



TECHNICAL DATA SHEET

Document number: TTDS-023
Issue: 5
Date: December 2012

TMS-SCE-2X and TMS-SCE-3X Heat shrinkable sleeves

PRODUCT OVERVIEW

MATERIAL DESCRIPTION:	Thin wall flame retarded radiation cross-linked modified polyolefin heat-shrinkable tubing, assembled as organized cut sleeves in a "ladder" configuration. 3:1 and 2:1 shrink ratio products available.
USE:	Identification of wires and cables by computer-based printing onto sleeves. Sleeves can also provide terminal insulation and strain relief. Suitable for a wide variety of applications, including aerospace, military and general rail applications.
STANDARDS:	TMS-SCE is designed to TE standard RW-2511. TMS-SCE-3X Sleeves meet the material and performance requirements of SAE AMS-DTL-23053/5 for Class 1 ^{1,2} TMS-SCE-2X Sleeves meet the material and performance requirements of SAE AMS-DTL-23053/5 for Classes 1 and 3 SAE AS5942 Marking of Electrical Materials, 4.1 Adherence ³ MIL-STD-202G Method 215 Resistance to Solvents
PRINTING SYSTEM	See document 411-121005 'IDENTIFICATION PRINTER PRODUCT RIBBON MATRIX' for the recommended printer/product/ribbon combination
SERVICE TEMPERATURE ⁴ :	-55°C to +135°C (-67°F to +275°F).
MAXIMUM STORAGE TEMPERATURE:	40°C (104°F).
COLORS ⁵ :	Standard: White and Yellow Non Standard: Red, Pink, Orange, Green, Blue, Violet, Grey, Black
SHELF LIFE ⁶ :	5 years from date of manufacture
AGENCY APPROVALS:	UL recognised Standard 224 (File E35586) ⁷ . CSA certified (File 31929).

¹ This standard does not cover TMS-SCE-3X dimensions.

² TMS-SCE does not fully comply with the colour requirements of MIL STD 104. Pastel colours are used to enhance print contrast.

³ SAE AS5942 replaces obsolete standard SAE AS81531; the performance of the product has not changed.

⁴ As installed. Defined in document SAE-AMS-DTL-23053 for 'continuous operating temperature range'; classes 1 and 3.

⁵ TMS-SCE-2X only available in White

⁶ Product must be stored in original packaging, maintained between 10°C to 40°C and 45±5% relative humidity.

⁷ UL224 standard approval, meets flammability rating for 'flame test - all tubing'.

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FIRE SAFETY ^{8,9}

RESISTANCE TO FLAME PROPAGATION AND FIRE SUSTAINING

FLAME SPREAD INDEX (Is)	35 maximum – No flame spread or flame dripping. (ASTM E162 Surface Flammability of Materials, Using a Radiant Heat Energy Source)
SPECIFIC OPTICAL DENSITY (flaming/non flaming)	100 maximum (1.5 minutes), 200 maximum (4 minutes) (ASTM E662 Specific Optical Density of Smoke, Generated by Solid Materials)
MAXIMUM AVERAGE RATE OF HEAT EMISSION ¹⁰ (MARHE)	300 kW/m ² (50kW/m ² Irradiance, ASTM E 1354: Heat and Visible Smoke Release Rates or Materials and Products using an Oxygen Consumption (Cone) Calorimeter).
RESISTANCE TO BURNING	TMS-SCE Burn time 60 seconds maximum (ASTM D2671 Procedure B). TMS-SCE-2X No flag burn; no burning of cotton or dripping (ASTM D2671 Procedure C).

TOXIC FUMES

TOXIC GAS GENERATION FROM MATERIAL COMBUSTION	Toxic gas generation from material combustion (Boeing BSS 7239, SMP 800-C), parts per million (ppm), maxima:
	Carbon monoxide 3500
	Nitrogen oxides 100
	Sulphur dioxide 100
	Hydrogen chloride 500
	Hydrogen fluoride 200
	Hydrogen bromide 100
	Hydrogen cyanide 150

⁸ Specifically required by US Department of Transport - Federal Rail Administration (FRA 49 CFR Appendix B to Part 238), and also National Fire Protection Association (NFPA 130) (Excluding resistance to burning).

⁹ Tested on Heat Shrink sleeving, as supplied.

¹⁰ No national maximum limit currently applies. Results supplied for fire hazard risk assessment purposes only.

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PHYSICAL

TENSILE STRENGTH:	10.3 MPa minimum
ULTIMATE ELONGATION:	200% minimum
2% SECANT MODULUS:	172.4 MPa maximum
LONGITUDINAL CHANGE:	-20% maximum for TMS-SCE-3X -5% maximum for TMS-SCE-2X

ELECTRICAL

DIELECTRIC STRENGTH:	19.7 MV/m minimum
VOLUME RESISTIVITY:	10^{14} Ohm-cm minimum

ENVIRONMENTAL

HEAT AGEING:	100% ultimate elongation retained and print legible after 168 hours at 175°C (347°F)
HEAT SHOCK:	No cracking, dripping or flowing and print legible after 4 hours at 250°C (482°F)
LOW TEMPERATURE FLEXIBILITY:	Print legible. No cracking after 11mm (7/16 inch) mandrel bend after 4 hours at -55°C (-67°F).
WATER ABSORPTION:	0.5% maximum
COPPER MIRROR CORROSION:	Non-corrosive; no pitting or blackening of mirror after 16 hours at 175°C (347°F)
COPPER CONTACT:	No pitting or blackening of copper after 16 hours 175°C (347°F)
MOLD GROWTH:	Print legible after 56 day incubation (ISO 846, method B) - tensile strength and ultimate elongation maintained after testing.

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PRINT ENDURANCE

PRINT ADHERENCE: Print legible after 50 rubs (AMS AS5942)
Print legible after 30 strokes (MIL-STD-202G, Method 215).

FLUID RESISTANCE Fluid immersion for 24 hours at 21°C (70°F) followed by 20 rubs

INDUSTRIAL GRADE FLUIDS

Test Fluid	Result
Water	Print legible
Detergent (Tepol in water, 1% by weight)	Print legible
MIL-L-7808 Lubricating oil	Print legible
MIL-L-23699 Lubricating oil	Print legible
MIL-T-83133 Aircraft Fuel (JP-8)	Print legible
Sodium Chloride (in water, 5% by weight)	Print legible
MIL-H-83282 Hydraulic Fluid	Print legible
Propylene Glycol de-icing Fluid (in water, 50% by volume)	Print legible
Isopropyl Alcohol	Print legible

HIGH PERFORMANCE FLUIDS

Skydrol™ 500 hydraulic fluid	Print legible
Aviation Gasoline (100/130)	Print legible

Refer to TE specification RW-2511 for full TMS-SCE performance & dimensional details.

Some types of neoprene insulation used in jackets contain additives that can migrate to the surface and discolor the polyolefin TMS-SCE sleeves. Any discoloration is dependent on the composition of the neoprene, combined with application conditions. Users should independently evaluate the suitability of TMS-SCE sleeves for applications involving neoprene-jacketed cables

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