



## SPECIFICATION RW-2525

TE 108-121025

### TMS-CCUV and TMS-CCUV-CT SLEEVING

#### SCOPE

This Quality Assurance Specification establishes the quality standard for a flexible, sleeving specifically designed as UV protection for cable identification markers.

The sleeving is suitable for use in wire harness systems requiring high fluid resistance to the effects of nuclear, biological, and chemical agent exposure and decontamination as defined in RT-700.

The operating temperature for this product is -55°C to +135°C (-67 to +275°F).

The sleeve is used in conjunction with Identification sleeving to add additional protection in harsh environments.

TMS-CCUV is supplied as pre-cut lengths of loose pieces whereas TMS-CCUV-CT product is a semi-flattened continuous spool of tubing. Both formats meet the performance specification detailed herein. The product is a 2:1 shrink ratio heat shrink product.

The tube for qualification testing is size 3 (1/4inch / 6.4mm) as supplied internal diameter.

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## Table of Contents

1	Revision History.....	3
2	Requirements .....	3
3	Test method.....	5
4	sampling .....	6
5	Packaging .....	6
6	Shelf life.....	6
7	Requirements .....	7
8	Related documents.....	8
9	Test Fluids Description .....	8



## 1 REVISION HISTORY

Revision Number	Description of change	Date	Incorporated By
1	Replaces RW 2027 rev 3	March 2000	-
2	Format & update	February 2014	M Priddle
3	Addition of -CT product	February 2023	Alan F Kean
4	New revision to correct TE systems	May 2024	Alan F Kean

## 2 REQUIREMENTS

### 2.1 Composition, appearance and color

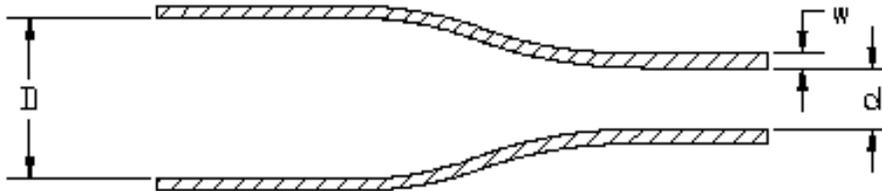
The sleeving shall be homogeneous and essentially free from pinholes, flaws, bubbles, cracks, seams, defects, and inclusions. The sleeve is clear.

### 2.2 Dimensions

The product shall be supplied in one of the following formats:

- TMS-CCUV                      Cut pieces, 2:1 shrink ratio to the dimensions of Table 1.
- TMS-CCUV-CT                2:1 shrink ratio to the dimensions of Table 2, as a continuous length of 50m (164ft).

**Figure 1. Product Dimension Change During Recovery**



Heat Shrink Product in as Supplied “D” (Expanded) and in the Recovered State “d”.



Size	Minimum Supplied Inside Diameter	Minimum Supplied Length	Maximum Recovered Inside Diameter	Nominal Recovered Wall Thickness
1	3.2 (.126)	65 (2.559)	1.6 (.063)	0.25 (.010)
2	4.8 (.189)	65 (2.559)	2.4 (.094)	0.25 (.010)
3	6.4 (.252)	65 (2.559)	3.2 (.126)	0.30 (.012)
4	9.5 (.374)	65 (2.559)	4.8 (.189)	0.30 (.012)
5	12.7 (.500)	65 (2.559)	6.4 (.252)	0.30 (.012)
6	19.0 (.748)	65 (2.559)	9.5 (.374)	0.43 (.017)
7	25.4 (1.000)	65 (2.559)	12.7 (.500)	0.48 (.019)
8	38.0 (1.496)	65 (2.559)	19.0 (.748)	0.51 (.020)
9	6.4 (.252)	32 (1.260)	3.2 (.126)	0.30 (.012)
10	12.7 (.500)	32 (1.260)	6.4 (.252)	0.30 (.012)
11	25.4 (1.000)	32 (1.260)	12.7 (.500)	0.48 (.019)
12	9.5 (.374)	32 (1.260)	4.8 (.189)	0.30 (.012)
13	19.0 (.748)	32 (1.260)	9.5 (.374)	0.43 (.017)
14	38.0 (1.496)	32 (1.260)	19.0 (.748)	0.51 (.020)

Table 1. TMS-CCUV Product Dimensions in mm (inch)

Size	Minimum supplied inside Diameter	Maximum Recovered Inside Diameter	Nominal Recovered wall thickness	Minimum Flattened width
2	4.8 (.189)	2.4 (.094)	0.25 (.010)	8.0 (.315)
3	6.4 (.252)	3.2 (.126)	0.30 (.012)	10.7 (.420)
4	9.5 (.374)	4.8 (.189)	0.30 (.012)	15.5 (.610)
5	12.7 (.500)	6.4 (.252)	0.30 (.012)	20.3 (.799)
6	19.0 (.748)	9.5 (.374)	0.43 (.017)	30.5 (1.20)
7	25.4 (1.000)	12.7 (.500)	0.48 (.019)	40.4 (1.59)
8	38.0 (1.496)	19.0 (.748)	0.51 (.020)	60.3 (2.37)

Table 2. TMS-CCUV-CT Product Dimensions in mm (inch)

### 2.3 Performance Requirements

The sleeving shall meet all the requirements contained in Table 3 when tested to the methods given in section 3.



### 3 TEST METHOD

#### 3.1 Preparation of Test Specimens

Unless otherwise specified, tests shall be carried out on specimens of sleeving recovered by conditioning in an oven at  $200\pm 2^{\circ}\text{C}$  ( $392\pm 3^{\circ}\text{F}$ ) for 3 minutes and allowed to cool to ambient temperature. Condition the test specimens for a minimum of 3 hours at  $23\pm 2^{\circ}\text{C}$  ( $73.4\pm 3^{\circ}\text{F}$ ) and 50 $\pm$ 5 percent humidity prior to all testing.

#### 3.2 Dimensions and Longitudinal Change

The test method shall be as specified in ASTM D2671. The length and inside diameter of three 150mm long specimens of expanded sleeving shall be measured. The specimens shall then be recovered and the length and inside diameter of each shall be measured. The longitudinal change shall be expressed as a percentage of the original length. The minimum and maximum recovered wall thickness shall be determined.

#### 3.3 Tensile Strength and Ultimate Elongation

The test method shall be as specified in ASTM D2671. Use 25.4 mm (1 inch) benchmarks and an initial jaw separation of 50.8mm (2 inches). Rate of jaw separation shall be 50 $\pm$ 5mm per minute (2inches/min). The test shall be carried out at a temperature of  $23\pm 2^{\circ}\text{C}$  ( $73.4\pm 3^{\circ}\text{F}$ ).

#### 3.4 Specific Gravity

The test method shall be as specified in ASTM D2671. Requirements are as given in table 3.

#### 3.5 Heat Shock

The test method shall be as specified in ASTM D2671.

Three specimens shall be conditioned at the temperature and time as specified in Table 3

#### 3.6 Heat Ageing

The test method shall be as specified in ASTM D2671. Five tensile test specimens shall be prepared as in Clause 3.1. The specimens shall be conditioned in an oven for the time and temperature specified in Table 3 and then tested for ultimate elongation according to Clause 3.3.

#### 3.7 Low Temperature Flexibility

For tubing of expanded diameter less than 6mm (.236in) cut three tubular specimens 150mm (5.91in) long from the sample. The tube specimens shall be recovered on to a suitable gauge wire in accordance with Clause 3.1 and conditioned as specified in Table 3. For tubing of expanded diameter greater than 6mm (.236in) cut three strip specimens 6mm (.236in) wide and 150mm (5.91in) long from the expanded tubing.

For strip specimens the test mandrel diameter shall be 10 times the specimen wall thickness  $\pm 10$  percent. For tubular specimens, the test mandrel diameter shall be equivalent to the outside diameter of the sample  $\pm 10$  percent.

Without removing the specimens from the cold chamber wrap the specimens 360 $^{\circ}$  around the mandrel in approximately 2 seconds. Disregard any side cracking, cause by flattening of the specimens on the mandrel.

#### 3.8 Clarity Stability

The test methods shall be as specified in AMS-DTL-23053E, color stability. The CCUV is recovered over a printed sleeve and then the specimens shall be conditioned in an oven as specified in Table 3. They are then visually examined for legibility of print through the CCUV wall.



### 3.9 Flammability

The test method shall be as specified in ASTM D2671 Procedure C. Test five samples.

### 3.10 Dielectric Strength

The test method shall be as specified in ASTM D2671. The specimens shall be recovered on the metal mandrels for 10 minutes at  $175 \pm 2^\circ\text{C}$  or until the tubing has completely shrunk on to the mandrel. The mandrel shall be the maximum recovered diameter  $\pm 10\%$ .

### 3.11 Copper Contact Corrosion

The test method shall be as specified in ASTM D2671 Procedure B. The specimens shall be conditioned as specified in Table 3 and the copper mandrel visually examined.

### 3.12 Copper Mirror Corrosion

The test method shall be as specified in ASTM D2671 Procedure A. The specimens shall be conditioned as specified in Table 3 and the mirrors shall be visually examined.

### 3.13 Fungus Resistance

The test method shall be as specified in ASTM G 21 and a rating made.

### 3.14 Water Absorption

The test method shall be as specified in ASTM D2671.

### 3.15 Fluid Resistance

The test method shall be as specified in ASTM D2671. The test specimens shall long enough for tensile testing and be prepared as in Clause 3.1 and immersed in one of the fluids specified in Table 3. They are removed lightly wiped and air dried at  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3^\circ\text{F}$ ). The tensile strength and ultimate elongation shall be tested according to Clause 4.3. The test shall be repeated on the remaining specified fluids.

## 4 SAMPLING

Testing frequency shall be Production Routine and Qualification.

Production Routine Tests shall be carried out on every batch of sleeving and shall consist of Dimensions and Longitudinal Change.

Qualification tests shall be carried out to the requirements of the Design Authority.

## 5 PACKAGING

Packaging shall be in accordance with good commercial practice. Each package shall bear an identification label showing material quantity, description, size, color, and batch number. Additional information shall be supplied as specified in the contract or order.

## 6 SHELF LIFE<sup>1</sup>

When stored as prescribed above, the shelf life of this heat shrink product is 144 months from date of manufacture.

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<sup>1</sup> Storage life is a guideline based on 30 years of experience. TE Connectivity cannot provide any test data to validate this statement.





## 8 RELATED DOCUMENTS

RT-700	Harness Systems Chemical Agent Exposure and Decontamination
ASTM D2671: 1999	Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use
AMS-DTL-23053E	Insulating Sleeving, Electrical, Heat Shrinkable, General Specification for Marking of Electrical Insulation Materials.
ASTM G21-15(2021)e1	Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

## 9 TEST FLUIDS DESCRIPTION

Fluid	Description
MIL-T-83133 (JP-8)	Kerosene based jet fuel, replacement for JP-4. NATO code is F-34. It's specified by MIL-DTL-83133 and British Defence Standard 91-87.
MIL-PRF -5606	Military grade hydraulic fluid
MIL-PRF-23699	Synthetic lubricating oil STD class (NATO Code 0-156). Has replaced MIL-L-7808 oil at temperatures above 25°C.
MIL-PRF-7808	Turbine lubricating oil
5% Sodium chloride solution	Sodium chloride is a universal compound used in many chemicals and de-icing fluids
Ethylene Glycol De-icing fluid (MIL-A-8243)	Di-icing fluid
Tap Water	Universal solvent