

DM.TEC Reference: 108-121042
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CLASS 1: PUBLIC
(See TE Policy TEC-02-04)

SPECIFICATION RW-2538

STD and STB Snap on Markers

Scope of work instruction

This Quality Assurance Specification establishes the quality standard for pre-printed STD and STB markers. All markers are available as alphanumeric characters or symbols, STB markers are colour coded in accordance with EN 60062:2016/A1:2019.

The operating temperature for this product is -40°C to +106°C (-40°F to +223°F).

STD and STB markers are fabricated from zero halogen Polyoxymethylene (POM) compound. Markers are designed for identification of wires and small cables and are pre-marked alphanumerically. Markers are applied individually using an applicator, the markers are designed with an expanding profile which accommodates a range of wires and small cable sizes.

This specification is specific to TE Connectivity product and therefore references equipment and documentation used within TE laboratories. Similar equipment should be used if test methods are to be replicated elsewhere.

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1. Requirements

1.1.1. Composition, Appearance and Colour

Markers are manufactured from Polyoxymethylene (POM). The markers and applicator shall be homogeneous and essentially free from flaws, defects, pinholes, bubbles, seams, cracks or inclusions. Colour shall be uniform. Marker sizes 01-12 shall be supplied mounted on an applicator. Separate applicators are available for sizes 15 to 24.

1.1.2. Table 1: Colours and Ordering

Size Code	Colour of Applicator	Colour of STD Marker	Colour of STB Marker	Pack Quantity
STD/STB 01	Brown	Yellow or white	Colour coded in accordance with EN 60062:2016/A1:2019	10 Mounting applicators with 30 identical markers
STD/STB 02	Grey			10 Mounting applicators with 30 identical markers
STD/STB 03	Green			10 Mounting applicators with 30 identical markers
STD/STB 05	Natural			10 Mounting applicators with 30 identical markers
STD/STB 06	Red			10 Mounting applicators with 30 identical markers
STD/STB 09	Blue			10 Mounting applicators with 30 identical markers
STD/STB 12	Yellow			10 Mounting applicators with 30 identical markers
STD/STB 15	Orange			50 identical markers; applicator available on request
STD/STB 17	Orange			50 identical markers; applicator available on request
STD/STB 21	Grey			50 identical markers; applicator available on request
STD/STB 24	Grey	50 identical markers; applicator available on request		



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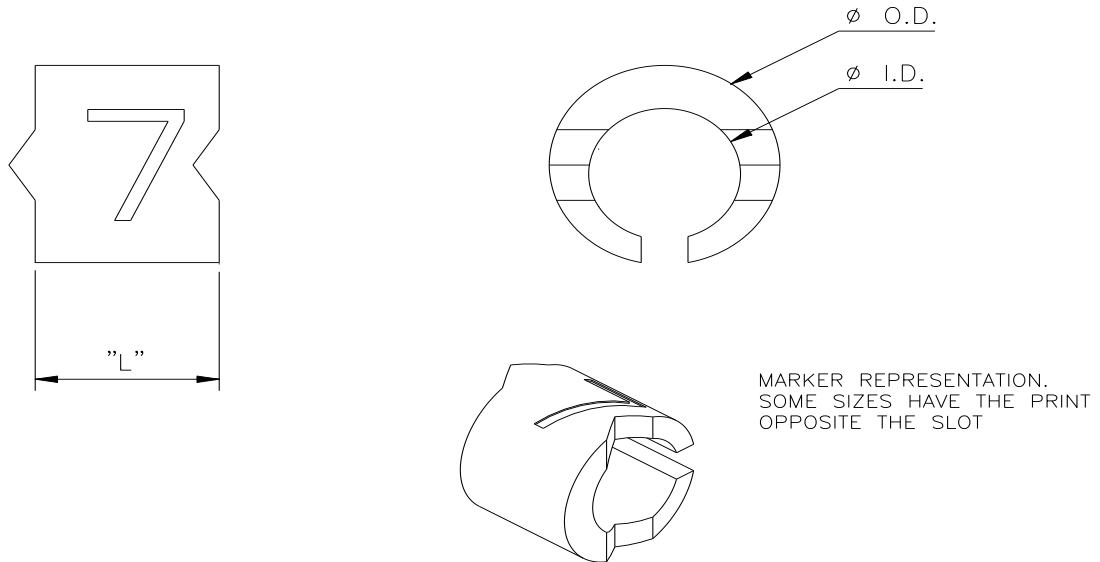
1.1.3. Dimensions, Available Sizes and Formats

Table 2: Product dimensions

Part Description	Nominal I.D of Marker mm (inches)	Nominal O.D of Marker mm (inches)	Nominal Length 'L' mm (inches)	Nominal Markers Required for Test Length of 70 mm	Recommend Cable Diameter Range mm (inches)
STD/STB01W-X	1.00 (0.04)	1.60 (0.06)	2.30 (0.09)	30	1.00 – 1.40 (0.04 – 0.06)
STD/STB02W-X	1.40 (0.06)	2.00 (0.08)	2.30 (0.09)	30	1.40 – 1.80 (0.06 – 0.07)
STD/STB03W-X	1.90 (0.08)	2.80 (0.11)	3.00 (0.12)	23	1.90 – 2.60 (0.08 – 0.10)
STD/STB05W-X	2.30 (0.09)	3.90 (0.15)	3.20 (0.13)	22	2.30 – 3.00 (0.09 – 0.12)
STD/STB06W-X	2.60 (0.10)	3.95 (0.16)	3.15 (0.12)	22	2.60 – 3.50 (0.10 – 0.14)
STD/STB09W-X	3.20 (0.13)	4.50 (0.18)	3.00 (0.12)	23	3.20 – 4.50 (0.13 – 0.18)
STD/STB12W-X	4.50 (1.77)	6.00 (0.23)	3.50 (0.14)	20	4.50 – 6.00 (0.18 – 0.24)
STD/STB15W-X	5.80 (0.29)	7.40 (0.29)	5.00 (0.20)	14	5.80 – 8.50 (0.29 – 0.34)
STD/STB17W-X	8.50 (0.34)	10.55 (0.42)	5.50 (0.22)	13	8.50 – 11.50 (0.34 – 0.45)
STD/STB21W-X	11.00 (0.43)	13.00 (0.51)	6.70 (0.26)	10	11.00 – 15.50 (0.43 – 0.61)
STD24W-X	15.00 (0.59)	17.40 (0.69)	8.00 (0.32)	9	15.00– 19.00 (0.59 – 0.75)

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1.1.4. Figure 1: Marker detail



2. Quality Assurance Provisions

2.1.1. Qualification Testing

Qualification tests are those performed on finished markers, submitted for product performance validation. Qualification shall consist of all tests listed in this specification.

Marker size 09 shall qualify the whole range for testing purposes.

3. Test Methods

3.1.1. Preparation of Test specimens

All sample preparation and testing shall be carried out at a temperature of $23 \pm 2^\circ\text{C}$ ($73 \pm 5^\circ\text{F}$) unless otherwise stated.

Markers are received in a printed state where an initial print assessment is made, Samples must score a C8¹ or above to be considered adequate and suitable for testing.

Testing is to be completed at the maximum recommended cable diameter using an equivalently sized mandrel unless otherwise stated, see table 2. A test sample is a 70mm length of markers closely packed on a mandrel. Three samples shall be used per test. For chemical testing it may be suitable to make one set of 70mm length at the end of a mandrel to make handling easier.

¹ When assessed against the TE Print Contrast reference scale, document 411-121002.



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3.1.2. Print Performance

3.1.3. Mark Adherence

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be specified in TE document 109-121012. Samples shall be tested using a modified Crockmeter fitted with an eraser and 1kg (2.2lb) load using the number of rubs specified in table 5.

After the Mark Adherence test, marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

3.1.4. Solvent Resistance

Three mandrels each mounted with 70mm length of markers shall be prepared as detailed in Clause 3.1.1 shall be tested in accordance with TE document 109-121014. A new set of three mandrels is used for each solvent.

The marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

3.1.5. Fluid Resistance

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be specified in TE document 109-121039. Samples shall be completely immersed in each of the fluids for the times and at the temperatures specified table 5. A separate sample set is used for each fluid.

The volume of fluid shall not be less than 20 times that of the specimen. After immersion, the markers are lightly blotted with tissue paper to remove excess surface fluid and air dried at $23\pm 3^{\circ}\text{C}$ ($73\pm 5^{\circ}\text{F}$) for $45\pm 15\text{min}$. The print shall be tested in accordance with TE test reference 109-121012. Samples are tested with a Crockmeter fitted with Super Twill² cloth and a 1kg (2.2lb) load using the number of rubs specified in table 5.

Additional IPA testing is required using a mandrel mounted with three sets of 70mm lengths of markers as detailed in Clause 3.1.1 using the number of rubs specified in table 5. Soak the Super Twill cloth with IPA and test for Mark Permanence as detailed in TE document 109-121012.

After the Print Permanence test, marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

² Trade Mark of Chicopee



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3.2. Physical Testing

3.2.1. Dimensions

The test method shall be as specified in TE document 109-121003. Five individual markers shall be tested for inside and outside diameter and sample length see table 2.

3.2.2. Specific Gravity

Five samples shall be tested to the procedure as specified in TE Document 109-121015. Ensure no air is trapped on the sample during the test.

3.3. Thermal Testing

3.3.1. Heat Ageing

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be as specified in TE document 109-121008. Specimens shall be conditioned for 168 hours at 106°C (223±4°F) in an air circulating oven. Mandrels with mounted samples shall be removed and allowed to cool to room temperature for a minimum of 2 hours at 23±3°C (73±5°F).

After conditioning the 70mm sample lengths shall be tested for Mark Adherence, in accordance with section 3.1.3 with the number of rubs specified in table 5. The marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

3.3.2. Heat Shock

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be as specified in TE Document 109-121007. Specimens shall be conditioned for 4 hours at 140±2°C (284±4°F) in an air circulating oven. Remove the markers and leave to cool to room temperature for a minimum of 2 hours at 23±3°C (73±5°F).

After conditioning three samples shall be tested for Mark Adherence in accordance with section 3.1.3 with the number of rubs specified in table 5. The marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

3.3.3. Low Temperature Storage

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be as specified in TE Document 109-121006. Specimens shall be conditioned for 2 hours at -40°C (-40±°F) in a cold chamber. The mandrel with mounted samples is removed from the chamber and allowed to return to room temperature for a minimum of 2 hours at 23±3°C (73±5°F).



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Samples shall be tested for Mark Adherence in accordance with section 3.1.3. The marking shall be examined for legibility using normal reading vision. Print Contrast shall be measured in accordance with TE Document 411-121002.

3.3.4. Thermal Cycling

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. The test method shall be as specified in TE document 109-121046. Specimens shall be conditioned for 4 cycles of 1 hour at -40°C ($-40\pm^{\circ}\text{F}$) and then for 1 hour at 106°C (223°F) in an air circulating oven. After cycling remove the markers and leave to cool to room temperature for a minimum of 2 hours at $23\pm 3^{\circ}\text{C}$ ($73\pm 5^{\circ}\text{F}$).

Samples shall be tested for Mark Adherence in accordance with section 3.1.3 with the number of rubs specified in table 5. The marking shall be examined for legibility using normal reading vision. Print Contrast shall be evaluated in accordance with 411-121002.

3.4. Environmental Testing

3.4.1. Water Absorption

Test method shall be specified in TE document 109-121016. Three markers shall be weighed after drying in an oven at $50\pm 2^{\circ}\text{C}$ ($122\pm 5^{\circ}\text{F}$) for 24hrs and weighed again after immersion in water for 24 hours at $23\pm 3^{\circ}\text{C}$ ($73\pm 5^{\circ}\text{F}$). The mean average of three samples should be stated.

3.4.2. UV Resistance

Three separate 70mm lengths of markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. Testing is completed on marker colours white and black. The test should be carried out using a UV-O-meter chamber in accordance with ASTM G154. Test duration is for 240 hours at $1.35\text{W}/\text{m}^2/\text{nm}$ irradiance.

- i. UVA consisting of a repeating cycle of 8 hours exposure at $60\pm 2^{\circ}\text{C}$, followed by 4 hours of condensation at $50\pm 2^{\circ}\text{C}$ ($122\pm 5^{\circ}\text{F}$).
- ii. UVB consisting of a repeating cycle of 8 hours exposure at $60\pm 2^{\circ}\text{C}$, followed by 4 hours of condensation at $50\pm 2^{\circ}\text{C}$ ($122\pm 5^{\circ}\text{F}$).

After conditioning the samples shall be tested for Mark Adherence in accordance with section 3.1.3 with the number of rubs specified in table 5. Print Contrast shall be evaluated in accordance with 411-121002.

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3.4.3. Xenon-arc

Three sets of 70mm length markers shall be mounted on a single mandrel and prepared as in Clause 3.1.1. Testing is completed on marker colours white and black. The program used as specified in ISO 4892 table 5 method A. Test duration is 240 hours at 0.5 W/m² in cycles of 102 minutes of dry at 50% relative humidity followed by 18 minutes of wet.

After Conditioning the samples shall be tested for Mark Adherence in accordance with section 3.1.3 with the number of rubs specified in table 5. Print Contrast shall be evaluated in accordance with 411-121002.

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4. Related Documents

4.1 Table 3- Details of Related Standards and Revisions

Document, Revision	Description
ASTM D570-98(2018)	Standard test method for water absorption of plastics
ASTM D792-20 METHOD A	Standard test methods for specific gravity (relative density) and density of plastics by displacement
ASTM G-154-16	Standard practice for operating fluorescent ultraviolet (UV) lamp apparatus for exposure of non-metallic material
IEC 60684-2:1997	Flexible insulating sleeving-part 2: methods of test
ISO 4892-2:2013	Plastics-Methods of exposure to laboratory light sources-Part 2: Xenon-arc lamps
MIL STD 202 METHOD 215	Test methods for electronic and electrical component parts. resistance of solvents
SAE AS5942	Marking of electrical insulating materials

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4.1.2 Table 4- TE Connectivity Documents

TE Reference	Title	Complies with
411-121002	TE Connectivity Print Contrast Reference Scale	---
109-121003	Dimensions	---
109-121006	Low Temperature Flexibility	IEC 60684-2:1997
109-121007	Heat Shock	---
109-121008	Heat Ageing	---
109-121012	Mark Adherence/Print Permanence	SAE AS5942
109-121014	Resistance to Solvents MIL 202	MIL 202 Method 215
109-121015	Specific Gravity	ASTM D792-20 Method A
109-121016	Water Absorption	ASTM D570-98(2018)
109-121039	Fluid Immersion Testing at Room Temperature	---
109-121046	Thermal Shock and Cycling	---



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TABLE 5: REQUIREMENTS

PROPERTY	TEST METHOD	REQUIREMENTS	RW-2538 SECTION
Mark Adherence	TE Document 109-121012 50 rubs, 1kg load, eraser	Legible, minimum Print Contrast C3	3.1.3.
Solvent Resistance <ul style="list-style-type: none"> • Solution A • Solution B • Solution C • Solution D 	TE Document 109-121014 50 strokes, tooth brush	Legible, minimum Print Contrast C3	3.1.4
Fluid Resistance <ul style="list-style-type: none"> • JP8 Fuel (MIL-T-83133) • Hydraulic Fluid (MIL-PRF-83282) • Hydraulic Fluid (MIL-PRF-23699) • Diesel Fuel • Lubricating Oil (MIL-L-7808) • Tap Water • Salt Water (5% salt) • Isopropyl alcohol • Teepol Detergent • Anti-icing Fluid (MIL-A-8243) • Skydrol LD4 Followed by: Mark Adherence	TE Document 109-121012 24±2hours immersion, 23±2°C 20 rubs, 1kg load, eraser	Legible, minimum Print Contrast C3	3.1.5.

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PROPERTY	TEST METHOD	REQUIREMENTS	RW-2538 SECTION
Dimensions	TE Document 109-121003	Measure and record	3.2.1
Specific Gravity	TE Document 109-121015	1.8g Maximum	3.2.2
Heat Ageing 168 hours at 106°C (223±F) Followed by: Mark Adherence	TE Document 109-121008 20 rubs, 1kg load, eraser	No damage to the marker and print Legible, minimum Print Contrast C3	3.3.1.
Heat Shock 4 hours at 140°C (284°F) Followed by: Mark Adherence	TE Document 109-121007 20 rubs, 1kg load, eraser	No damage to the marker and print Legible, minimum Print Contrast C3	3.3.2.
Low Temperature Storage 4 hours at -40°C (-40°F) Followed by: Mark Adherence	TE Document 109-121006 20 rubs, 1kg load, eraser	No damage to the marker and print Legible, minimum Print Contrast C3	3.3.3
Thermal Cycling 4 cycles of 1hour of -40 °C followed by 1 hour of 80°C Followed by: Mark Adherence	TE Document 109-121046 20 rubs, 1kg load, eraser	No damage to the marker and print Legible, minimum Print Contrast C3	3.3.4
Water Absorption 24 hours at 23°C (73°F)	TE Document 109-121016	1.5% Max	3.4.1.

