

HMN-001 Ground Insert Series

1. INTRODUCTION

1.1 Purpose

This document provides the qualification summary of TE Connectivity HMN-001 ground insert series inserts.

1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HMN-001 ground 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 108-137570

1.4 Product Description

Name	Remarks
HMN-001-MP	HMN-001 GROUND INSERT, MALE
HMN-001-FP	HMN-001 GROUND INSERT, FEMALE

1.5 Qualification Test Sequence

Test or Examination	Test Group							
	A	B	C	D	E	F	G	H
	Test Sequence ¹⁾							
Visual and dimensional examination	1,6	1,5	1,3	1,9	1,3	1,7	1,8	1,3
Durability of marking	2							
Polarisation and coding (If application)	3							
Pull out force of terminations								2 ^c
^c Only for screw-type clamping contact connection								
Contact retention force in insert	4							
Mechanical strength impact	5							
Mechanical Operation (Durability)		3						
Vibration, Simulated long life random Category 1, Class B							3	
^a Vibration, Simulated long life random Category 2							4 ^a	
Shock							5	
^a Shock							6 ^a	
Contact Resistance		2,4		2,7		2,5	2,7	
Temperature Rise Test			2					
Insulation Resistance				3,8		6		
Provision for earthing-Grounding contact resistance (if applicable)					2			

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

Notes:

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

2. TEST PROCEDURE

General			
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

Mechanical			
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: No. 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 80N Test 13e of IEC 60512-13-5
2.4	Pull out force of terminations	See 6.6 of EN 61984	See 6.6 of EN 61984
	° Only for screw-type clamping contact connection	The conductor of the smallest and largest cross-sectional area shall not slip out of the clamping unit, and pull out force as specified in Table 3, and torque force as specified in Table 4 IEC 60999-1 or IEC 60999-2	Mechanical tests on the conductor connection as specified in 9.3~9.6 of IEC 60999-1 or IEC 60999-2
2.5	Contact retention force in insert	No axial displacement likely to impair normal operation, min 80N force for each pin or socket 6.18.2 of EN 61984	Test load applied in axial direction, test speed:20mm/min, permissible shift contacts of 1.0mm, 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 \leq 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)	500 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) a device simulating normal operating conditions at the speed of approximately 50mm/min B) manual mating/un-mating 300 Max. cycle per hour IEC 60512-9-1 Test 9a 7.3.9 of EN 61984
2.8	Vibration, Simulated long life random at increased levels	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 ^a	^a Vibration, Simulated long life random at increased levels	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Frequency:5~150Hz Per EN 61373, Category 2, (IEC60068-2-6 Test Fc)
2.10	Shock	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Acceleration:50m/s ² Duration:30ms Total 18 shocks (three positive and three negative in each of the three orthogonal axes), Per EN 61373
2.11 ^a	^a Shock	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Acceleration:300m/s ² Duration:18ms Total 18 shocks (three positive and three negative in each of the three orthogonal axes), Per EN 61373 Category 2

Electrical

2.12	Contact Resistance	Initial	Max.5m Ω	Test current: 1A Measure points ^b at the end of the termination Max three contacts per specimen plus protective earthing, if any IEC 60512-2-2 Test 2b
		Final	The change of contact resistance shall be no more than 50 % of the reference value or \leq 5 m Ω . The higher value is permissible	
2.13	Temperature Rise Test	The sum of the ambient temperature and the temperature rise (ΔT) of a connector shall not exceed the upper limiting temperature 6.16 of EN 61984		Length of test cable see table 7 of 7.3.8 of EN 61984 Carry its rated current Upper limiting temperature:125°C (Table 5b) IEC 60512-5-1 Test 5a

2.14	Insulation Resistance	Not less than 400MΩ	Test voltage 1000V DC Time:60s IEC 60512-3-1 Test 3a Method B
2.15	Provision for earthing-Grounding contact resistance (if applicable)	Resistance is less than or equal to 0.1 Ω 6.5.3 of EN 61984	Resistance between accessible metal parts and the earthing contact 7.3.13 of EN 61984

Environmental			
2.16	Cold	No damage likely to impair function	Subject mated specimen to -40℃ Duration time:16h, Test Ab Per IEC 60512-11-10 Test 11j (IEC 60068-2-1)
2.17	Dry Heat	No damage likely to impair function	Subject mated specimen to +125℃ Duration time:168h Test Bb Per IEC 60512-11-9 Test 11i (IEC 60068-2-2)
2.18	Damp Heat, cyclic	No damage likely to impair function	Subject mated specimen to Min ambient temperature: 25±2℃ Max ambient temperature: 40±2℃ Number of cycles:21 Duration time:12h+12h Variant 1 IEC 60512-11-12 Test 11m
2.19	Rapid Change of temperature (Temperature Cycle)	No damage likely to impair function	Subject mated specimen to Ta=-40±2℃ to Tb=+125±2℃, duration t1: 1h each extreme, 100 cycles IEC 60512-11-4 Test 11d (IEC 60068-2-14 Test Na)
2.20	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: 4day (96h) IEC 60512-11-7 Test 11g 7.3.14 of EN 61984
			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
^a test items are for the special application, for example: Rail application etc. ^b measuring point: at the conductors as close as possible to the termination, if this is not possible, the conductor resistance shall be recalculated. ^c test items are for themselves separate tests and are performed on new specimens.			

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	Not subjected to this test	Passed
	Polarisation and coding (If application)	Require provision against incorrect mating	Not application	Passed
	Contact retention force in insert	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
	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
	Contact Resistance	5mΩ Max.	0.203 mΩ Max.	Passed
	Mechanical Operation (Durability)	500 operation cycles without load No damage likely to impair normal use	No physical damage	Passed
	Contact Resistance	The change of contact resistance shall be no more than 50 % of the reference value or ≤ 5 mΩ. The higher value is permissible	0.025 mΩ 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(ΔT) less than 125°C	28.4°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
	Contact Resistance	5mΩ Max.	0.25 mΩ Max.	Passed
	Insulation Resistance	Not less than 400 MΩ	$>2.04 \times 10^{10}\Omega$	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
	Contact Resistance	The change of contact resistance shall be no more than 50 % of the reference value or ≤ 5 mΩ. The higher value is permissible	0.08 mΩ Max.	Passed
	Insulation Resistance	Not less than 400MΩ	$>4.41 \times 10^{10}\Omega$	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
	Provision for earthing-Grounding contact resistance (if applicable)	Resistance is less than or equal to 0.1 Ω	0.87 m Ω Max.	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
	Contact Resistance	5m Ω Max.	0.31 m Ω 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
	Contact Resistance	The change of contact resistance shall be no more than 50 % of the reference value or ≤ 5 m Ω . The higher value is permissible	0.02 m Ω Max.	Passed
	Insulation Resistance	Not less than 400M Ω	$>3.96 \times 10^{10} \Omega$	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group G	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
	Contact Resistance	5m Ω Max.	0.70 m Ω Max.	Passed
	Vibration, Random -Category 2	No damage likely to impair function; No discontinuities greater than $t > 1 \mu s$	No physical damage; No electrical discontinuity greater than 1 μs	Passed
	Shock -Category 2	No damage likely to impair function; No discontinuities greater than $t > 1 \mu s$	No physical damage; No electrical discontinuity greater than 1 μs	Passed
	Contact Resistance	The change of contact resistance shall be no more than 50 % of the reference value or ≤ 5 m Ω . The higher value is permissible	0.33 m Ω Max.	Passed
	Visual and dimensional examination	Meets requirements of product drawing	No physical damage	Passed
Group H	Pull out force of terminations For screw-type clamping contact connection	16mm ² : 100N Min	16mm ² : 294.7N Min	Passed