



**NOTE**

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.

**1.85mm Series High Frequency Coaxial Cable Assembly**

**1. SCOPE**

The 1.85mm interface cable assembly is designed to meet the rising performance needs of in microwave and test & measurement applications requiring high performance. This specification gives an overview of all relevant specifications or requirements related to 1.85mm series Cable Assembly

1.1. Content

This specification covers performance, tests and quality requirements for TE Connectivity (TE) 1.85mm series high frequency coaxial cable assembly of nominal characteristic impedance 50 ohms and have an operating frequency range of up to 70GHz

1.2. Qualification

All components for the cable assembly, connectors, over-mold/tube/strain-relief and cable were subject to their individual design objectives and were qualified accordingly. This document addresses the total cable assembly. When tests are performed on the subject product line, procedures specified in table 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. 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.

2.1. TE Connectivity (TE) Documents

TEC-109-201	Component heat resistance to lead-free reflow soldering.
501-160328	Qualification Test Report (1.85mm series RF cable assembly)
114-160147	

2.2 Commercial Standards and Specifications

EIA-364	Electrical Connector/Socket Test Procedures Including Environmental Classifications
IEC 60966-1	Radio-frequency and coaxial cable assemblies: General requirements and test methods
IEC 61169-32	Radio-frequency connectors-Part 32:RF coaxial connectors with inner diameter of outer conductor 1.85mm(0.072in) with screw coupling-Characteristic impedance 50 ohms(type 1.85)
IEC 60068-2-11	Environmental testing - Part 2-11: Tests - Test Ka: Salt mist
IEEE287	Standard for precision coaxial connectors

2.3 Reference Documents

- 109-1 General Requirements for Testing
- 102-950 Qualification of Separable Interface Connectors

**3. REQUIREMENTS**

3.1 Design and Construction

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

3.2 Materials

Materials used in the construction of this product shall be as specified on the applicable TE drawing.

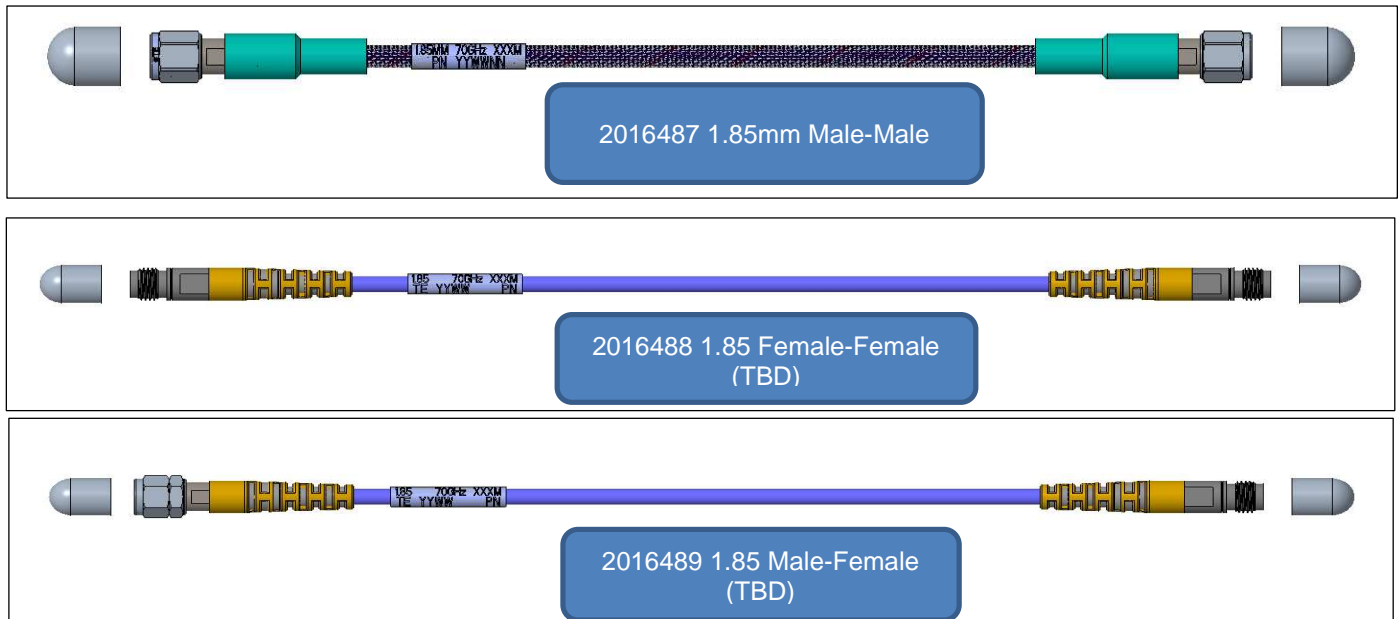
- 3.2.1 Connector: 1.85mm
- 3.2.2 Cable: Armor or without armor

3.3 Ratings

- 3.3.1 Voltage: 30 VAC RMS at sea level
- 3.3.2 Temperature Range: -40°C to 125 °C
- 3.3.3 Characteristic Impedance: 50 ohms Normal
- 3.3.4 Frequency Range: DC to 70 GHz

3.4 Performance Requirements and Test Description

Cable assembly of 1.85mm plug or socket, accurate and stable for all needs with guaranteed low loss value, RF leakage, phase stable, VSWR due to smallest form factor, good mechanical and physical stable characteristic,



3.5 Performance and Test Description

Products is designed to meet the electrical, mechanical and environmental performance requirements specified in upper Figure. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.6 Test Requirements and Procedures Summary (table 1)

Test Description	Requirement	Procedure
Initial examination of product	Meets requirements of product drawing.	EIA-364-18/IPC 620 class 2 Visual and dimensional (Certificate of Conformance) inspection per product drawing.
<b>ELECTRICAL</b>		
Impedance	50±2ohm	EIA-364-108/ IEC 60966-1. Measurement is made using a time domain reflectometer with input step applied to the cable assembly through an air line acting as an impedance reference per figure 1 (7ps risetime)
Insertion loss	Before and after test, Insertion loss can meet below: -4dB/m(0.01~18GHz), -4.5dB/m(18~25.6GHz), -7dB/m(25.6~65GHz), -7.2dB/m(65~70GHz)	EIA-364-101/IEC60966-1 Measurements shall be made using a suitable network analyser(70GHz or above) as figure2
Insertion loss stability	During and after the test, the specified change of IL shall not exceed 0.1dB Cable length and wound turns: <600mm            0.5turns 600mm~900mm    1.5turns 901mm~1200mm   2turns >1200mm           3turns	IEC60966-1 during measurement insertion loss, and wound cable on a mandrel (2inch; 2.5inch or 4inch diameter) of radius equal to the dynamic bending radius
Return Loss	Before and after mechanical test, The value can meet below, -25dB Min @DC~18GHz -22dB Min @18~25.6GHz -17.5dB Min @25.6~70GHz	EIA-364-108/IEC 60966-1 Measurements shall be made using a suitable network analyser(70GHz or above)as figure2
Shielding effectiveness (for cable)	No less than 90dB@DC~18GHz	IEC60966-1 According to IEC62153-4-7
<b>MECHANICAL</b>		
Interface dimension	The dimensions of the interface shall be in accordance with drawing or standard specification	IEEE287 GPC interface dimension
Centre contact captivation (for connector)	The permanent displacement of centre contact should meet interface dimension after remove the stress	IEC 61169-32/IEC 61169-1 An axial force 17.8N applied smoothly to the centre contact in both directions. An axial torque 0.04N.M applied smoothly to the centre contact in both directions
Coupling torque (for connector)	-Normal:0.8N.M TO 1.0N.M -Proof: 1.60N.M	IEEE287/IEC 61169-1 The test shall be carried out on connector coupling or with a gauge. 5cycles engagement and separation, shall be measured fifth cycle
Tensile strength of coupling mechanism (male connector)	Load 267N min keep 60s	IEC 61169-1 An axial tensile force shall be applied smoothly to mated connector pairs of coupling.

Test Description	Requirement	Procedure
Vibration, random (for connector)	No discontinuities of 1 microsecond or longer duration	IEC61169-1 section 9.3.3 or MIL-STD-202 Method 204, test condition D (20gs) Subject mated specimens to $98m/S^2$ , 10Hz~2000Hz, 10g, time to be 15minutes on each of three mutually perpendicular axes
Mechanical Shock (for connector)	No discontinuities of 1 microsecond or longer duration	IEC61169-1 section 9.3.14 or MIL-STD-202, method 213, test condition I (100gs) Subject mated specimens to $490m/s^2$ , 1/2 sine 11ms duration, 50g, 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks
Bending test-wound on mandrel	Before, during and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts: 0.1dB max @ (DC~18GHz, 18~25.6GHz, 25.6~70GHz) Phase shifts: 10 Degree max	Cable wrap 360 degree around Dia 114mm mandrel, keep 1 minute Refer to figure 3
Flexure test (Flex under load)	Before and After 2000cycles test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts: 0.1dB max @ (DC~18GHz, 18~25.6GHz, 25.6~70GHz) Phase shifts: 10 Degree max	IEC 60966-1 The test shall be performed using a fixture and load 2N Refer to figure 4
Bending test-bend on 4 different orientation	Before and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts: 0.1dB max @ (DC~18GHz, 18~25.6GHz, 25.6~70GHz) Phase shifts: 10 Degree max	Bend cable in 4 different direction as picture from SR end L=40mm, R=57mm, A=180° Refer to figure 8
Cable crushing test	Before and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts: 0.1dB max @ (DC~18GHz, 18~25.6GHz, 25.6~70GHz) Phase shifts: 10 Degree max	IEC 60966-1 Load force 440N/100mm, keep 1min Refer to figure 5
abrasion test of cable assembly (for cable)	cable sheath should not be damaged	IEC60966-1 section 9.7 cable assembly apply scrape fixture, 60cycles
Cable torque	The cable shall neither slip nor rotate in relation to the connectors, Before, during and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts: 0.1dB max @ (DC~18GHz, 18~25.6GHz, 25.6~70GHz) Phase shifts: 10 Degree max	IEC 60966-1 An axial torque 0.1N.m of specified magnitude shall be applied to the free end of straight cable for a duration of 60s min As figure 6

Test Description	Requirement	Procedure
Mechanical endurance (Durability test)	Before and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts:0.20dB max @ (DC~18GHz,18~25.6GHz,25.6~70GHz) Phase shifts: 4.5 Degree max	IEC 61169-32 Apply 500 cycles mating and dis- mating
<b>ENVIRONMENT</b>		
Heating and aging	Before and after test, the SI can meet: Impedance shifts: 0.15Ohm max Insertion Loss shifts:0.1dB max @ (DC~18GHz,18~25.6GHz,25.6~70GHz) Phase shifts: 10 Degree max	Apply samples on 60°C keep 336hours
Temperature Cycling (Thermal Shock)	Before and after test, the SI can meet: Impedance shifts: 0.5Ohm max Insertion Loss shifts:0.2dB max @ (DC~18GHz,18~25.6GHz,25.6~70GHz) Phase shifts: 16 Degree max	EIA-364-32, method A, condition I apply specimen on (-55°C-→+85°C 130min/cycle,5cycles)
Salt mist (for connector)	After test, the connector should be visual inspection, no change in appearance and any other damaged; engagement and separation shall be achievable by hand or normal manner	IEC 60068-2-11, Apply specimen on conditsalt mist 96hours

**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.*

## 3.8. Product Qualification and Requalification Test Sequence (Table 2)

Test or Examination	Test Group (a)						
	1	2	3	4	5	6	7
	Test Sequences (b)						
Initial Examination of Product	1	1	1	1	1	1	1
Visual inspection	2,7,12,17,22	2,7,12,17,22	2,7,12,17,22	2,7,12,17	2,7,12,17	2,8,14,20 22,24	2,4,6
Interface dimensions						3,9,15	
Impedance	3,8,13,18,23	3,8,13,18,23	3,8,13,18,23	3,8,13,18	3,8,13,18	3,10,16	
Return Loss	4,9,14,19,24	4,9,14,19,24	4,9,14,19,24	4,9,14,19	4,9,14,19	4,11,17	
Insertion Loss	5,10,15,20,25	5,10,15,20,25	5,10,15,20,25	5,10,15,20	5,10,15,20	5,12,18	
Screen effectiveness							3
Vibration						6	
Mechanical shock						7	
Bending test-wound on mandrel	16	16	16	11	11		
Flexure test	6						
Bending test-bend on 4 different orientation	21	21	21	16	16		
Abrasion test							5
Cable crushing test				6			
Centre contact captivation---axial force						13	
Coupling torque---proof						19	
Tensile strength of coupling mechanism						21	
Cable torque	11	11	11				
Mechanical endurance			6				
Heating and aging					6		
Temperature Cycling		6					
Salt mist						23	

**NOTE**

- (a) See paragraph 4.2  
(b) Numbers indicate sequence in which tests are performed.

**4. QUALITY ASSURANCE PROVISIONS**
**4.1. Test Conditions**

Unless otherwise specified, all the tests shall be performed in any combination of the following test conditions shown in table 3.

(Table 3)

Temperature	15°C – 35°C
Relative Humidity	45% – 75%
Atmospheric Pressure	86.6 – 106.6 kPa

#### 4.2. Qualification Testing

##### A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 1 Specimens.

##### B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in table2.

#### 4.3. Requalification Testing

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

#### 4.4. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

#### 4.5. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

### 5. ADDITIONAL



Figure 1

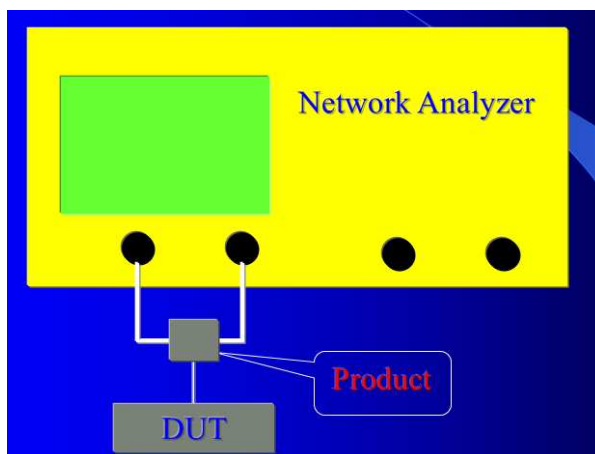


Figure 2

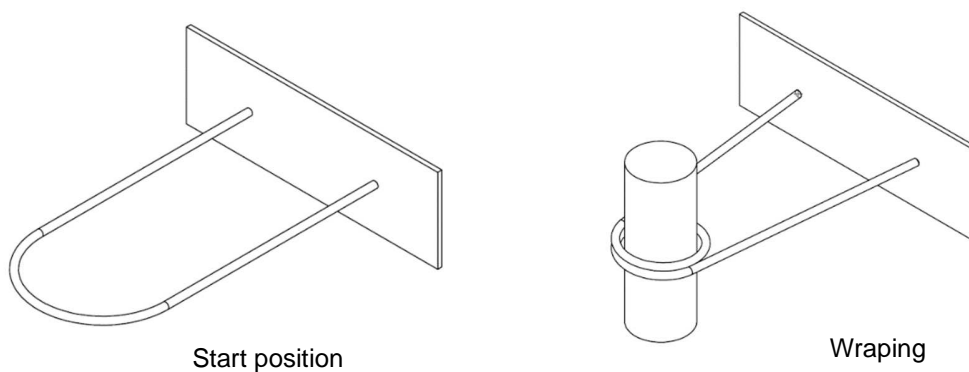


Figure 3

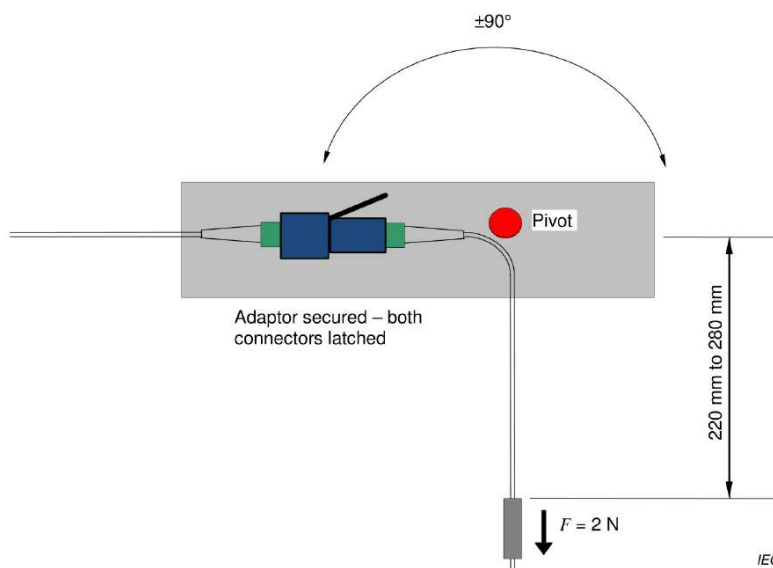


Figure4



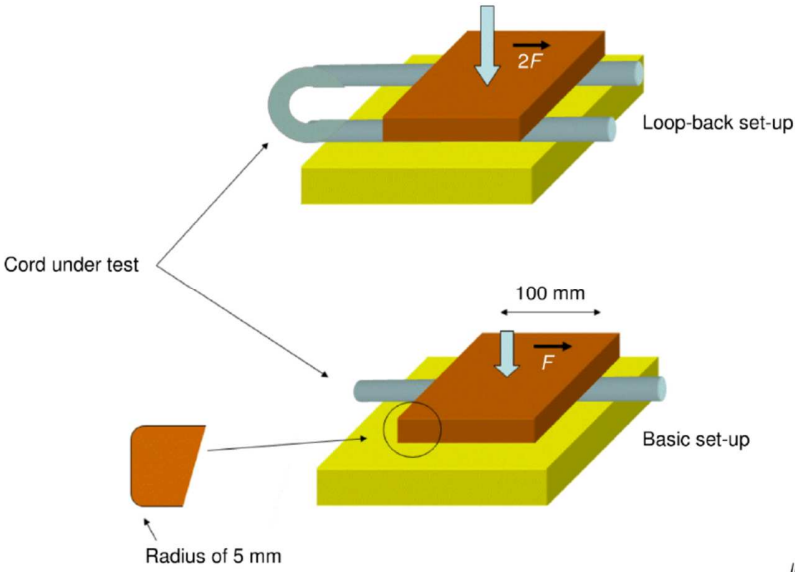


Figure 5



Figure 6

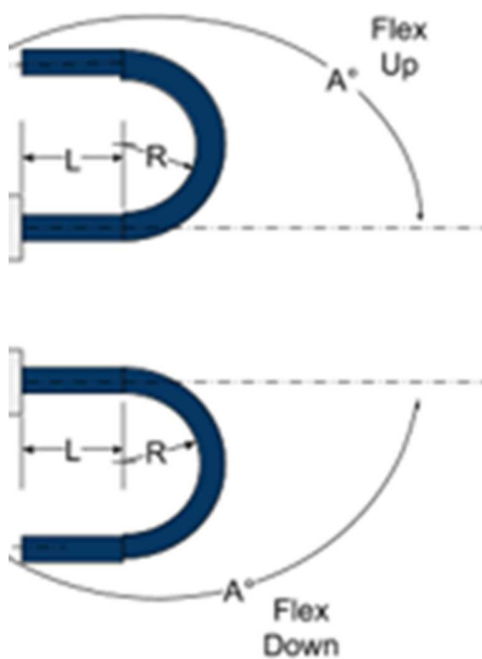


Figure 7

REV	DATE (DD-MM-YY)	CATEGORY	ADDITIONS, DELETIONS, CHANGES
1.0	08-July-2020	All	Preliminary version
1.1	18-Dec-2020	All	Corrected some error
1.2	05-Apr-2021	All	Followed "verification plan"
1.3	08-Apr-2021	All	Followed the latest verification plan to update
1.4	15-Apr-2021	All	Followed alignment to update
1.5	11-Jun-2021	All	Changed test Sequence