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| <b>SURFACE VEHICLE<br/>STANDARD</b>                     | <b>J3117™</b> | <b>JUL2023</b> |
|                                                         | Issued        | 2017-05        |
|                                                         | Cancelled     | 2023-07        |
| Superseded by J3117/1                                   |               |                |
| Un-Shielded Balanced Single Twisted Pair Ethernet Cable |               |                |

#### RATIONALE

This document has been cancelled because it is superseded by SAE J3117/1.

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This technical report has been declared "CANCELLED" as of July 2023 and has been superseded by SAE J3117/1. By this action, this document will remain listed in the respective index, if applicable. Cancelled technical reports are available from SAE.

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Full document details: SAE J3117\_202307

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## 1. SCOPE

This document covers un-shielded balanced single twisted pair data cable intended for use in surface vehicle cables for 100 Mbps Ethernet applications. The tests in this document are intended to qualify cables for normal operation in an automotive environment while maintaining the necessary electrical properties for reliable data transmission.

### 1.1 Application

The 100 Mbps cable is used for 100BASE-T1 Ethernet PHY applications.

## 2. REFERENCES

### 2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

#### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J1678 Low Voltage Ultra Thin Wall Primary Cable

SAE EA-1128 Wire Color Charts

#### 2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>

ISO 6722-1 Road Vehicles - 60 V and 600 V Single Core Cables - Test methods, dimensions and requirements.

ISO 14572 Road vehicles - Round, sheathed, 60 V and 600 V screened and unscreened single - or multi-core cables - Test methods and requirements for basic- and high-performance cables

#### 2.1.3 IEEE Publications

Available from IEEE Operations Center, 445 and 501 Hoes Lane, Piscataway, NJ 08854-4141, Tel: 732-981-0060, [www.ieee.org](http://www.ieee.org).

IEEE 802.3bw 100BASE-T1

#### 2.1.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM B5423 Standard Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation

ASTM B5374 Standard Test Methods for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation

#### 2.2 General References

Available from OPEN ALLIANCE website. [www.opensig.org](http://www.opensig.org)

OPEN ALLIANCE Definitions for Communication Channel (Version 2.0)

### 3. TERMS & DEFINITIONS

For the purposes of this document, the following terms and definitions apply.

#### 3.1 CROSSTALK

A measurement of the unwanted signal transmitted from one aggressor circuit or channel of a transmission system to the victim circuit or channel (for two or more channels in the same bundle).

#### 3.2 IMPEDANCE (Z)

The total opposition to alternating current by an electric circuit, equal to the square root of the sum of the squares of the resistance and reactance of the circuit and usually expressed in ohms, denoted as: Z.

#### 3.3 INSERTION LOSS (ATTENUATION)

The loss of signal power resulting from the insertion of a device in a transmission line and is usually expressed in decibels (dB). This is the s-parameter defined as  $S_{dd21}$  or  $S_{dd12}$ .

#### 3.4 J-UTP

Jacketed (sheathed) Un-shielded Twisted Pair

#### 3.5 LCL, LONGITUDINAL CONVERSION LOSS

A ratio, expressed in decibels (dB), of the differential mode (DM) signal applied between the wires in a pair and the resulting common mode (CM) noise signal reflected at the same end. This is the s-parameter defined as  $S_{dc11}$  and  $S_{dc22}$ .

#### 3.6 LCTL, LONGITUDINAL CONVERSION TRANSMISSION LOSS

A ratio, expressed in decibels (dB), of the differential mode (DM) signal applied between the wires in a pair and the resulting common mode (CM) noise signal transmitted from one end to the other end.

This is the s-parameter defined as  $S_{dc21}$  and  $S_{dc12}$ .

#### 3.7 LOW VOLTAGE (LOW TENSION)

Usually considered to be  $\leq 60$  V DC (25 V AC).

#### 3.8 MINIMUM WALL (THICKNESS)

The lowest allowable insulation thickness at any point.

### 3.9 NOMINAL

A suitable approximate value used to designate or identify a component.

### 3.10 PHY

Abbreviation for the physical layer device. A PHY connects a link layer device to a physical medium such as a copper cable or optical fiber. A PHY chip (PHYceiver) is commonly found on Ethernet devices. Its purpose is to provide analog signal physical access to the link.

### 3.11 RETURN LOSS

A ratio expressed in decibels (dB) of the power of the outgoing signal to the power of the reflected or returned signal. This is the s-parameter defined as  $S_{dd11}$  and  $S_{dd22}$ .

### 3.12 S-PARAMETER

| Single channel characteristics (port 1,2) |                         |                                           |
|-------------------------------------------|-------------------------|-------------------------------------------|
| RL                                        | $S_{dd11}$ , $S_{dd22}$ | Return Loss (differential mode)           |
| IL                                        | $S_{dd21}$              | Insertion Loss (differential mode)        |
| LCL                                       | $S_{dc11}$ , $S_{dc22}$ | Longitudinal Conversion Loss              |
| LCTL                                      | $S_{dc12}$ , $S_{dc21}$ | Longitudinal Conversion Transmission Loss |

### 3.13 TCR, TEMPERATURE CLASS RATING

A class designation based on the long term heat aging (3000 hour) test.

### 3.14 UTP

Unshielded Twisted Pair

### 3.15 WCC

Whole communication channel is the complete electrical wire connection between two ECUs.

## 4. GENERAL

### 4.1 Classification

4.1.1 Temperature Classes. Four cable classes have been defined in Figure 1 to respond to the various temperatures encountered on vehicles.

| Class | Operating Temperature | Equivalent to Temperature Class |
|-------|-----------------------|---------------------------------|
| A     | -40 °C to +85 °C      | T1                              |
| B     | -40 °C to +100 °C     | T2                              |
| C     | -40 °C to +125 °C     | T3                              |
| D     | -40 °C to +150 °C     | T4                              |

**Figure 1 - Temperature class**

### 4.2 General Test Conditions

Test samples shall be preconditioned for at least 16 hours at a room temperature of  $23\text{ °C} \pm 3\text{ °C}$ . Unless otherwise specified, all tests shall be conducted at this same temperature. All samples shall pass. In the case where the test result is based on an average, the average shall meet the requirement.