

THERMOFIT® MARKER SYSTEM
TMS®-SCE

Rev No	AFC No	Date	Created By
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1. SCOPE

This specification covers the requirements and performance of the TMS-SCE Marker System. This system is an automatic method of identifying wire and cable by typing or otherwise printing a mark on Tyco Electronics TMS-SCE Markers. The mark is permanent upon printing.

1.1 CLASSIFICATION
1.1.1 Markers

The markers shall be fabricated from modified radiation crosslinked polymer tubing, flattened and mounted on a carrier. All TMS-SCE markers covered by this specification shall meet the performance requirements of SAE AMS DTL 23053/5 Class 1. TMS-SCE-2X sleeves shall be fabricated from tubing which meets all the requirements of SAE AMS DTL 23053/5 classes 1 & 3.

1.1.2 System Equipment

The marker system comprises specific printers and ribbons (details of approved printers and ribbons are available from Tyco Electronics on request). Compliance to this specification can only be guaranteed if Tyco Electronics approved printers and ribbons are used. TMS-SCE markers are primarily intended for printing with dot matrix and thermal transfer printers.

2. APPLICABLE DOCUMENTS

This specification takes precedence over documents referenced herein. Unless otherwise specified, the latest issue of the referenced documents applies. The following documents form a part of this specification to the extent specified herein.

2.1 GOVERNMENT FURNISHED DOCUMENTS
Military

A A 694	Sodium Chloride, Technical
MIL STD 202	Test Method Standard Electronic and Electrical Component Parts
MIL PRF 5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL PRF 7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL PRF 23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL DTL 83133	Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35 and JP-8+100 (NATO F-37)

(Copies of the above publications may be obtained from the U.S. Military / Federal Document Department of the Navy, Navy Publications and Forms Center, 700 Robins Avenue Philadelphia, Pennsylvania 19111-5094.)

2.2 OTHER PUBLICATIONS

American Society for Testing and Materials

ASTM D 570 Test Method for Water Absorption of Plastics
ASTM D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 876 Test Method for Nonrigid Vinyl Chloride Polymer Tubing, Used for Electrical Insulation

(Copies of the above publications may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.)

Underwriter's Laboratories, Inc.

UL-224 Extruded Insulating Tubing

(Copies of the above publication may be obtained from Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062-2096.)

International Organization for Standardization

ISO-846 Plastics – Evaluation of the Action of Microorganisms

(Copies of the above publications may be obtained from International Organization for Standardization, Case Postale 56, CH-1211 Geneve 20, Switzerland.)

Society Of Automotive Engineers

SAE AMS DTL 23053 Insulating Sleeving, Electrical, Heat Shrinkable, General Specification for
SAE AMS DTL 23050/5 Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible Cross-Linked
SAE AS 81531 Marking of Electrical Insulating Materials
SAE AS 8243 Anti-Icing and Deicing-Defrosting Fluid

(Copies of SAE publications may be obtained from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or via the SAE website at <http://www.sae.org>.)

3. REQUIREMENTS

3.1 MATERIAL

The markers shall be fabricated from irradiated, thermally-stabilized, modified polyolefin compound. They shall be homogeneous and essentially free from flaws, defects, pinholes, bubbles, seams, cracks or inclusions.

3.2 COLOR

Markers shall be white or of various pastel colors. Pastel colors are intended to provide enhanced mark contrast. However, TMS-SCE-2X markers shall meet the color requirements of MIL STD 104 Class 1.

3.3 FORM

The markers shall be cut lengths mounted on a carrier in accordance with Figure 1.

3.4 PROPERTIES

The sleeves shall meet the requirements of Table 4.

4. QUALITY ASSURANCE PROVISIONS

4.1 CLASSIFICATION OF TESTS

4.1.1 Qualification Tests

Qualification tests are those performed on finished markers or marker material submitted for qualification as a satisfactory product and shall consist of all tests listed in this specification.

4.1.2 Acceptance Tests

Acceptance tests are those submitted for acceptance under the contract. Acceptance tests shall consist of the following:

Dimensions
 Expanded Concentricity
 Longitudinal Change
 Tensile strength*
 Ultimate Elongation*
 2% Secant Modulus*
 Low Temperature Flexibility*
 Heat Shock*
 Print Adherence (Clause 4.3.11.1)
 Flammability (ASTM D2671 only)*

4.2 SAMPLING INSTRUCTIONS

4.2.1 Qualification Test Samples

Qualification test samples shall consist of 15 m (50 feet) of continuous marker material and the appropriate number of finished markers necessary to run all tests.

4.2.2 Acceptance Test Samples

Acceptance test samples shall consist of 5 m (16 feet) of tubing and the appropriate number of finished markers necessary to run all tests.

* Physical property tests performed at this time qualify subsequent sleeving lots produced from the same compound batch

4.3 TEST PROCEDURES

When required by the test procedure, finished markers will be recovered or tubing specimens will be thermally conditioned by placing them in a forced air oven for 3 minutes at $200 \pm 5^{\circ}\text{C}$ ($392 \pm 9^{\circ}\text{F}$). Specimens will then be removed from the oven and allow to cool to $23 \pm 3^{\circ}\text{C}$ ($73 \pm 5^{\circ}\text{F}$) before continuing. Use finished markers, as supplied, for all other tests.

4.3.1 Expanded and Recovered Dimensions

Measure the expanded inside diameter, recovered inside diameter, and recovered wall thickness of assembled marker sleeves in accordance with SAE AMS DTL 23053 sections 4.6.3.1.1, 4.6.3.1.2, and 4.6.3.2 respectively.

4.3.2 Expanded Concentricity

Measure the expanded concentricity in accordance with SAE AMS DTL 23053 section 4.6.3.3.

4.3.3 Longitudinal Change

Mark two gauge marks 44.5mm (1.75 in.) apart on a finished marker sleeve. Recover the sample and measure the distance between gauge marks. The longitudinal change shall be expressed as a percentage of the original gauge mark distance in accordance with SAE AMS DTL 23053 section 4.6.4.

4.3.4 Tensile Strength and Ultimate Elongation

Measure the tensile strength and ultimate elongation of the recovered tubing in accordance with SAE AMS DTL 23053 section 4.6.13. The jaw separation speed shall be 508mm (20 inches) per minute.

4.3.5 Secant Modulus

Measure the secant modulus of the expanded tubing at 2 percent strain in accordance with SAE AMS DTL 23053 section 4.6.12.1.

4.3.6 Restricted Shrinkage

Test for restricted shrinkage of the tubing in accordance with SAE AMS DTL 23053 section 4.6.6 Procedure A. No cracks should be visible after 30 minutes at $175 \pm 2^{\circ}\text{C}$ ($347 \pm 4^{\circ}\text{F}$).

4.3.6.1 Voltage Withstand

After testing per 4.3.6, further prepare the sample for voltage withstand testing in accordance with SAE AMS DTL 23053 section 4.6.6.3.

4.3.7 Specific Gravity

Measure the specific gravity of freely recovered markers in accordance ASTM D 792.

4.3.8 Low Temperature Flexibility

Test low temperature flex of the tubing in accordance with SAE AMS DTL 23053/5 section 4.6.7.1. Condition the specimens for 4 hours at $-55 \pm 1^\circ\text{C}$ ($-67 \pm 2^\circ\text{F}$). While at this temperature, bend the tubular specimens 360 degrees, in 10 ± 2 seconds, over a similarly conditioned mandrel, selected in accordance with Table 1. Bend the strip specimens 360 degrees over an 11.1mm (7/16-inch) mandrel, similarly conditioned. Examine the specimens for cracks.

TABLE 1
Mandrel Dimensions for Bend Testing

Tubing Size (3:1 Expansion Ratio)	Tubing Size (2:1 Expansion Ratio)	Diameter of Mandrel	
		mm	inches
3/32 through 3/8	1/8 through 1/4	7.9 ± 0.05	$5/16 \pm 0.002$
1/2 through 3/4	3/8 through 1/2	9.5 ± 0.08	$3/8 \pm 0.003$
1 through 2-1/4	3/4	11.1 ± 0.10	$7/16 \pm 0.004$

4.3.9 Heat Shock

Test for heat shock in accordance with SAE AMS DTL 23053 section 4.6.8. Bend through 360 degrees, in 2 to 4 seconds, over a mandrel selected in accordance with Table 1 in accordance with SAE AMS DTL 23053 section 4.6.3.1.1. Disregard any side cracking caused by flattening of the specimens on the mandrel.

4.3.10 Heat Resistance

In accordance with SAE AMS DTL 23053 section 4.6.9, cut five 100mm (4 in.) lengths of tubing for sizes with recovered inside diameter less than 8.4mm (0.330 in.). For sizes with recovered inside diameter greater than 8.4mm (0.330 in.), prepare five samples by die cutting with Die C with the long dimension of the die parallel to the longitudinal axis of the tubing. Condition the specimens for 168 hours at $175 \pm 2^\circ\text{C}$ ($347 \pm 4^\circ\text{F}$) in a convection oven, with an air velocity of 30 to 60 m (100 to 200 ft) per minute past the specimens. Remove the specimens from the oven, and allow to cool to room temperature.

4.3.10.1 Ultimate Elongation

After conditioning samples in accordance with 4.3.10, test for ultimate elongation in accordance with section 4.3.4.

4.3.10.2 Print Adherence

Mark three assembled markers in accordance with section 4.3.11 and shrink on mandrels approximately equal to the recovered diameter of the specimens. Condition the specimens in accordance with section 4.3.10 and test for print adherence in accordance with section 4.3.11.1.

4.3.11 Print Performance

Mark twenty-four assembled markers with a Tyco Electronics approved printer and ribbon combination. Type (or print) random characters across the length of each marker to within 6 mm (1/4 inch) of both ends using the font indicated in Table 2. Remove the markers from the carrier and test in the expanded and recovered form. Shrink the sleeves on a metal mandrel whose diameter is approximately the diameter of the fully recovered sleeve. For 2X sizes, freely recover the sleeves without a mandrel. Recover the markers for 3 minutes at $200 \pm 5^\circ\text{C}$ ($392 \pm 9^\circ\text{F}$). Remove the specimens from the oven, and allow to cool to $23 \pm 3^\circ\text{C}$ ($73 \pm 5^\circ\text{F}$).

TABLE 2
Character Font and Size for Print Performance Testing

Part Number	Font and Size
TMS-SCE-3/32, TMS-SCE-2X-3/32	Arial or Courier 8 Bold
TMS-SCE-1/8, TMS-SCE-2X-1/8	Arial or Courier 10 Bold
TMS-SCE-3/16, TMS-SCE-2X-3/16	Arial or Courier 12 Bold
TMS-SCE-1/4, TMS-SCE-2X-1/4	Arial or Courier 12 Bold
TMS-SCE-3/8, TMS-SCE-2X-3/8	Arial or Courier 12 Bold
TMS-SCE-1/2, TMS-SCE-2X-1/2	Arial or Courier 12 Bold
TMS-SCE-3/4, TMS-SCE-2X-3/4	Arial or Courier 14 Bold
TMS-SCE-1	Arial or Courier 18 Bold
TMS-SCE-1-1/2	Arial or Courier 18 Bold
TMS-SCE-2	Arial or Courier 18 Bold
TMS-SCE-2-1/4	Arial or Courier 18 Bold

4.3.11.1 Print Adherence

Test three specimens for print adherence in accordance with Paragraph 4.6.2 of SAE AS 81531. Perform the number of rubs specified in Table 4 and examine the specimens for legibility at a distance of 356mm (14 inches).

4.3.11.2 Solvent Resistance

Test three specimens for solvent resistance at least 24 hours after marking. When required, run a referee test 72 hours after marking. Test in accordance with MIL STD 202 Method 215, except examine the specimens for legibility at a distance of 356mm (14 inches).

4.3.12 Color

Test color in accordance with SAE AMS DTL 23053 section 3.4.2.1.

4.3.13 Color Stability

Test for color stability in accordance with SAE AMS DTL 23053 section 4.6.15. Samples will be conditioned for 24 hours at $175 \pm 2^\circ\text{C}$ ($347 \pm 4^\circ\text{F}$).

4.3.14 Dielectric Strength

Test for dielectric strength in accordance with ASTM D 2671.

4.3.15 Volume Resistivity

Test for volume resistivity in accordance with ASTM D 876.

4.3.16 Corrosion

Prepare tubing samples for corrosion testing in accordance with SAE AMS DTL 23053 section 4.6.10

4.3.16.1 Copper Corrosion

Test tubing for copper corrosion in accordance with SAE AMS DTL 23053 section 4.6.10.1. Heat the samples for 16 hours at $175 \pm 2^\circ\text{C}$ ($347 \pm 4^\circ\text{F}$).

4.3.16.2 Copper Mirror Corrosion

Test tubing for copper mirror corrosion in accordance with SAE AMS DTL 23053 section 4.6.10.2. Heat the samples for 16 hours at $175 \pm 2^\circ\text{C}$ ($347 \pm 4^\circ\text{F}$).

4.3.17 Flammability

Test tubing for flammability in accordance with SAE AMS DTL 23053/5 and UL224, Specific clauses and test methods within these two standards are used depending on which product tested. The appropriate classification for each product family is given below:

Product Family	Test Method	Classification
TMS-SCE-YY-ZZ	SAE AMS DTL 23053/5 : Clause 4.6.14; Procedure B ASTM D2671; UL224 : All tube flame test	Class 1
TMS-SCE-2X-YY-ZZ	SAE AMS DTL 23053/5 : Clause 4.6.14; Procedure C ASTM D2671; UL224 : VW-1	Class 3

4.3.18 Fungus Resistance

Fungus resistance testing shall be conducted in accordance with ISO 846 B with an incubation time of 56 days.

4.3.18.1 Tensile Strength

After conditioning per section 4.3.18, test for tensile strength in accordance with section 4.3.4.

4.3.18.2 Ultimate Elongation

After conditioning per section 4.3.18, test for ultimate elongation in accordance with section 4.3.4.

4.3.18.3 Dielectric Strength

After conditioning per section 4.3.18, test for dielectric strength in accordance with section 4.3.14.

4.3.19 Water Absorption

Test tubing for water absorption in accordance with ASTM D 570. Immersion conditions are 24 hours at $23 \pm 3^\circ\text{C}$ ($73 \pm 5^\circ\text{F}$).

4.3.20 Fluid Resistance

Mark twenty-four assembled markers in accordance with section 4.3.11. Condition the markers in accordance with SAE AMS DTL 23053 section 4.6.11. in the fluids listed in Table 4.

4.3.20.1 Dielectric Strength

Following fluid resistance conditioning in section 4.3.20, test the specimens for dielectric strength in accordance with section 4.3.14.

4.3.20.2 Tensile Strength

Following fluid resistance conditioning in section 4.3.20, test the specimens for tensile strength in accordance with section 4.3.4.

4.3.20.3 Print Adherence

Following fluid resistance conditioning in section 4.3.20, test the specimens for print adherence in accordance with section 4.3.11.1.

4.4 REJECTION AND RETEST

Failure of any sample to conform to any of the requirements of this specification sheet shall be cause for rejection of the lot represented. Markers which have been rejected may be replaced or reworked to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and action taken to correct the defects shall be furnished to the inspector.

5. PREPARATION FOR DELIVERY

5.1 STORAGE CONDITIONS

Markers should be stored in a clean dry location. Maximum storage temperature is 40 °C (104 °F).

5.2 STORAGE LIFE

For TMS-SCE-2X-YY-ZZ Storage Life shall be in compliance with SAE AMS DTL 23053/5 section 3.5.1. 5 years when stored between 18°C to 35°C (64°F to 95°F).

5.3 PACKAGING

Packaging shall be in accordance with good commercial practice.

5.4 MARKING

Each container of markers shall be identified with the product designation, size, quantity, manufacturer's identification and lot number and date of manufacture.

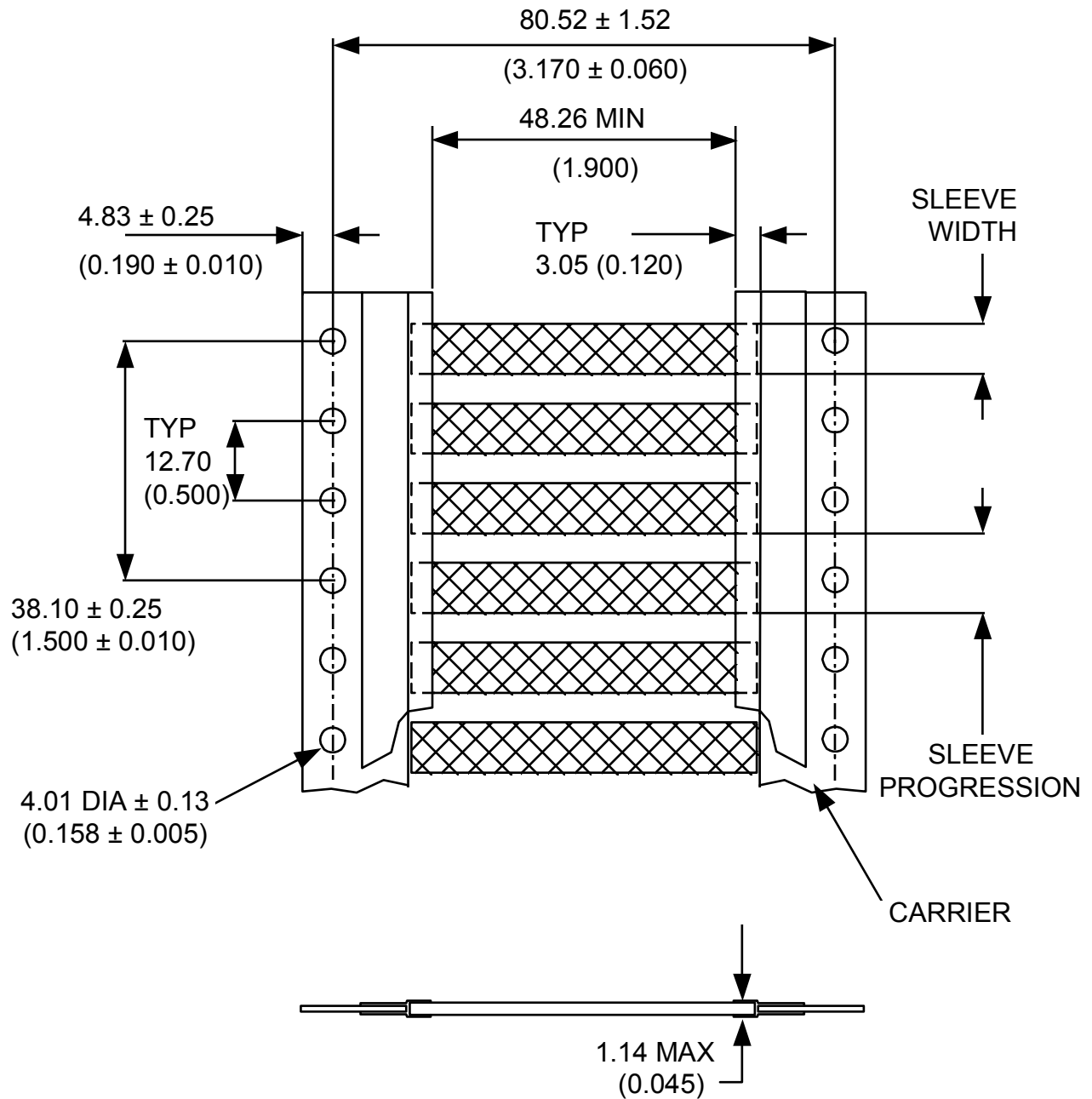


FIGURE 1

DIMENSIONS IN mm (INCHES)

TABLE 3
REQUIREMENTS
(DIMENSIONS IN mm, (INCHES))

Part Number	Minimum Expanded inside Dia.	Maximum Recovered inside Dia.	Recovered Wall Thickness	Sleeve Progression	Nominal Weight (g/pc)
TMS-SCE-3/32	2.36 (0.093)	0.79 (0.031)	0.58 +/- 0.08 (0.023 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.150
TMS-SCE-2X-3/32	2.36 (0.093)	1.17 (0.046)	0.51 +/- 0.08 (0.020 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.204
TMS-SCE-1/8	3.18 (0.125)	1.07 (0.042)	0.58 +/- 0.08 (0.023 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.203
TMS-SCE-2X-1/8	3.18 (0.125)	1.58 (0.062)	0.51 +/- 0.08 (0.020 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.275
TMS-SCE-3/16	4.75 (0.187)	1.57 (0.062)	0.58 +/- 0.08 (0.023 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.268
TMS-SCE-2X-3/16	4.75 (0.187)	2.36 (0.093)	0.51 +/- 0.08 (0.020 +/- 0.003)	12.70 +/- 0.89 (0.500 +/- 0.035)	0.362
TMS-SCE-1/4	6.35 (0.250)	2.11 (0.083)	0.58 +/- 0.08 (0.023 +/- 0.003)	16.94 +/- 0.89 (0.667 +/- 0.035)	0.351
TMS-SCE-2X-1/4	6.35 (0.250)	3.18 (0.125)	0.64 +/- 0.08 (0.025 +/- 0.003)	16.94 +/- 0.89 (0.667 +/- 0.035)	0.594
TMS-SCE-3/8	9.53 (0.375)	3.18 (0.125)	0.58 +/- 0.08 (0.023 +/- 0.003)	25.40 +/- 1.14 (1.000 +/- 0.045)	0.504
TMS-SCE-2X-3/8	9.53 (0.375)	4.75 (0.187)	0.64 +/- 0.08 (0.025 +/- 0.003)	25.40 +/- 1.14 (1.000 +/- 0.045)	0.850
TMS-SCE-1/2	12.70 (0.500)	4.22 (0.166)	0.61 +/- 0.08 (0.024 +/- 0.003)	29.64 +/- 1.14 (1.167 +/- 0.045)	0.681
TMS-SCE-2X-1/2	12.70 (0.500)	6.35 (0.250)	0.64 +/- 0.08 (0.025 +/- 0.003)	29.64 +/- 1.14 (1.167 +/- 0.045)	1.145
TMS-SCE-3/4	19.05 (0.750)	6.35 (0.250)	0.61 +/- 0.08 (0.024 +/- 0.003)	42.34 +/- 1.14 (1.667 +/- 0.045)	1.203
TMS-SCE-2X-3/4	19.05 (0.750)	9.53 (0.375)	0.76 +/- 0.08 (0.030 +/- 0.003)	42.34 +/- 1.14 (1.667 +/- 0.045)	2.063
TMS-SCE-1	25.40 (1.000)	8.46 (0.333)	0.64 +/- 0.08 (0.025 +/- 0.003)	50.80 +/- 1.14 (2.000 +/- 0.045)	1.535
TMS-SCE-1-1/2	38.10 (1.500)	19.05 (0.750)	0.51 +/- 0.08 (0.020 +/- 0.003)	71.96 +/- 1.14 (2.833 +/- 0.045)	2.751
TMS-SCE-2	50.80 (2.000)	25.40 (1.000)	0.64 +/- 0.08 (0.025 +/- 0.003)	101.60 +/- 1.14 (4.000 +/- 0.045)	4.727
TMS-SCE-2-1/4	57.15 (2.250)	19.05 (0.750)	0.76 +/- 0.08 (0.030 +/- 0.003)	101.60 +/- 1.14 (4.000 +/- 0.045)	4.206

TABLE 4
Requirements

PROPERTY	UNIT	REQUIREMENT	TEST METHOD
PHYSICAL			
Dimensions 3 min. at 200 ± 2°C (392 ± 4°F)	mm (in.)	In accordance with Table 3	Section 4.3.1 SAE AMS DTL 23053
Concentricity (Expanded)	Percent	50% minimum 70% minimum (2X sizes)	Section 4.3.2 SAE AMS DTL 23053
Longitudinal Change	Percent	0 to -20 maximum 0 to -5 maximum (2X sizes)	Section 4.3.3 SAE AMS DTL 23053
Tensile Strength	MPa (psi)	10.3 (1,500) minimum	Section 4.3.4 SAE AMS DTL 23053
Ultimate Elongation	Percent	200 minimum	Section 4.3.4 SAE AMS DTL 23053
Secant Modulus (Expanded) 2 percent strain	MPa (psi)	172.4 (25,000) maximum	Section 4.3.5 SAE AMS DTL 23053
Restricted Shrinkage 30 min. at 175 ± 2°C (347 ± 4°F)	---	No Cracking	Section 4.3.6 SAE AMS DTL 23053 Procedure A
Followed by test for: Voltage Withstand 2,000 Vac for 1 minute	---	Pass	Section 4.3.6.1 SAE AMS DTL 23053
Specific Gravity	---	1.35 maximum	Section 4.3.7 ASTM D 792
Low Temperature Flexibility 4 hours at -55 ± 1°C (-67 ± 2°F)	---	No cracking	Section 4.3.8 SAE AMS DTL 23053
Heat Shock 4 hours at 250 ± 3°C (482 ± 5°F) Followed by Visual Examination	---	No dripping, flowing, or cracking Legible at 14 inches	Section 4.3.9 SAE AMS DTL 23053
Heat Resistance 168 hours at 175 ± 2°C (347 ± 4°F) Followed by test for: Ultimate Elongation Print Adherence	---		Section 4.3.10 SAE AMS DTL 23053
	Percent Rubs	100 minimum 50 minimum, legible	Section 4.3.10.1 Section 4.3.10.2
Print Performance Print Adherence	Rubs	50 minimum, legible	Section 4.3.11.1 SAE AS 81531
Solvent Resistance	Strokes	30 minimum, legible	Section 4.3.11.2 MIL-STD-202
Color	---	Pass (2X sizes only)	Section 4.3.12 SAE AMS DTL 23053
Color Stability 24 hours at 175 ± 2°C (347 ± 4°F)	---	Pass (2X sizes only)	Section 4.3.13 SAE AMS DTL 23053
ELECTRICAL			
Dielectric Strength	KV / mm (Volts / mil)	19.7 minimum (500) minimum	Section 4.3.14 ASTM D 2671
Volume Resistivity	ohm-cm	10 ¹⁴ minimum	Section 4.3.15 ASTM D 876

TABLE 4
Requirements (continued)

PROPERTY	UNIT	REQUIREMENT	TEST METHOD
Water Absorption	Percent	0.5 maximum	Section 4.3.19 ASTM D 570
CHEMICAL Corrosive Effect 16 hours at 175 ± 2°C (347 ± 4°F) Copper Contact Copper Mirror	--- ---	Non corrosive No pitting or blackening of copper	Section 4.3.16.1 Section 4.3.16.2 SAE AMS DTL 23053
Flammability TMS-SCE-YY-ZZ	---	Burn time shall not exceed one minute, and not more than 25% of indicator flag shall be burned or charred. No dripping or flowing. 1) No flaming or glowing longer than 1 minute from any flame application. 2) 25% maximum flag burn. 3) No burning of cotton. No dripping.	Section 4.3.17 ASTM D 2671 Procedure B UL224 all tube flame test
Flammability TMS-SCE-2X-YY-ZZ	---	1) No flaming or glowing longer than 1 minute from any flame application. 2) 25% maximum flag burn. 3) No burning of cotton. No dripping.	Section 4.3.17 ASTM D 2671 Procedure C UL224 VW-1
Fungus Resistance 56 day incubation Followed by test for: Tensile Strength Ultimate Elongation Dielectric Strength	MPa (psi) Percent Kv / mm (Volts / mil)	10.3 (1,500) minimum 200 minimum 19.7 minimum (500) minimum	Section 4.3.18 ISO 846 B Section 4.3.18.1 ISO 846 B Section 4.3.18.2 ISO 846 B Section 4.3.18.3 ISO 846 B
Fluid Resistance 24 hours at 24 ± 3°C (75 ± 5°F) JP-8 Fuel (MIL DTL 83133) Aviation Gasoline (100/130) Hydraulic Fluid (MIL PRF 5606) Skydrol* 500B-4 Lubricating Oil (MIL PRF 7808) Lubricating Oil (MIL PRF 23699) 5% NaCl (A-A-694) Deicing Fluid (SAE AS 8243) Followed by test for: Dielectric Strength Tensile Strength Print Adherence	--- Kv / mm (Volts / mil) MPa (psi) Rubs	--- 15.8 minimum (400) minimum 6.9 (1000) minimum 20 minimum, legible	Section 4.3.20 SAE AMS DTL 23053 Section 4.3.20.1 ASTM D 2671 Section 4.3.20.2 SAE AMS DTL 23053 Section 4.3.20.3 SAE AS 81531

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