# New Generation Grace Inertia Connector 3.3

## 1. INTRODUCTION

### 1.1 Purpose

The purpose of this test is to evaluate the performance of New Generation Grace Inertia Connector 3.3 where the raw material of Rec terminal (1983780-1) is changed from 3-704937-3 to 2-705758-5 for VAVE (TEBIT 245347). Testing was performed on below products to determine its compliance with the requirements of 108-106094 Rev. D.

### 1.2 Scope

This specification covers the electrical, mechanical, and environmental performance for New Generation Grace Inertia Connector 3.3. Testing was performed at TE Connectivity Shanghai Electrical Test Laboratory (Building ID 554) between 2021-03-25 and 2021-04-12.
The associated test number is TP-21-00620.

### 1.3 Conclusion

Based on the test results, all samples meet the requirement according to customer requirement.
The results in this report only effect on the sampling specimens.

### 1.4 Test Specimens

Specimens with the following part numbers were used for test:

| Test Group | Part No. | Description | Qty. (pcs) |
|---|---|---|---|
| 1 | 1983780-1 | New GIC 3.3 Rec contact with 24AWG UL1015 | 5 |
| | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 5 |
| | 1983780-1 | New GIC 3.3 Rec contact with 22AWG UL1007 | 5 |
| 2 | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 15 |
| | 1-1971906-7 | NEW GIC 3.3 HEADER ASSY 14POS | 3 |
| 3 | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 70 |
| | 1-1971905-7 | NEW GIC 3.3 PLUG HOUSING 14POS | 5 |
| | 1-1971906-7 | NEW GIC 3.3 HEADER ASSY 14POS | 5 |
| 4 | 1-1971905-6 | NEW GIC 3.3 PLUG HOUSING 12POS | 9 |
| | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 36 |
| | 1983780-1 | New GIC 3.3 Rec contact with 22AWG UL1007 | 36 |
| | 1983780-1 | New GIC 3.3 Rec contact with 24AWG UL1015 | 36 |
| | 1-1971906-6 | NEW GIC 3.3 HEADER ASSY 12POS | 9 |
| 5 | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 42 |
| | 1-1971906-7 | NEW GIC 3.3 HEADER ASSY 14POS | 3 |
| | 1-1971905-7 | NEW GIC 3.3 PLUG HOUSING 14POS | 3 |
| 6 | 1-1971906-7 | NEW GIC 3.3 HEADER ASSY 14POS | 3 |
| | 1-1971905-7 | NEW GIC 3.3 PLUG HOUSING 14POS | 3 |
| | 1983780-1 | New GIC 3.3 Rec contact with 20AWG UL1007 | 42 |

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1.5 Test Sequence

| Test Item | Test Group | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | Test Sequence | | | | | |
| Contact Insertion Force | | | 2 | | | |
| Crimp Tensile Strength Test | 2 | | | | | |
| Dielectric Withstanding Voltage | | | | | 8 | |
| Dry Heat | | | | | | 3 |
| Durability Test | | 4 | 6 | | | |
| Examination of Product | 1,3 | 1,7 | 1,10 | 1,3 | 1,5 | 1,4 |
| Humidity and Temperature Cycling | | | | | 4 | |
| Insulation Resistance | | | | | 3,7 | |
| Low Level Contact Resistance | | | 4,7 | | 2,6 | 2,5 |
| Mating Force | | 2,5 | 3 | | | |
| Retention Force Test | | | 9 | | | |
| Temperature Rise | | | | 2 | | |
| Unmating Force | | 3,6 | 5,8 | | | |

Note: a). Test group defined per customer requirement.
b). Numbers indicate sequence in which tests are performed.

1.6 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15 °C to 35 °C
Relative Humidity: 25 % to 75 %

## 2. TEST PROCEDUES

**2.1 Contact Insertion Force**
Measure the force required to insert contact into housing.
Requirements: 8.82 N Max. per contact
Test Method: EIA-364-05C-2020

**2.2 Crimp Tensile Strength Test**
Apply an axial pull-off load to crimped wire of contact secured on the tester. Operation speed: 100 mm/min. Subject take insulation barrel away.
Requirement: 58.8 N min. for 20 AWG, 49 N min. for 22 AWG, 29.4 N min. for 24 AWG
Test Method: EIA-364-08C-2015

**2.3 Dielectric Withstanding Voltage**
Apply a test potential of 1.5 kV AC for 1 minute. Test between adjacent circuits and between the surface of housing and contact of mated connectors. Current leakage: 5 mA Max.
Requirements: No breakdown of flashover shall occur.
Test Method: EIA-364-20F-2019

**2.4 Dry Heat**
Mated specimens were exposed to a temperature of 105 °C for 96 hours.
Requirement: No evidence of physical damage was visible.
Test Method: EIA-364-17C-2011

**2.5 Durability Test**
Specimens were mated and unmated 30 times at a maximum rate of 600 cycles per hour.
Requirement: No evidence of physical damage was visible.
Test Method: EIA-364-09D-2018

**2.6 Examination of Product**
Visual inspection of product.
Requirement: No evidence of physical damage was visible.

Test Method: EIA-364-18B-2017

**2.7 Humidity and Temperature Cycling**
Mated specimens were exposed to 10 cycles (10 days) of humidity-temperature cycling. Each cycle consisted of temperature between 25 °C and 65 °C and humidity between 80 %RH~90 %RH.
Requirement: No evidence of physical damage was visible.
Test Method: MIL-STD-202G, Method 106 Condition D

**2.8 Insulation Resistance**
Impressed a test voltage of 500 V DC. Test between adjacent circuits and between the surface of housing and contact of mate connectors.
Requirement: 1000 MΩ minimum for initial measurement, 500 MΩ minimum for final measurement.
Test Method: EIA-364-21E-2014

**2.9 Low Level Contact Resistance**
Measure and record the contact resistance with a test current of 100 milliamperes maximum and 20 millivolts open circuit (source) voltage maximum.
Requirement: 10 milliohms maximum for initial measurement.  20 milliohms maximum for final measurement.
Test Method: EIA-364-23C-2006

**2.10 Connector Mating force**
Measure the force required to mate connectors without Housing Lock. Operation speed:100mm/min.
Requirement: Mating force: (5.88×14 Pos.) N = 82.32 N Max.
Test Method: EIA-364-13E-2011

**2.11 Contact Mating force**
Measure the force required to mate contacts. Operation speed:100mm/min.
Requirement: Mating force: 5.88 N Max. ($1^{st}$～$30^{th}$)
Test Method: EIA-364-13E-2011

**2.12 Retention Force Test**
Apply an axial pull-off load to crimped wire. Operation speed: 100mm/min.
Requirements:19.8 N (2kgf) Min. without TPA for all Wire Size
Test Method: TE 109-39 A

**2.13 Temperature Rise**
Measure temperature rising by energized current. Subject measurement must do at the place of no influence from convection of air. And contacts shall be assembled in housing all of circuits. The thermocouple shall be attached to the contact of center circuit number. Under loaded specified current as followed: 3.5 A for 20 AWG; 2.5 A for 22 AWG; 2.2 A for 24 AWG.
Requirement: 30 ºC Max.
Test Method: EIA-364-70C-2014

**2.14 Connector Unmating Force**
Measure the force required to un-mate connectors without housing lock. Operation speed:100mm/min.
Requirement: (0.58×14 Pos.) N= 8.12 N Min. (1st), (0.29×14 Pos.) N= 4.06 N Min. (30th)
Test Method: EIA-364-13E-2011

**2.15 Contact Unmating Force**
Measure the force required to un-mate contacts. Operation speed:100mm/min.
Requirement: 0.34 N (1st), 0.25 N (30th)
Test Method: EIA-364-13E-2011

## 3. SUMMARY OF TEST

| Group | SN | Description | Test Item | Qty(pcs) | Test Result | | | | Requirement | Conclusion | View |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Max | Min | Avg | Unit | | | |
| 1 | 1 | / | Examination of Product | 5 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | 20 AWG | Crimp Tensile Strength Test | 5 | 88.3 | 75.5 | 83.1 | N | 58.8 N Min. | Meet Spec. | View |

| Group | SN | Description | Test Item | Qty(pcs) | Test Result | | | | Requirement | Conclusion | View |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Max | Min | Avg | Unit | | | |
| | 2 | 22 AWG | Crimp Tensile Strength Test | 5 | 78.4 | 56.1 | 71.0 | N | 49 N Min. | Meet Spec. | View |
| | 2 | 24 AWG | Crimp Tensile Strength Test | 5 | 49.4 | 40.5 | 44.2 | N | 29.4 N Min. | Meet Spec. | View |
| | 3 | / | Examination of Product | 5 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| 2 | 1 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | 1st- Mating | Mating Force | 3 | 2.2 | 1.5 | 1.9 | N | 5.88 N Max. | Meet Spec. | View |
| | 3 | 1st - Unmating | Unmating Force | 3 | 1.6 | 0.8 | 1.1 | N | 0.34 N Min. | Meet Spec. | View |
| | 4 | / | Durability Test | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 5 | 30th-Mating | Mating Force | 3 | 2.5 | 1.3 | 1.9 | N | 5.88 N Max. | Meet Spec. | View |
| | 6 | 30th- Unmating | Unmating Force | 3 | 1.8 | 0.8 | 1.2 | N | 0.25 N Min. | Meet Spec. | View |
| | 7 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| 3 | 1 | / | Examination of Product | 5 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | / | Contact Insertion Force | 5 | 8.6 | 4.1 | 6.3 | N | 8.82 N Max. | Meet Spec. | View |
| | 3 | / | Mating force | 5 | 34.4 | 33.5 | 33.9 | N | 82.32 N Max. | Meet Spec. | View |
| | 4 | / | Low Level Contact Resistance | 5 | 5.43 | 3.51 | 4.40 | mΩ | 10 mΩ Max. | Meet Spec. | View |
| | 5 | 1st - Unmating | Unmating Force | 5 | 23.8 | 20.9 | 22.7 | N | 8.12 N Min. | Meet Spec. | View |
| | 6 | / | Durability Test | 5 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 7 | / | Low Level Contact Resistance | 5 | 6.66 | 4.10 | 4.73 | mΩ | 20 mΩ Max. | Meet Spec. | View |
| | 8 | 30th- Unmating | Unmating Force | 5 | 30.5 | 20.5 | 24.2 | N | 4.06 N Min. | Meet Spec. | View |
| | 9 | / | Retention Force Test | 5 | 40.9 | 20.2 | 30.1 | N | 19.8 N Min. | Meet Spec. | View |
| | 10 | / | Examination of Product | 5 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| 4 | 1 | / | Examination of Product | 9 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | 24 AWG | Temperature Rise | 3 | 14.1 | 12.3 | 13.4 | ℃ | 30 ℃ Max. | Meet Spec. | View |
| | 2 | 22 AWG | Temperature Rise | 3 | 15.2 | 12.3 | 14.0 | ℃ | 30 ℃ Max. | Meet Spec. | View |
| | 2 | 20 AWG | Temperature Rise | 3 | 24.4 | 15.5 | 20.1 | ℃ | 30 ℃ Max. | Meet Spec. | View |
| | 3 | / | Examination of Product | 9 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| 5 | 1 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | / | Low Level Contact | 3 | 5.60 | 3.97 | 4.44 | mΩ | 10 mΩ Max. | Meet Spec. | View |

| Group | SN | Description | Test Item | Qty(pcs) | Test Result | | | | Requirement | Conclusion | View |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Max | Min | Avg | Unit | | | |
| | | | Resistance | | | | | | | | |
| | 3 | / | Insulation Resistance | 3 | 7.48 | 1.15 | 2.56 | $10^{12}$ Ω | 1000 MΩ Min. | Meet Spec. | View |
| | 4 | / | Humidity and Temperature Cycling | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 5 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 6 | / | Low Level Contact Resistance | 3 | 6.16 | 3.97 | 4.47 | mΩ | 20 mΩ Max. | Meet Spec. | View |
| | 7 | / | Insulation Resistance | 3 | 72.77 | 6.84 | 16.70 | $10^{8}$ Ω | 500 MΩ Min. | Meet Spec. | View |
| | 8 | / | Dielectric Withstanding Voltage | 3 | No breakdown or flashover. | | | / | No breakdown or flashover. | Meet Spec. | View |
| 6 | 1 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 2 | / | Low Level Contact Resistance | 3 | 4.86 | 3.97 | 4.48 | mΩ | 10 mΩ Max. | Meet Spec. | View |
| | 3 | / | Dry Heat | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 4 | / | Examination of Product | 3 | No physical damage. | | | / | No physical damage. | Meet Spec. | View |
| | 5 | / | Low Level Contact Resistance | 3 | 5.02 | 3.62 | 4.26 | mΩ | 20 mΩ Max. | Meet Spec. | View |

## 4. VALIDATION

Requested by:

Kim, Sung Chul
_____ 2021-03-11
TE Connectivity Product Engineering

Prepared by:

Qi Qinyan
_____ 2021-04-16
TE Connectivity Shanghai Electrical Components Test Lab.

Approved by:

Harlan Wu
_____ 2021-04-16
Test Manager
TE Connectivity Shanghai Electrical Components Test Lab.

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