



The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

## T1 Industrial IP20 plug and PCB adapter

### 1. SCOPE

#### 1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of TE T1 Industrial Cable Assembly's consisting of several versions of cables:

- 1x 2x AWG 26/7 cable with 2x T1 Industrial plug male IP20;
- T1 Industrial jack AH IP20;

#### 1.2. Qualification Test Results

Successful qualification testing on the subject product line has been completed. The Qualification Test Report number as noted in TE Documents paragraph 2.2.

### 2. APPLICABLE DOCUMENTS AND FORMS

2.1. The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

#### 2.2. TE Documents

- 109-197 Test Specification vs EIA and IEC Test Methods
- 501-19309 Qualification Test Report
- 2364150 Customer Drawing SPE T1 Industrial Plug IP20 KIT
- 2364151 Customer Drawing SPE T1 Industrial RA JACK IP20

#### 2.3. Reference Document

109-197 Test Specification (TE Test Specification vs EIA and IEC Test Methods)

### 3. REQUIREMENTS

#### 3.1. Design and Construction

- Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

#### 3.2. Ratings

Voltage	60V (MAX.)
Current	4A (MAX.)
Operating Temperature	-40°C – 80°C
IEC 60529	IP20
Frequency	600MHz
Data rate	10Mbit/s, 100Mbit/s, 1Gbit/s,

3.3. All components meet IEC 63171-6 (was IEC 61076-3-125).

3.4. Products to be used in Single Pair Ethernet (SPE) systems with cables norms ISO/IEC 11801 and TIA 42.

3.5. Made for Industrial application M<sub>3</sub>l<sub>3</sub>C<sub>3</sub>E<sub>3</sub> -environments.

3.6. 360°Shielding, latch locking and high mechanical plug performance.



TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Visual examination	Meets visual requirements. No defects that would impair normal operation	IEC 60512-1-1:2002
<b>ELECTRICAL</b>		
Low Level Contact Resistance (LLCR)	$R_C \leq 20 \text{ m}\Omega$ $R_{C \text{ Shielding}} \leq 100 \text{ m}\Omega$	IEC 60512-2-1
Insulation resistance	$R_I \geq 5 \cdot 10^8 \Omega$ for contact / contact and contact / shielding voltage: 500 V for 60sec. Method B	IEC 60512-3-1 test 3a
Voltage proof	No breakdown or flash-over at 1.4 kV DC / 60 s for contact / contact 1.0 kV DC / 60 s for contact / shielding Method B	IEC 60512-4-1: 2003
<b>ENVIRONMENTAL</b>		
Rapid change of temperature	-40 °C / +85 °C t = 30 min. 10 cycles, condition mated.	IEC 60512-11-4
Corrosion, industrial atmosphere	Flowing mixed gas corrosion 4 days, test method 4 Condition half mated/ half unmated samples.	IEC 60512-11-7 Method 4
<b>SIGNAL INTEGRITY</b>		
Insertion loss	IEC 63171-6 see Chapter 5.5.2 Category B.	IEC 60512-28-100 Test 28a
Return loss	IEC 63171-6 see Chapter 5.5.3 Category B.	IEC 60512-28-100 Test 28b
TCL (Transverse Conversion Loss)	IEC 63171-6 see Chapter 5.5.5 Category B.	IEC 60512-28-100 Test 28f
TCTL (Transverse Conversion Loss)	IEC 63171-6 see Chapter 5.5.6 Category B.	IEC 60512-28-100 Test 28g
Input to output resistance	$R_{C, \text{ Shielding}} \leq 50 \text{ m}\Omega$ $R_{\text{ Screen}} \leq 100 \text{ m}\Omega$ (measurement points as defined in Chapter 5.1.1 input/output connector path)	IEC 60512-2-1:2002
Resistance unbalance	$R_{\text{ unbalance}} \leq 25 \text{ m}\Omega$	IEC 60512-2-1:2002

Transfer Impedance	see Chapter 5.5.8 (Measuring points as defined in Chapter 5.1.1, all signal contacts and shielding.)	IEC 60512-26-100: 2008 60512-26-100: 2011 Test 26e
Coupling Attenuation (Shielding)	Coupling attenuation for grade 2 cables. (!)	EC 62153-4-15
<b>MECHANICAL</b>		
Locking device mechanical operations	Cycles: 2000 20 cycles/s max.	IEC 60603-7:2008 Annex B
Insertion and withdrawal forces	$F_{\text{Insertion}} \leq 25 \text{ N}$ $F_{\text{Withdrawal}} \leq 25 \text{ N}$ $v_{\text{max}} = 10 \text{ mm/s}$ <u><i>latching mechanism inactivated!</i></u>	IEC 60512-13-2
Mechanical operation (half of the specified number of operations)	Cycles: 500 (half of defined mating cycles - see Chapter 5.4.2, Table 5) $v_{\text{max}} = 10 \text{ mm/s}$ $t_{\text{rest}} \geq 5 \text{ s}$ <u><i>latching mechanism inactivated!</i></u>	IEC 60512-9-1
Effectiveness of connector coupling devices	$F = 50 \text{ N}$ $t = 60 \text{ s}$ $v_{\text{max}} \leq 25 \text{ mm/min.}$ <u><i>no contact interruption &gt; 1 μs</i></u>	IEC 60512-15-6


**NOTE**

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Table 1.

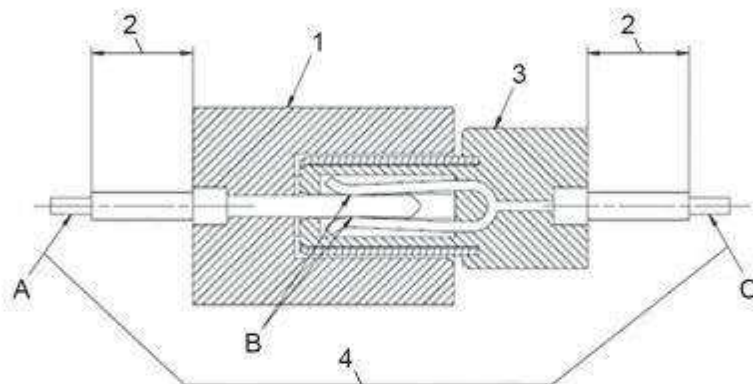
3.7. Setup for Low Level Contact Resistance (LLCR). See picture 1.

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**6.3.2 Arrangement for contact resistance measurement**

- The measurement of contact resistance shall be carried out on the number of contacts specified.
- Any subsequent measurements of contact resistance shall be made on the same contacts. Figure 28 shows a contact resistance arrangement.

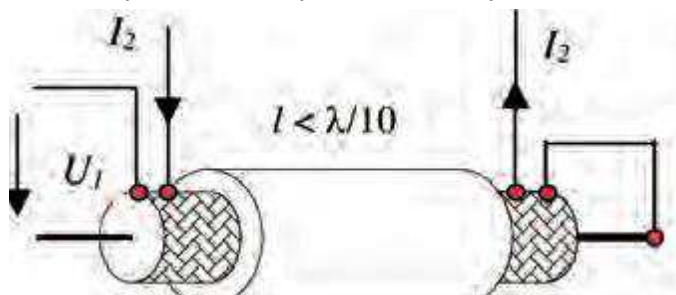


**Key**

- 1 Fixed connector
- 2 Attached wires: as short as practical
- 3 Free connector
- 4 Contact resistance measuring points
- A Measuring point A
- B Measuring points B (one on the male contact, one on the female contact)
- C Measuring point C

Picture 1

3.8. Test setup Transfer Impedance. See picture 2.



Picture 2

3.9. Product Qualification and Requalification Test Sequence (table 1)

	SAMPLE QUANTITY (Min.)				
	TEST GROUP (a)				
	A1	A2	B	C1	C2
Sample amount	3 pairs	3 pairs	2 pairs	2 pairs	2 pairs
TEST OR EXAMINATION	TEST SEQUENCE (b)				
Visual examination of product	1, 4, 8	1, 7, 9, 12	1, 9	1, 8	1
Rapid change of temperature	6				
Locking device mechanical operations	3				
Insertion and withdrawal forces		3			
Mechanical operation (half of the specified number of operations)		5, 11			
Low Level Contact Resistance (LLCR)	2, 5, 7	2, 4, 6, 10, 13	2, 6		
Corrosion, industrial atmosphere		8			
Effectiveness of connector coupling devices			5		
Insulation resistance			3, 7		
Voltage proof			4, 8		
Insertion loss				2	
Return loss				3	
TCL (Transverse Conversion Loss)				4	
TCTL (Transverse Conversion Total Loss)				5	
Input to output resistance				6	
Resistance unbalance				7	
Transfer Impedance					2
Coupling Attenuation (Shielding)					3



**NOTE**

- (a) See paragraph 3.
- (b) Numbers indicate sequence in which tests are performed.

#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Sample Selection

Samples shall be selected at random from current production.

###### B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 1 and 2.

###### C. Test sequence shall be serialized for tractability.

##### 4.2. Re-Qualification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product quality assurance shall co-ordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/ product, quality and reliability engineers.

##### 4.3. Acceptance

Acceptance is based upon verification that product meets requirements. Failures attributed to equipment, test set-up or operator deficiencies shall not disqualify product. When product failure occurs, corrective action shall be taken, and samples re-submitted for qualification. Testing to confirm corrective action is required before re-submittal.

##### 4.4. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.