

## HMN-USB Insert Series

### 1. INTRODUCTION

#### 1.1 Purpose

This document provides the qualification summary of TE Connectivity HMN-USB series inserts.

#### 1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HMN-USB inserts. Testing was performed at the TE Shanghai Electrical Components Test Laboratory.

#### 1.3 Conclusion

Based on the test results, all meet the requirements according to TE Connectivity Design Objectives 108-137066

#### 1.4 Product Description

Name	Remarks
HMN-USB-M	Blank insert
HMN-USB-F	Insert with USB female module

#### 1.5 Qualification Test Sequence

Test or Examination	Test Group					
	A	B	C	D	E	F
	Test Sequence <sup>1)</sup>					
Visual and dimensional examination	1,7	1,5	1,3	1,11	1,8	1,6
Durability of marking	2					
Polarisation and coding (If application)	3					
USB PCBA assembly and USB patch cable retention force in module	4					
Module retention in frame	6					
Mechanical strength impact	5					
Mechanical Operation (Durability)		3				
Vibration, Random						3
Shock						4
Low Level Contact Resistance		2,4		2,8	2,5	2,5
Temperature Rise Test			2			
Dielectric Voltage Withstand Test				3,9	6	
Insulation Resistance				4,10	7	

Cold				5		
Dry Heat				6		
Damp Heat, cyclic					4	
Rapid Change of temperature (Temperature Cycle)					3	
Corrosion (Alternative)				7		

**Notes:**

- 1) Numbers indicate the sequence in which the tests are performed.

**2. TEST PROCEDURE**

<b>General</b>			
No.	Test Items	Requirements	Condition according to
2.1	Visual and dimensional examination	Meets requirements of product drawing	Visual and dimensional examination IEC 60512-1-1/-2, Test 1a and 1b 6.2 of EN 61984

<b>Mechanical</b>			
2.2	Durability of marking	Marking shall be still readable according to 6.2 of EN61984 (If marking made by impression, molding, pressing or engraving or the like are not subjected to this test)	Test piston: Size 1 Wet test with liquid: water Duration: 10 cycles Force:5N IEC 60068-2-70 Test Xb (7.3.2 of EN61984)
2.3	Polarisation and coding	For multi-pole connector, require provision against incorrect mating according to 6.3 & 6.9.1 of EN 61984 No damage likely to impair function	For unenclosed connector (internal connections) 20N For enclosed connector (external connections) 1.5 x Mating force, but not higher than 80Ns Test 13e of IEC 60512-13-5
2.4	USB PCBA assembly and USB patch cable retention force in module	No axial displacement likely to impair normal operation, min 50N force for USB PCBA assembly in HMN-USB-F and min 50N force for USB patch cable in HMN-USB-M 6.18.2 of EN 61984	Test load applied in axial direction, test speed:20mm/min. Test 15a of IEC 60512-15-1
2.5	Module retention in frame	Male module: minimum of 100 N Female module: minimum of 100 N  No axial displacement likely to impair normal operation.	Test load applied in axial direction, test speed:20mm/min. Test 15a of IEC 60512-15-1

2.6	Mechanical strength impact	Connector and internal insulation shall no damage to impair normal use. A reduction of clearance and creepage distance is not allowed. 6.18.1& 6.18.3 of EN 61984	Dropping height: - 750mm for specimens of mass ≤ 250g - 500mm for specimens of mass >250g Dropping cycles:8 positions in 45° step, one cycles per position IEC 60512-7-2 Test 7b
2.7	Mechanical Operation (Durability)	1500 operation cycles without load No damage likely to impair normal use 6.14.1 of EN 61984	Shall be engaged and disengaged by means of a device simulating normal operating conditions at the rate of 500 Max. cycles per hour IEC 60512-9-1 Test 9a 7.3.9 of EN 61984
2.8	Vibration, Random	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Frequency:5~150Hz Per EN 61373, Category 1, Class B (IEC60068-2-6 Test Fc)
2.9	Shock	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Acceleration:50m/s <sup>2</sup> Duration:30ms Total 18 shocks (three positive and three negative in each of the three orthogonal axes) Per EN 61373, Category 1, Class B

**Electrical**

2.10	Low Level Contact Resistance [Resistance from start points to the end points of contacts of HMN-USB-F module]	Initial	Max.120mΩ	EIA 364-23  Measure at to 20mV open circuit at 100mA maximum.
		Final	Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ. The higher value is permissible.	
2.11	Temperature Rise Test	Maximum temperature rise( $\Delta T$ ) less than 30°C		Length of test cable see table 7 of 7.3.8 of EN 61984 Rated current: 1A Max. IEC 60512-5-1 Test 5a
2.12	Dielectric Voltage Withstand Test	No flashover or breakdown of voltage 6.13 of EN 61984		Impulse test voltage according to Table 8, applied three impulses of each polarity and interval of at least 1s between impulses. 7.3.12 of EN 61984
2.13	Insulation Resistance	Not less than 400 MΩ		Test voltage 500V DC Time:60s IEC 60512-3-1 Test 3a Method B

Environmental			
2.14	Cold	No damage likely to impair function 6.6.3;6.8;6;15;6.18.3 of EN 61984	Subject mated specimen to -40°C Duration time:16h, Test Ab Per IEC 60512-11-10 Test 11j (IEC 60068-2-1)
2.15	Dry Heat	No damage likely to impair function 6.6.3;6.8;6;15;6.18.3 of EN 61984	Subject mated specimen to +70°C Duration time:168h Test Bb Per IEC 60512-11-9 Test 11i (IEC 60068-2-2)
2.16	Damp Heat, cyclic	No damage likely to impair function	Subject mated specimen to Min ambient temperature: 25°C Max ambient temperature: 45°C Number of cycles:21 Variant 1 IEC 60512-11-12 Test 11m
2.17	Rapid Change of temperature (Temperature Cycle)	No damage likely to impair function	Subject mated specimen to Ta=-40±2°C to Tb=+70±2°C, duration t1: 1h each extreme, 100 cycles IEC 60512-11-4 Test 11d (IEC 60068-2-14 Test Na)
2.18	Corrosion (Alternative)	No damage likely to impair function Per 6.21 of EN 61984	Test 1: Flowing mixed gas corrosion according to test 11g, method 1 or method 4 (Table 1) Duration time: 4days (96h) IEC 60512-11-7 Test 11g 7.3.14 of EN 61984
			Alternative: Test 2: Sulphur dioxide test with general condensation of moisture according to EN ISO 6988 Duration time:24h (1 test cycle) 7.3.14 of EN 61984

3. SUMMARY OF TEST RESULTS:

Examination of product – all test group

Test Group	Test Item	Requirement	Test Result	Judgment
Group A	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Durability of marking	Marking shall be readable	Marking still readable	Passed
	Polarisation and coding (If application)	Require provision against incorrect mating	No damage likely to impair function	Passed
	USB PCBA assembly and USB patch cable retention force in module	No axial displacement likely to impair normal operation.	No axial displacement likely to impair normal operation.	Passed
	Mechanical strength impact	No damage likely to impair function	No physical damage	Passed
	Module retention in frame	No axial displacement likely to impair normal operation.	No axial displacement likely to impair normal operation.	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group B	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Low Level Contact Resistance	Max.120mΩ	73.68 mΩ Max.	Passed
	Mechanical Operation (Durability)	After 1500 operation cycles No damage likely to impair normal use	No physical damage	Passed
	Low Level Contact Resistance	The contact resistance rise shall be no more than 50 % of the reference value or 5 mΩ. The higher value is permissible	4.37% Max.	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group C	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Temperature Rise Test	Maximum temperature rise( $\Delta T$ ) less than 30°C	9.90°C Max.	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group D	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Low Level Contact Resistance	Max.120mΩ	61.90 mΩ Max.	Passed
	Dielectric Voltage Withstand Test	No breakdown or flashover	No breakdown or flashover	Passed
	Insulation Resistance	Not less than 400MΩ	>0.79x10 <sup>10</sup> Ω	Passed
	Cold	No damage likely to impair function	No physical damage	Passed
	Dry Heat	No damage likely to impair function	No physical damage	Passed
	Corrosion	No damage likely to impair function	No physical damage	Passed
	Low Level Contact Resistance	The contact resistance rise shall be no more than 50 % of the reference value or 5 mΩ. The higher value is permissible	10.57% Max.	Passed
	Dielectric Voltage Withstand Test	No breakdown or flashover	No breakdown or flashover	Passed

	Insulation Resistance	Not less than 400MΩ	>0.339x10 <sup>10</sup> Ω	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group E	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Low Level Contact Resistance	Max.120mΩ	66.73 mΩ Max.	Passed
	Rapid Change of temperature (Temperature Cycle)	No damage likely to impair function	No physical damage	Passed
	Damp Heat, cyclic	No damage likely to impair function	No physical damage	Passed
	Low Level Contact Resistance	The contact resistance rise shall be no more than 50 % of the reference value or 5 mΩ. The higher value is permissible	2.12% Max.	Passed
	Dielectric Voltage Withstand Test	No breakdown or flashover	No breakdown or flashover	Passed
	Insulation Resistance	Not less than 400MΩ	>0.219x10 <sup>10</sup> Ω	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group F	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Low Level Contact Resistance	Max.120mΩ	64.34mΩ Max.	Passed
	Vibration, Random	No damage likely to impair function; No discontinuities greater than t>1μs	No physical damage; No electrical discontinuity greater than 1 μs	Passed
	Shock	No damage likely to impair function; No discontinuities greater than t>1μs	No physical damage; No electrical discontinuity greater than 1 μs	Passed
	Low Level Contact Resistance	The contact resistance rise shall be no more than 50 % of the reference value or 5 mΩ. The higher value is permissible	7.13% Max.	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed