

## HCM350 crimp series insert

### 1. INTRODUCTION

#### 1.1 Purpose

This document provides the qualification summary of TE Connectivity HCM350 crimp series insert of HDC connector.

#### 1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HCM350 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 108-137073.

#### 1.4 Product Description

| Name      | Remarks           |
|-----------|-------------------|
| HCM350-MC | Crimp termination |
| HCM350-FC | Crimp termination |

#### 1.5 Qualification Test Sequence

| Test or 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                           |     |     |      |     |     |     |
| Polarization and coding (If application) | 3                           |     |     |      |     |     |     |
| Pull out force of terminations           | 7 <sup>a</sup>              |     |     |      |     |     |     |
| Only for Crimped connections             |                             |     |     |      |     |     |     |
| 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 (Alternative)                         |  |  |   | 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

| General |                                    |                                       |   |
|---------|------------------------------------|---------------------------------------|---|
| No.     | Test Items                         | Requirements                          | Condition according to  |
| 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 |

| Mechanical |  |   |   |
|------------|--|---|---|
| 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: Size 1<br>Wet test with liquid: water<br>Duration: 10 cycles<br>Force:5N<br>IEC 60068-2-70 Test Xb<br>(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 80Ns<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> Only for crimp contact connection | The conductor shall not slip out of crimp barrel and pull out force as specified in NF F 00 363   | Visual tests on the crimp barrel and tensile strength test of the crimp connection as specified in NF F 00 363  |

|     |                                   |   |  |
|-----|-----------------------------------|---|--|
| 2.5 | Contact retention force in insert | Test load shall be three times the specified insertion force (mating) of one contact, whichever is less. The minimum test load shall not be less than 50 N.<br>6.18.2 of EN 61984 | Test load applied in axial direction, test speed:20mm/min, permissible shift contacts of 1.0mm,<br>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<br>7.3.9 of EN 61984 |
| 2.8 | Vibration, Random                 | No damage likely to impair function<br>No discontinuities greater than $t > 1\mu s$   | Frequency:5~150Hz<br>Per EN 61373, Category 1, Class B<br>(IEC60068-2-6 Test Fc)   |
| 2.9 | Shock                             | No damage likely to impair function<br>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.1mΩ   | Test current: 1A<br>Measure points <sup>b</sup> 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   | Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ |   |
| 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 400 MΩ | 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<br>6.6.3;6.8;6;15;6.18.3 of EN 61984         | Subject mated specimen to<br>-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<br>6.6.3;6.8;6;15;6.18.3 of EN 61984         | Subject mated specimen to<br>+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°C<br>Max ambient temperature: 45°C<br>Number of cycles:21<br>Variant 1<br>IEC 60512-11-12 Test 11m  |
| 2.17          | Rapid Change of temperature<br>(Temperature Cycle) | No damage likely to impair function  | Subject mated specimen to<br>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<br>(Alternative)                         | No damage likely to impair function<br>Per 6.21 of EN 61984                      | Test 1: Flowing mixed gas corrosion<br>according to test 11g, method 1 or<br>method 4 (Table 1)<br>Duration time: 4days (96h)<br>IEC 60512-11-7 Test 11g<br>7.3.14 of EN 61984                       |
|               |  |  | Alternative:<br>Test 2: Sulphur dioxide test with<br>general condensation of moisture<br>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 |

<sup>a</sup> test items are for themselves separate tests and are performed on new specimens.

<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.

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            | require provision against incorrect mating  | No damage likely to impair function                                       | Passed   |
|            | Contact retention force in insert  | Test load shall be three times the specified insertion force (mating) of one contact or the specified insertion force of one contact plus 50 N, whichever is less. The minimum test load shall not be less than 20 N. | 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   |
|            | Pull out force of terminations     | 35mm <sup>2</sup> : 2800N Min<br>120mm <sup>2</sup> : 5200N Min   | 35mm <sup>2</sup> : >3700N<br>120mm <sup>2</sup> : >5900N                 | Passed   |
|            | For crimp contact connection       |   |   |          |
| Group B    | Visual and dimensional examination | Meets requirements of product drawing   | No physical damage  | Passed   |
|            | Contact Resistance                 | Max. 1mΩ  | 0.11mΩ Max.   | Passed   |
|            | Mechanical Operation (Durability)  | After 500 operation cycles No damage likely to impair normal use  | No physical damage  | Passed   |
|            | Contact Resistance                 | Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ   | 0.11mΩ 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              | The sum of the ambient temperature and the temperature rise ≤125°C<br>[35mm <sup>2</sup> current rating: 125A<br>120mm <sup>2</sup> current rating: 350A]   | 35mm <sup>2</sup> Δ T:Max 43.03 °C<br>120mm <sup>2</sup> Δ T:Max 60.73 °C | 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                 | Max. 1mΩ  | 0.11 mΩ Max.  | Passed   |
|            | Dielectric Voltage Withstand Test  | No breakdown or flashover   | No breakdown or flashover   | Passed   |
|            | Insulation Resistance              | Not less than 400MΩ   | >1.16x10 <sup>12</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   |

|         |   |   |  |        |
|---------|---|---|--|--------|
|         | Contact Resistance                              | Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ | 0.11 mΩ Max.   | Passed |
|         | Dielectric Voltage Withstand Test               | No breakdown or flashover   | No breakdown or flashover  | Passed |
|         | Insulation Resistance                           | Not less than 400MΩ   | >2.3×10 <sup>12</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 |
|         | Protection against electric shock               | No live part shall be accessible  | No live parts was accessible.  | 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                              | Max.1mΩ   | 0.09 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 |
|         | Contact Resistance                              | Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ | 0.09 mΩ Max.   | Passed |
|         | Dielectric Voltage Withstand Test               | No breakdown or flashover   | No breakdown or flashover  | Passed |
|         | Insulation Resistance                           | Not less than 400MΩ   | >1.15×10 <sup>12</sup> Ω   | 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                              | Max.5mΩ   | 0.2 mΩ Max.  | Passed |
|         | Vibration, Random                               | No damage likely to impair function;<br>No discontinuities greater than t>1μs                       | No physical damage;<br>No electrical discontinuity greater than 1 μs | Passed |
|         | Shock   | No damage likely to impair function;<br>No discontinuities greater than t>1μs                       | No physical damage;<br>No electrical discontinuity greater than 1 μs | Passed |
|         | Contact Resistance                              | Deviation of the contact resistance shall be no more than 50% of the initial reference value or 5mΩ | 0.2 mΩ Max.  | Passed |
|         | Visual and dimensional examination              | Meets requirements of product drawing   | No physical damage   | Passed |