# HK6/36 & HK12/2 inserts

## 1. INTRODUCTION

### 1.1 Purpose

This document provides the qualification summery of TE Connectivity HK6/36 & HK12/2 inserts of HDC connector.

### 1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of HK6/36-042 & HK12/2-014 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 108-137053.

### 1.4 Product Description

| Name | Remarks |
|---|---|
| HDC-HK12/2-014M | |
| HDC-HK12/2-014F | |
| HDC-HK6/36-042M | |
| HDC-HK6/36-042F | |

### 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<br>-- 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 | | | | |

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|---|---|---|---|---|---|---|---|
| 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<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, 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 |
| | [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.<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 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>1μs | 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 No discontinuities greater than t>1μs | Acceleration:50m/s$^2$<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 | For Signal: Max.5 mΩ<br>For Power: Max.3 mΩ | 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 (△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℃ (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<br>HK12/2:<br>For Power : 8 KV<br>For Signal : 4 KV<br>HK6/36:<br>For Power : 8 KV<br>For Signal : 2.5 KV | | 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<br>-40℃ 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<br>+125℃ 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℃<br>Max ambient temperature: 45℃<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<br>Ta=-40±2℃ to Tb=+125±2℃,<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 |

[a] test items are for themselves separate tests and are performed on new specimens.
[b] 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 | | 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 |
| | Pull out force of terminations | For crimped connections | 0.14mm$^2$ contact: 28.46N<br>2.5 mm$^2$ contact: 300.28N | 0.14mm$^2$: 18N Min<br>2.5mm$^2$: 230N Min | passed |
| Group B | Visual and dimensional examination | | No physical damage | Meets requirements of product drawing | passed |
| | Contact Resistance | | HK12/2:<br>For Signal: 2.49 mΩ Max.<br>For Power: 0.85 mΩ Max.<br>HK6/36:<br>For Signal: 2.80 mΩ Max.<br>For Power: 0.94 mΩ Max. | For Signal: Max.5 mΩ<br>For Power: Max.3 mΩ | passed |
| | Mechanical Operation (Durability) | | No physical damage | After 500 operation cycles,<br>No damage likely to impair normal use | passed |
| | Contact Resistance | | HK12/2:<br>For Signal: 5.18 mΩ Max.<br>For Power: 1.69 mΩ Max.<br>HK6/36:<br>For Signal: 5.85 mΩ Max.<br>For Power: 1.74 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 | | 55.56 ℃ | The sum of the ambient temperature and the temperature rise≤125℃ | 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 | HK12/2:<br>For Signal: 3.15 mΩ Max.<br>For Power: 0.96 mΩ Max.<br>HK6/36:<br>For Signal: 2.92 mΩ Max.<br>For Power: 0.82 mΩ Max. | For Signal: Max.5 mΩ<br>For Power: Max.3 mΩ | passed |
| | Dielectric Voltage Withstand Test | No physical damage | No damage likely to impair function | passed |
| | Insulation Resistance | >1.17x10$^{12}$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 | HK12/2:<br>For Signal: 3.48 mΩ Max.<br>For Power: 1.31 mΩ Max.<br>HK6/36:<br>For Signal: 4.61 mΩ Max.<br>For Power: 1.18 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 | >8.53x10$^{11}$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 | HK12/2:<br>For Signal: 2.67 mΩ Max.<br>For Power: 0.83 mΩ Max.<br>HK6/36:<br>For Signal: 2.62 mΩ Max.<br>For Power: 0.89 mΩ Max. | For Signal: Max.5 mΩ<br>For Power: Max.3 mΩ | 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 | HK12/2:<br>For Signal: 3.90 mΩ Max.<br>For Power: 1.12 mΩ Max.<br>HK6/36:<br>For Signal: 4.16 mΩ Max.<br>For Power: 1.71 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 | >5.42x10$^{11}$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 | HK12/2:<br>For Signal: 2.86 mΩ Max.<br>For Power: 0.94 mΩ Max.<br>HK6/36:<br>For Signal: 3.02 mΩ Max.<br>For Power: 1.03 mΩ Max. | For Signal: Max.5 mΩ<br>For Power: Max.3 mΩ | passed |
| | Vibration, Random | No breakdown or flashover | No damage likely to impair function<br>No discontinuities greater than t>1μs | passed |
| | Shock | No breakdown or flashover | No damage likely to impair function<br>No discontinuities greater than t>1μs | passed |
| | Contact Resistance | HK12/2:<br>For Signal: 3.57 mΩ Max.<br>For Power: 1.32 mΩ Max.<br>HK6/36:<br>For Signal: 3.89 mΩ Max.<br>For Power: 1.14 mΩ Max. | The change of contact resistance shall be no more than 50 % of the reference value or<br>≤5 mΩ.<br>The higher value is permissible | passed |
| | Visual and dimensional examination | No physical damage | Meets requirements of product drawing | passed |