



## SPECIFICATION RW-2535

TE 108-121034

### Pre-Print Push-On Cable Markers K-Type, Z-Type, V-Type and G-Type

#### SCOPE

**This quality assurance specification establishes the quality standard for pre-printed cable markers for use as a general-purpose identification marker. The markers fall in to two categories PVC markers and Zero Halogen G-Type markers. All markers are available as alphanumeric characters or symbols and color coded in accordance with BS3858: 1992.**

PVC markers, Z-Type, V-Type and K-Type, are fabricated from specially designed, extruded plasticized PVC profile. Markers are pre-marked using a thermal foil and then flame sealed to improve mark adherence and print permanence.

G-Type markers are fabricated from a Zero Halogen, low smoke and low toxic fume (LFH) compound. This allows the markers to be used where fire may pose a risk to human life.

Push-on markers are supplied as individual idents or partial cut continuous lengths. Z-Type, V-Type and G-Type have an expanding profile which allow markers to accommodate a wide range of wire/cable sizes.

Z-Type, V-Type and G-Type markers are designed to be installed pre-termination, K-type markers are designed to be applied once cabling has been connected. K-Type markers are designed to fit onto a PVC carrier, which is then attached to a substrate using cable ties.

Operating temperature range for markers: Z-Type, V-type and K-Type -40°C to 70°C (-40 to 158°F)  
G-Type -45°C to 70°C (-49°F to 158°F)

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## 1 REVISION HISTORY

Revision Number	Description of change	Date	Incorporated By
1	Initial release	Sept' 2013	Lee Smith
2	Minor format changes	Jan' 2009	Lee Smith
3	Removal of O-Type and addition of G-Type.	Nov' 2017	Alan Kean

## 2 REQUIREMENTS

### 2.1 Composition, Appearance and Color

Markers are manufactured from plasticized PVC or LFH materials. The markers shall be smooth and free from bubbles, pinholes, creases and other defects in appearance. Color shall be uniform, and be a reasonable match to the equivalent color given in BS 6746C.

#### Colors and Marking

Color of Sleeve	Color code numerical association*	Color of mark G-Type	Color of mark Z-Type	Color of mark K-Type	Color of mark V-Type
Black	0				White
Brown	1				White
Red	2				White
Orange	3				Black
Yellow	4	Black	Black	Black	Black
Green	5				Black
Blue	6				White
Violet	7				White
Grey	8				Black
White	9		Black		Black

\*IEC 60062 Marking codes for resistors and capacitors



Not Available



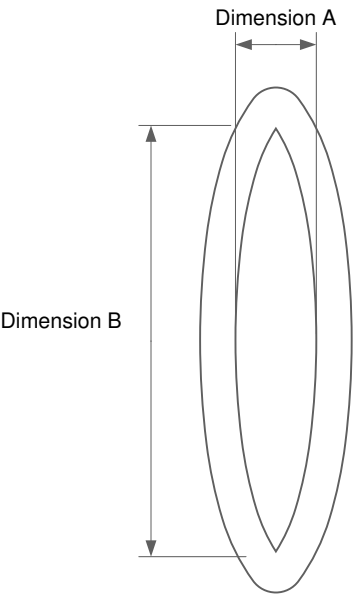
2.2 Dimensions  
2.2.1 K-Type Markers

Supplied Dimensions

Size code	Marker size	Wire size guide		Dimension 'A'		Dimension 'B'		Nominal character height	Weight (g/250mm)
		min	max	min	max	min	max		
1361	65	4.2	7.0	2.90	3.20	9.90	10.20	4.0	10.1

Available in yellow (4) only. Supplied on a spool, partially cut for easy removal.

Figure 1: K-Type Marker Detail



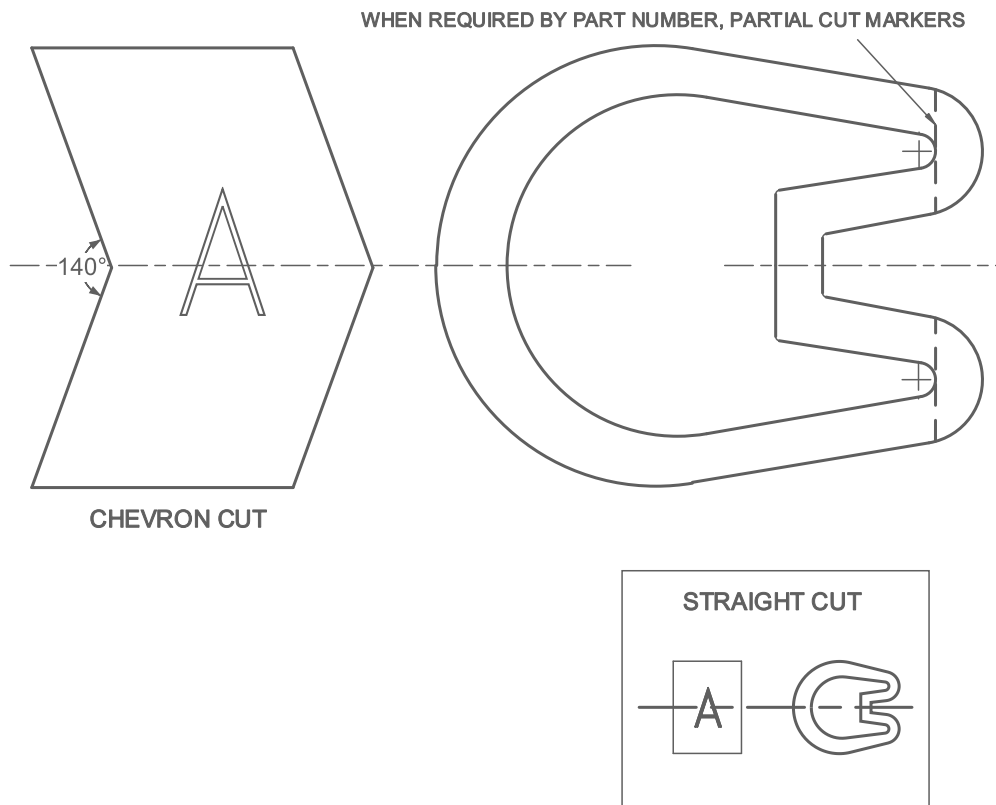
## 2.2.2 Z-Type Markers

### Supplied Dimensions

Size code (straight cut)	Size code chevron cut)	Marker size	Wire size guide (outside diameter)		Marker length	Character height	Pack Size (pieces)
			min	max			
0580	1151	5	1.5	2.0	4.3	1.8	1000
0581	1152	7	2.0	3.2	4.3	1.9	1000
0615	1153	9	2.5	4.0	4.3	2.6	1000
0616	1154	11	2.9	4.7	4.3	2.6	1000
0617	1155	13	3.4	5.7	4.3	2.7	1000
0618	1156	15	3.8	6.3	4.3	2.7	1000
0620	1157	18	4.3	6.9	4.3	2.7	500
0622	1158	23	5.5	8.9	6.0	3.5	500
0624	1159	35	7.9	12.7	6.0	3.5	250

Dimensions in mm

Figure 2: Z-Type Marker Detail





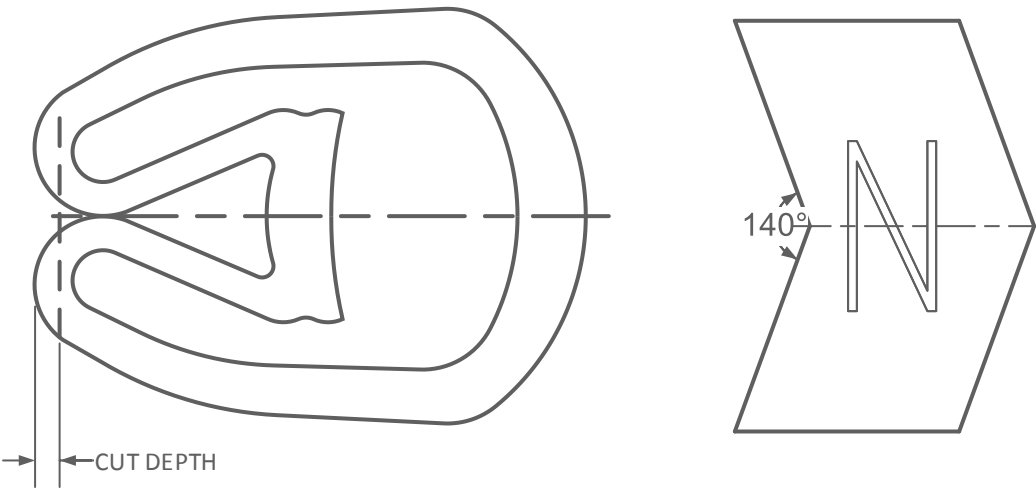
2.2.3 V-Type Markers

Supplied Dimensions

Size code	Marker size	Wire size guide (outside diameter)		Marker length	Character height	Pack Size (pieces)
		min	max			
0761	3/3	1.4	2.8	2.9	3.0	1000
0762	5/3	2.8	5.0	2.9	3.0	1000
0763	10/4	4.0	10.0	3.9	4.0	500
0764	16/6	8.0	16.0	5.9	4.0	250

Dimensions in mm

Figure 3: V-Type Marker Detail – Chevron cut only





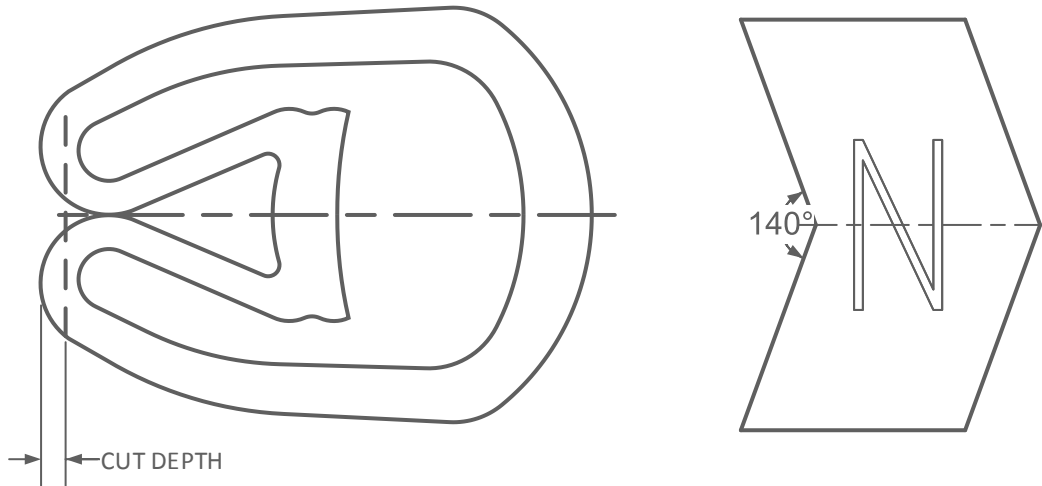
### 2.2.4 G-Type Markers

#### Supplied Dimensions

Size code	Marker size	Wire size guide (outside diameter)		Marker length	Character height	Pack size (pieces)
		min	max			
0719	G3/10	1.4	2.5	4.5	2.4	1000
0720	G3/20	2.8	3.5	4.5	2.4	1000
0721	G4/10	3.0	6.0	6.0	3.2	500
0722	G6/10	5.0	9.5	6.0	4.0	250
0723	G6/20	8.0	12.5	6.0	4.0	250

Dimensions in mm

Figure 4: G-Type Marker Detail – Chevron cut only



### 2.3 Printing

Markers are printed using hot foil marking with a single character or a legend. The mark is black or white as required. Where there is possibility of misinterpretation the character shall be followed by a period in the lower right of the mark. Mark density shall be at a level that enables the reader to clearly recognise the character at 355mm (14 inch).



## 2.4 Properties

The markers shall meet the requirements detailed below in the general requirements table

## 3 QUALITY ASSURANCE PROVISIONS

### 3.1 Qualification Tests

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

For K-Type markers one size and color shall qualify the whole range. A minimum of two sizes and one color of other markers shall be considered to cover the full range.

## 4 TEST PROCEDURES

### 4.1 Preparation of Test Specimens

Unless specified, markers shall be tested as supplied. All tests shall be made at a temperature of  $23 \pm 2^{\circ}\text{C}$ .

When required by the test procedure, three markers shall be used for each test.

For ease of testing markers shall be slid onto metal mandrels before testing. Mandrel sizes will be based on the maximum cable diameter as recommended by TE Connectivity, see product dimensions in section 2.

### 4.2 Print Performance

#### 4.2.1 Mark Adherence

Three sets of markers shall be tested for each marker type and size; a set is a minimum of 5 markers. Markers shall be mounted onto metal mandrels as given in section 4.1, and then tested in accordance with TE test procedure 109-121012, using the 'Eraser Preparation for Mark Adherence testing' set up. Samples shall be rubbed 20 times using a modified Crockmeter fitted with an eraser and a 1kg load.

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





#### 4.2.2 Fluid Resistance

For each fluid, three sample sets of markers shall be immersed. A set is a minimum of 5 markers, mounted onto metal mandrels as detailed in section 4.1. Completely immerse the markers for the times and at the temperatures specified in the general requirements given in section 9. The volume of the fluid shall be not less than 20 times that of the specimen.

After immersion, lightly blot the markers with tissue paper to remove excess surface fluid and suspend the samples to air dry for at least 2 hours prior to rub testing.

The marking shall be tested in accordance with TE test reference 109-121012. Samples are tested with a Crockmeter fitted with 'Super Twill' cloth and a 1kg load.

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.

#### 4.3 Environmental Testing

Markers shall be prepared as given in section 4.1.

Suspend vertically in an air circulating oven at 70°C for 168 hours. The samples are then transferred immediately to a cold chamber maintained at -40°C for 1 hour.

At the end of the conditioning period, check for signs of splitting, blistering or cracking. Samples shall be stored at 23°C for 4 hours.

Test samples in accordance with TE test procedure 109-121012, using the 'Eraser Preparation for Mark Adherence testing' set up. Samples shall be rubbed 20 times using a Crockmeter fitted with an eraser and a 1kg load.

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



## 5 RELATED STANDARDS

REFERENCE	TITLE	COMPLIES WITH
411-121002	TE Connectivity print contrast reference scale	NOT APPLICABLE
109-121012	TE Connectivity Work Instruction - Print permanence testing using the mechanical Crockmeter	SAE AS5942
SAE AS 5942	Society of Automotive Engineers standard for Marking of Electrical Insulation Sleeves.	NOT APPLICABLE

## 6 TEST FLUIDS

Fluid	Description
Aircraft fuel	JP 8 Kerosene based Jet fuel
MIL-PRF-23699	Synthetic lubricating oil STD class (NATO Code 0-156). Has replaced MIL-L-7808 oil at temperatures above 25°C.
MIL-H-83282	The principal hydraulic fluid used in military aircraft. It replaces MIL-H-5606.
Diesel Fuel (BS EN 590:2009 A1)	General automotive fuel
Propylene Glycol de-icing fluid (SAE-AMS-1424)	50/50% (v/v) mixture with water
Tap Water	Universal solvent
Sea Water	Artificial sea water solution
Sodium chloride solution	5% (mass/mass in water) standard salt solution
Teepol	1% Teepol in water (v/v) - commonly used detergent
IPA - Isopropyl alcohol	Widely used as a solvent and cleaner
Skydrol LD4	Common aircraft hydraulic fluid. (G-Type only)



## 7 SAMPLING

Testing frequency shall be Production routine or Qualification. Production routine tests shall be carried out on every manufactured batch and shall consist of visual examination for workmanship, printing quality and dimensions.

A manufactured batch is defined as that quantity of material extruded at any one time from the same compound batch.

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

## 8 PREPARATION FOR DELIVERY

### 8.1 Packaging

Markers shall be supplied on spools or in boxes. Each package shall be labelled showing the description, quantity, size, batch number and date of manufacture.

Additional information may be supplied as specified in the contract or order.



## 9 GENERAL REQUIREMENTS

TEST	RW-2535 REF.	UNITS	TEST REQUIREMENTS
<b>PHYSICAL</b>			
<b>Composition, appearance and color</b>	Section 2.1.	---	Markers shall be smooth and free from bubbles, pinholes and creases and other defects in appearance. Color shall be uniform, and be a reasonable match to the equivalent color given in BS 6746C.
<b>Dimensions</b>	Section 2.2.	mm	Figures 1 to 4.
<b>PRINT PERFORMANCE</b>			
<b>Print Quality</b>	Section 2.3	---	Initial Print Contrast C8 minimum.
<b>Mark Adherence</b>	Section 4.2.1. TE Test Method 109-121012	---	Print shall remain legible, minimum Print Contrast C3.
<b>Fluid Resistance</b> <ul style="list-style-type: none"> <li>✦ Aircraft Fuel (JP-8)</li> <li>✦ MIL-PRF-23699</li> <li>✦ MIL-H-83282</li> <li>✦ Diesel Fuel</li> <li>✦ Propylene Glycol</li> <li>✦ Tap Water</li> <li>✦ Sea Water</li> <li>✦ Sodium Chloride (5% solution)</li> <li>✦ Teepol Detergent</li> <li>✦ Isopropyl alcohol</li> <li>✦ Skydrol LL4D<sup>1</sup></li> </ul>	Section 4.2.2.  24 hours at 23°C, followed by 2 hours' air drying at room temperature.  20 rubs using TE Test method 109-121012, Crockmeter, Super Twill, 1kg load.	---	No color change, no splitting, swelling or cracking.  Print shall remain legible, minimum Print Contrast C3.  <sup>1</sup> G-Type marker only.
<b>ENVIRONMENTAL TESTING</b>			
<b>Resistance to Extremes of Temperature</b>	Section 4.3.	---	No splitting, cracking or blistering. The original color shall be identifiable. Print shall remain legible, minimum Print Contrast C3.

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