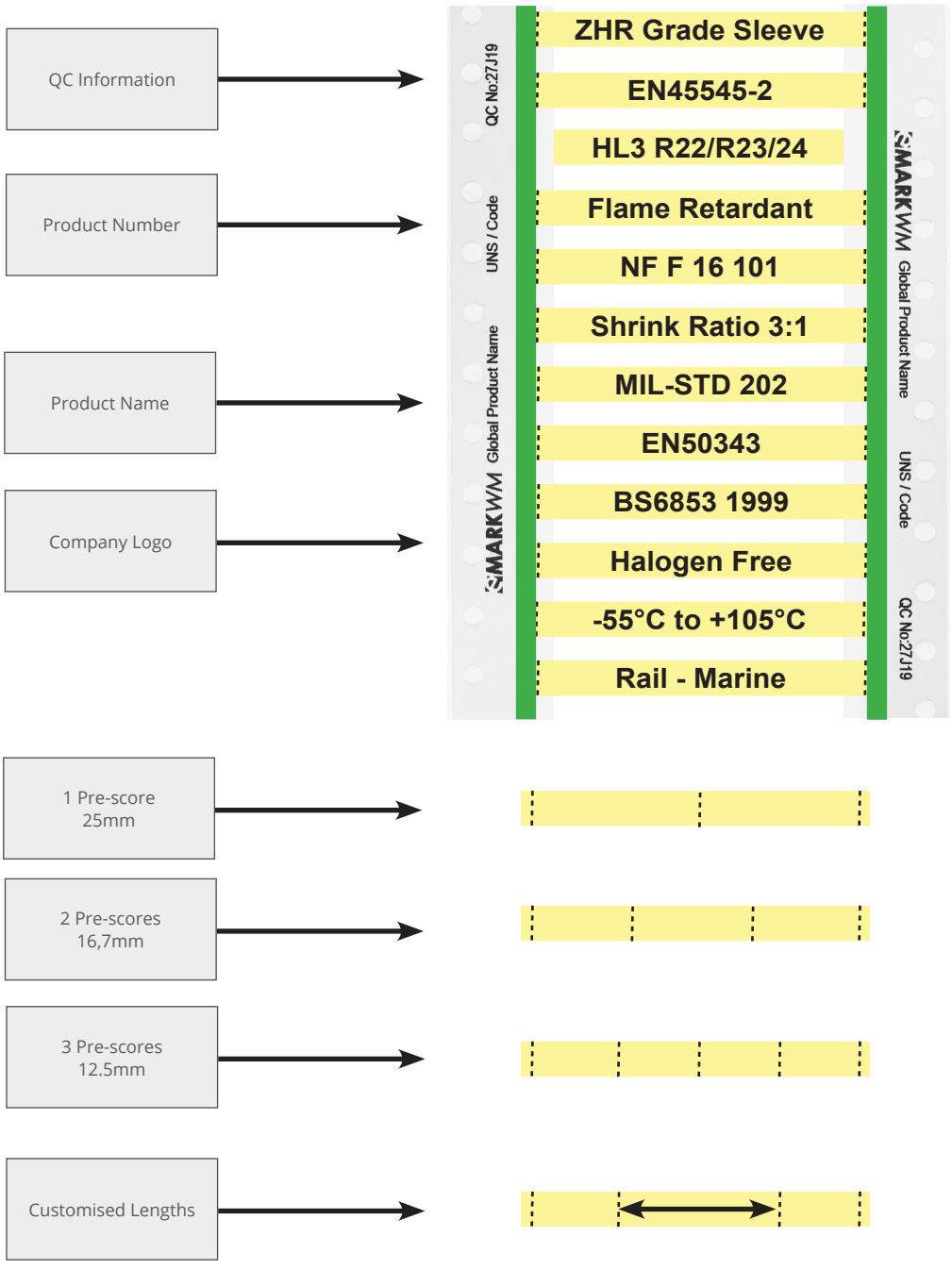
Customised Liner Information example



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Ordering description example only - Diameter recommendation

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

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LinkSolutions

Related Standard Test Methods And Documents

Document	Description
ASTM D638 - ASTM G154 - ISO 37	Tensile strength and ultimate elongation
ASTM D638- ISO188	Heat aging 168 at 158°C
ASTM D2671 heat shock (section 26-30), procedure b	Flammability testing. Heat shock 4 hours at 225°C
ASTM D2671 -UL224	Longtitudinal change
ASTM D2671 (Section 79-80) ASTM D570	Water absoption. 2 Maximum
ASTM G154	Dialectrical strength.
ASTM D2671B - UL224	Copper corrosion (Section 93 procedure A) damaged area of copper mirror,
AMS-DTL-23053/5	Chemical resistance -
ASTM D257 -IEC 93	Volume resistivity Ω-cm
ASTM D 635-HB - SAE-AMS-DTL-23053/5	Flammability resistance - Fire propagation
ASTM D E 662	Optical density of smoke (D_m) measured in flaming mode and non flaming mode in single smoke chamber test.
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 passanger carrying trains
BS 6853 (1999) Annex D	BS 6853 Annex D: Methods for measuring smoke density. A_0. The test is performed inside a chamber measuring 3 metres by 3 metres by 3 metres and the test is sometimes referred to as the three metres cube test. The test duration is 40 minutes.
BS 6853 (1999) Annex B	Determination of weighted summation of toxic fume, (R value). BS6853-code of practice of fire precautions in the design and construction of passenger carrying trains
DIN 5510	DIN 5510 determinate the fire classification of railway vehicle material and structure by burning behaviour, smoke density and dropping behavieour.
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	Railway applications. Rolling stock fire protection on railway vehicles. - Part 2 requirements for fire behavior of materials and components. Fire hazard lavel class. HL1,HL 2 & HL 3 - R22-R23
EN50343 annex H section 6.6 - Fluid resistance	Railway applications - Rolling stock - Rules for installation of cabling. Resistance to mineral oil, liquid fluid (IRM902, IRM 903) immersed up to 240 hours and thereafter 10 rubs with eraser.
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
BS IEC 60684-2-216 ASTM 2671 (section 36-43) procedure C - BS EN 60684-3-216	Low temperature flexibility. Wind to specific mandrel 1 hour at -55°C
BS IEC 60684-2-216:2019 Table 5 & IEC 60684-2:2011 Section 50, section 19.2 - Color fastness	exposure method, testing the degree of color fastnesses of exposed samples in relation to non-exposed samples (reference samples) and blue wool references
IEC 243- ASTM-D-3755	Voltage withstand. Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials Under Direct-Voltage Stress
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 st ock classification A1
NF T 51-071: 1999	Oxygen index test. This test have been replaced by IEC 60695-2-11/EN 60965-2-11
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

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