

HMN-020 series insert

1. INTRODUCTION

1.1 Purpose

This document provides the qualification summary of TE Connectivity HMN-020 series insert of HDC connector.

1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HMN-020 series insert. Testing was performed at the Shanghai Electrical Components Test Laboratory.

1.3 Conclusion

Based on the test results, all meet the requirements according to TE Connectivity Design Objectives 108-137063.

1.4 Product Description

| Name | Remarks |
|-----------|---------|
| HMN-020-M | |
| HMN-020-F | |

1.5 Qualification Test Sequence

| Test and Examination | Test Group | | | | | | |
|--|-----------------------------|-----|-----|------|-----|-----|-----|
| | A | B | C | D | E | F | G |
| | Test Sequence ¹⁾ | | | | | | |
| Visual and dimensional examination | 1,6 | 1,5 | 1,3 | 1,11 | 1,3 | 1,8 | 1,6 |
| Durability of marking | 2 | | | | | | |
| Polarisation and coding (If application) | 3 | | | | | | |
| Pull out force of terminations -- for Crimped connections | 7 ^a | | | | | | |
| Contact retention force in insert | 4 | | | | | | |
| Mechanical strength impact | 5 | | | | | | |
| Mechanical Operation (Durability) | | 3 | | | | | |
| Vibration, Random | | | | | | | 3 |
| Shock | | | | | | | 4 |
| 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 | | | | 7 | | | |
| Protection against electric shock | | | | | 2 | | |

*** Notes:**

- 1) Numbers indicate the sequence in which the tests are performed.
- 2) ^a test items are for themselves separate tests and are performed on new specimens.

2. TEST PROCEDURE

| General | | | |
|----------------|------------------------------------|---------------------------------------|---|
| No. | Description | Test procedure according | Requirements |
| 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: 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 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 |
| | ^a for Crimped connections | The conductor shall not slip out of crimp barrel and pull out force as specified in Table 1 of EN 60352-2 | Visual tests on the crimp barrel and tensile strength test of the crimp connection as specified in IEC 60352-2. |
| 2.5 | Contact retention force in insert | No axial displacement likely to impair normal operation, min 50N 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≤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, 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 ² Duration:30ms Total 18 shocks(three positive and three negative in each of the three orthogonal axes), Per EN 61373 |

| Electrical | | | | |
|------------|-----------------------------------|---|--|--|
| 2.10 | Contact Resistance | Initial | Max.5mΩ | Test current: 1A Measure pointsb 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 ≤5 mΩ. The higher value is permissible. | |
| 2.11 | 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 | |
| 2.12 | 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 400MΩ | Test voltage 1000V DC Time:60s IEC 60512-3-1 Test 3a Method B | |

| Environmental | | | |
|---|---|--|--|
| 2.14 | Cold | No damage likely to impair function | 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 | Subject mated specimen to +125°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 Duration time:12h+12h 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=+125±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: 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 |
| 2.19 | Protection against electric shock | no live parts shall be accessible by test finger, 6.4.2.2 or 6.4.2.3 of EN 61984 | Unenclosed connector. Test finger or 50mm sphere pressed with 20N against the surface as specified by the manufacture Mated specimen and socket connector (if application) 7.3.6.1 of EN 61984 |
| <p>^a test items are for themselves separate tests and are performed on new specimens.</p> <p>^b measuring point: at the conductors as close as possible to the termination, if this is not possible, the conductor resistance shall be recalculated.</p> | | | |

3. SUMMARY OF TEST RESULTS:

Examination of product – all test group

| Test Group | Test Item | Test Result | Requirement | Judgment |
|------------|--|---|---|----------|
| Group A | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Durability of marking | Marking shall be readable | Marking shall be readable | passed |
| | Polarisation and coding | No physical damage | require provision against incorrect mating | passed |
| | Contact retention force in insert | No axial displacement likely to impair normal operation | Axial displacement <1.0mm when test speed: 20mm/min, min 50N force for each pin or socket | passed |
| | Mechanical strength impact | No physical damage | No damage likely to impair function | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Terminations and connection methods -(Pull force) | For crimped connections 0.14mm ² contact: 27.71N 4.0mm ² contact: 337.37N | 0.14mm ² : 18N Min 4.0mm ² : 310N Min | passed |
| Group B | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Contact Resistance | 1.85 mΩ Max. | Max.5mΩ | passed |
| | Mechanical Operation (Durability) | No physical damage | After 500 operation cycles. No damage likely to impair normal use | passed |
| | Contact Resistance | 2.51 mΩ Max. | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ. The higher value is permissible | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| Group C | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Temperature Rise Test | 52.35 °C | The sum of the ambient temperature and the temperature rise≤125°C | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| Group D | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Contact Resistance | 1.85 mΩ Max. | Max.5mΩ | passed |
| | Dielectric Voltage Withstand Test | No physical damage | No damage likely to impair function | passed |
| | Insulation Resistance | >3.97x10 ¹¹ Ω | Not less than 400MΩ | passed |

| | | | | |
|------------------------------------|---|---------------------------------------|---|--------|
| | Cold | No physical damage | No damage likely to impair function | passed |
| | Dry Heat | No physical damage | No damage likely to impair function | passed |
| | Corrosion | No physical damage | No damage likely to impair function | passed |
| | Contact Resistance | 1.90 mΩ Max. | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ. The higher value is permissible | passed |
| | Dielectric Voltage Withstand Test | No breakdown or flashover | No breakdown or flashover | passed |
| | Insulation Resistance | >4.28x10 ¹¹ Ω | Not less than 400MΩ | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| Group E | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Protection against electric shock | No electric shock occurred | No electric shock | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| Group F | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Contact Resistance | 1.69 mΩ Max. | Max.5mΩ | passed |
| | Rapid Change of temperature (Temperature Cycle) | No physical damage | No damage likely to impair function | passed |
| | Damp Heat, cyclic | No physical damage | No damage likely to impair function | passed |
| | Contact Resistance | 4.93 mΩ Max. | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ. The higher value is permissible | passed |
| | Dielectric Voltage Withstand Test | No breakdown or flashover | No breakdown or flashover | passed |
| | Insulation Resistance | >7.49x10 ¹¹ Ω | Not less than 400MΩ | passed |
| Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed | |
| Group G | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |
| | Contact Resistance | 2.49 mΩ Max. | Max.5mΩ | passed |
| | Vibration, Random | No breakdown or flashover | No damage likely to impair function No discontinuities greater than t>1μs | passed |
| | Shock | No breakdown or flashover | No damage likely to impair function No discontinuities greater than t>1μs | passed |

| | | | | |
|--|------------------------------------|--------------------|---|--------|
| | Contact Resistance | 2.24 mΩ Max. | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ. The higher value is permissible | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |