

## HD series insert

### 1. INTRODUCTION

#### 1.1 Purpose

This document provides the qualification summary of TE Connectivity HD series insert of HDC connector.

#### 1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HD-064 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 108-137042.

#### 1.4 Product Description

| Name        | Remarks |
|-------------|---------|
| HDC-HD-064M |         |
| HDC-HD-064F |         |

#### 1.5 Qualification Test Sequence

| Test and Examination   | Test Group                  |     |     |      |     |     |     |
|--|-----------------------------|-----|-----|------|-----|-----|-----|
|  | A                           | B   | C   | D    | E   | F   | G   |
|  | Test Sequence <sup>1)</sup> |     |     |      |     |     |     |
| 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<br>-- for Crimped connections | 7 <sup>a</sup>              |     |     |      |     |     |     |
| 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) <sup>a</sup> test items are for themselves separate tests and are performed on new specimens.

**2. TEST PROCEDURE**

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

| <b>Mechanical</b> |                                      |   |  |
|-------------------|--------------------------------------|---|--|
| 2.2               | Durability of marking                | Marking shall be still readable according to 6.2 of EN61984<br>(If marking made by impression, molding, pressing or engraving or the like are not subjected to this test) | Test piston: No. 1<br>Wet test with liquid: water<br>Duration: 10 cycles<br>Force:5N<br>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<br>No damage likely to impair function                          | For unenclosed connector (internal connections) 20N<br>For enclosed connector (external connections) 1.5 x Mating force, but not higher than 80N<br>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  |
|                   | <sup>a</sup> 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.<br>6.18.1 & 6.18.3 of EN 61984 | Dropping height:<br>- 750mm for specimens of mass≤250g<br>- 500mm for specimens of mass>250g<br>Dropping cycles:8<br>positions in 45°step, one cycles per position<br>IEC 60512-7-2 Test 7b  |
| 2.7 | Mechanical Operation (Durability) | 500 operation cycles without load<br>No damage likely to impair normal use<br>6.14.1 of EN 61984  | Shall be engaged and disengaged by means of<br>A) a device simulating normal operating conditions at the speed of approximately 50mm/min<br>B) manual mating/un-mating 300 Max. cycle per hour<br>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<br>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><br>Duration:30ms<br>Total 18 shocks(three positive and three negative in each of the three orthogonal axes),<br>Per EN 61373   |

| Electrical |                                   |   |  |  |
|------------|-----------------------------------|---|--|--|
| 2.10       | Contact Resistance                | Initial   | Max.5mΩ  | Test current: 1A<br>Measure pointsb at the end of the termination<br>Max three contacts per specimen plus protective earthing, if any<br>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.<br>The higher value is permissible. |  |
| 2.11       | Temperature Rise Test             | The sum of the ambient temperature and the temperature rise ( $\Delta T$ ) of a connector shall not exceed the upper limiting temperature<br>6.16 of EN 61984 |  | Length of test cable see table 7 of 7.3.8 of EN 61984<br>Carry its rated current<br>Upper limiting temperature:125°C (Table 5b)<br>IEC 60512-5-1 Test 5a       |
| 2.12       | Dielectric Voltage Withstand Test | No flashover or breakdown of voltage<br>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.<br>7.3.12 of EN 61984         |
| 2.13       | Insulation Resistance             | Not less than 400MΩ   |  | Test voltage 1000V DC<br>Time:60s<br>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<br>Per IEC 60512-11-10 Test 11j<br>(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<br>Per IEC 60512-11-9 Test 11i<br>(IEC 60068-2-2)  |
| 2.16  | Damp Heat, cyclic                               | No damage likely to impair function  | Subject mated specimen to<br>Min ambient temperature: 25±2°C<br>Max ambient temperature: 40±2°C<br>Number of cycles:21<br>Duration time:12h+12h<br>Variant 1<br>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,<br>duration t1: 1h each extreme,<br>100 cycles<br>IEC 60512-11-4 Test 11d<br>(IEC 60068-2-14 Test Na)   |
| 2.18  | Corrosion (Alternative)                         | No damage likely to impair function<br>Per 6.21 of EN 61984                      | Test 1: Flowing mixed gas corrosion according to test 11g, method 1 or method 4 (Table 1)<br>Duration time: 4day (96h)<br>IEC 60512-11-7 Test 11g<br>7.3.14 of EN 61984                              |
|   |   |  | Test 2: Sulphur dioxide test with general condensation of moisture according to EN ISO 6988<br>Duration time:24h (1 test cycle)<br>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<br>Mated specimen and socket connector (if application)<br>7.3.6.1 of EN 61984 |
| <p><sup>a</sup> test items are for themselves separate tests and are performed on new specimens.</p> <p><sup>b</sup> 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<br>-(Pull force) | For crimped connections<br>0.14mm <sup>2</sup> contact: 28.46N<br>2.5 mm <sup>2</sup> contact: 300.28N | 0.14mm <sup>2</sup> : 18N Min<br>2.5mm <sup>2</sup> : 230N Min  | passed   |
| Group B    | Visual and dimensional examination                   | No physical damage   | Meets requirements of product drawing   | passed   |
|            | Contact Resistance                                   | 3.93 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                                   | 4.21 mΩ Max.   | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ.<br>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                                | 58.86 °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                                   | 4.83 mΩ Max.   | Max.5mΩ   | passed   |
|            | Dielectric Voltage Withstand Test                    | No physical damage   | No damage likely to impair function   | passed   |
|            | Insulation Resistance                                | >1.18x10 <sup>10</sup> 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                              | 5.84 mΩ Max.               | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ.<br>The higher value is permissible | passed |
|         | Dielectric Voltage Withstand Test               | No breakdown or flashover  | No breakdown or flashover   | passed |
|         | Insulation Resistance                           | >2.30x10 <sup>10</sup> 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                              | 3.53 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                              | 4.71 mΩ Max.               | The change of contact resistance shall be no more than 50 % of the reference value or ≤5 mΩ.<br>The higher value is permissible | passed |
|         | Dielectric Voltage Withstand Test               | No breakdown or flashover  | No breakdown or flashover   | passed |
|         | Insulation Resistance                           | >2.18x10 <sup>10</sup> Ω   | Not less than 400MΩ   | passed |
| Group G | Visual and dimensional examination              | No physical damage         | Meets requirements of product drawing   | passed |
|         | Contact Resistance                              | 3.77 mΩ Max.               | Max.5mΩ   | passed |
|         | Vibration, Random                               | No breakdown or flashover  | No damage likely to impair function<br>No discontinuities greater than >1μs   | passed |
|         | Shock   | No breakdown or flashover  | No damage likely to impair function<br>No discontinuities greater than >1μs   | passed |

|  |                                    |                    |  |        |
|--|------------------------------------|--------------------|--|--------|
|  | Contact Resistance                 | 4.98 mΩ Max.       | The change of contact resistance shall be no more than 50 % of the reference value or $\leq 5$ mΩ. The higher value is permissible | passed |
|  | Visual and dimensional examination | No physical damage | Meets requirements of product drawing  | passed |