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HARWiN

# Test Report Summary

## HT04302

Electrical, Mechanical & Environmental Testing of
M300 Connector Series

# 1. Introduction

## 1.1. Description and Purpose

The Harwin M300 Series is a range of High Reliability 5 & 10A Power connectors on a 3mm pitch. The following tests were carried out to establish or validate the claims made in Component Specification CO48XX (where XX is issue 01, 02 etc.).

## 1.2. Conclusion

The following data has been collated from Harwin test report 1106, with additional dimensional verification to be found in reports 1089-92, 1097-99 and 1101. The connectors met the test requirements – all electrical, mechanical and environmental requirements were fulfilled. These results are representative of all the M300 Series connectors. Further information available on request – please contact technical@harwin.com.

# 2. Test Method, Requirements and Results

## 2.1. Specification Parameters

Tests were carried out in accordance with the following standards:

| Testing Standard | Description of Test | Section | Page No. |
|---|---|---|---|
| EIA-364-01B: 2000 | Acceleration: Test Condition A | 2.3.1. | 3 |
| EIA-364-05B: 1998 | Contact Insertion, Release and Removal force in Housing | 2.3.2., 2.3.3. | 4 |
| EIA-364-08B: 1998 | Crimp Tensile Strength | 2.3.4. | 5 |
| EIA-364-09C: 1999 | Durability (Mechanical Operations) | 2.3.5. | 6 |
| EIA-364-13C: 2006 | Mating and Un-mating Forces: Test Method B | 2.3.6. | 6 |
| EIA-364-17B: 1999 | Temperature Life: Test Method A, Condition 6D | 2.3.7. | 7 |
| EIA-364-20C: 2004 | Withstanding Voltage (Proof): Test Method B, Conditions I & IV | 2.3.8. | 8 |
| EIA-364-21C: 2000 | Insulation Resistance | 2.3.9. | 8 |
| EIA-364-23B: 2000 | Low Level Contact Resistance | 2.3.10. | 8-9 |
| EIA-364-28D: 2006 | Vibration: Test Condition II and IV | 2.3.11. | 9-10 |
| EIA-364-31B: 2000 | Humidity (Damp Heat): Test Method II, Conditions A and D | 2.3.12. | 10 |
| EIA-364-32C: 2000 | Thermal Shock (Temperature Cycling): Test Condition V | 2.3.13. | 11 |
| EIA-364-70A: 1998 | Temperature Rise v. Current (Power Rating): Test Method 2 | 2.3.14. | 11-13 |
| BS EN 60068-2-27: 2009 ‡ | Environmental Testing (Bump and Shock) | 2.3.15., 2.3.16. | 14 |

‡ BS EN 60068-2-27 is a replacement for obsolete standard EIA-364-27B – Bump and Shock

## 2.2. List of Test Samples

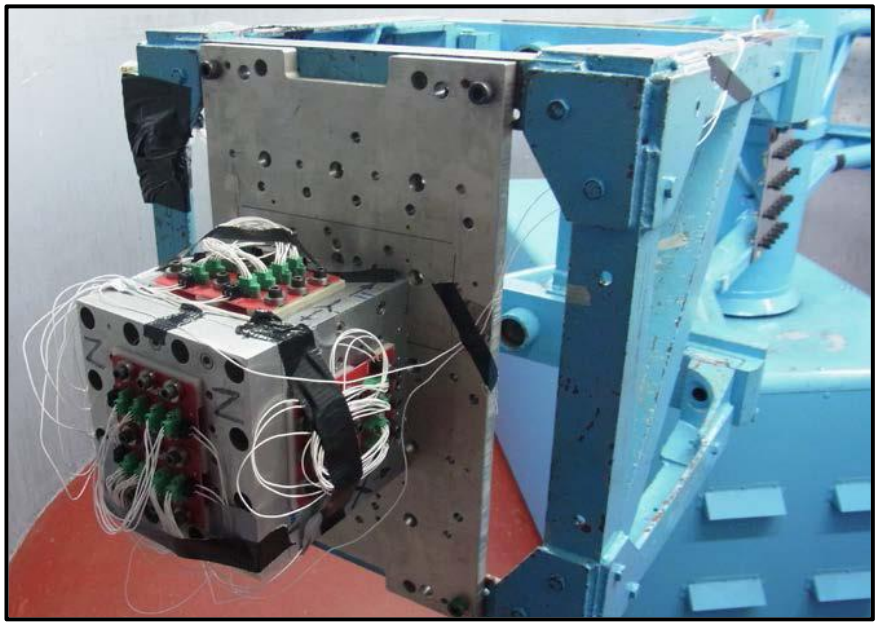
All testing was carried out using standard parts. For the mating force testing, Female Jackscrews were removed.

- M300-FV1034500 - Female Vertical SIL 3 Position PC Tail Connector
- M300-FV3064500 - Female Vertical DIL 6 Position PC Tail Connector
- M300-MV10345M1 - Male Vertical SIL 3 Position PC Tail Connector with Jackscrew
- M300-MV30645M1 - Male Vertical DIL 6 Position PC Tail Connector Jackscrew
- M300-0010045 - Female 18/20 AWG Cable Crimp Contacts
- M300-0020045 - Female 22 AWG Cable Crimp Contacts
- M300-1010045 - Male 18/20 AWG Cable Crimp Contacts
- M300-1020045 - Male 22 AWG Cable Crimp Contacts
- M300-2240600F2 - Female Cable DIL 6 Position Housing with Jackscrew
- M300-2250300F2 - Female Cable SIL 3 Position Housing with Jackscrew
- M300-3240600M1 - Male Cable DIL 6 Position Housing with Jackscrew
- M300-3250300M1 - Male Cable SIL 3 Position Housing with Jackscrew

## 2.3. Test Method and Results

### 2.3.1. Acceleration: EIA-364-01B: 2000, Test Condition A

Methodology: 2 samples of all types of connectors listed in section 2.2 in Cable-to-Board combinations, with a minimum of 200mm free length of 22AWG wire assembled to the cable connectors. Mated pairs are mounted to the test equipment as shown. During this test, the samples were monitored continuously for discontinuity with a constant current source of 100mA DC. Parts were visually inspected for damage after testing.



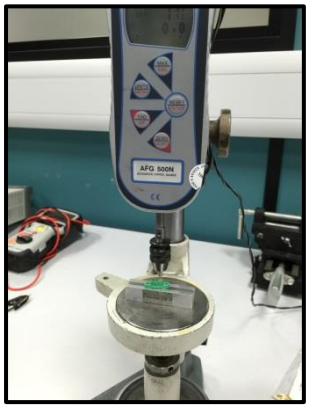
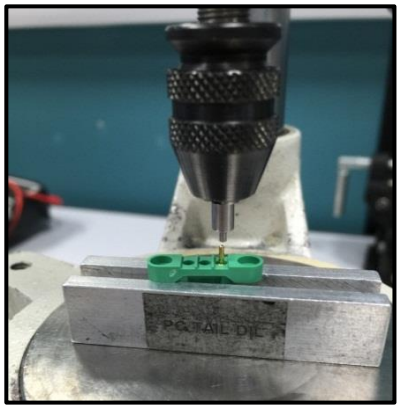
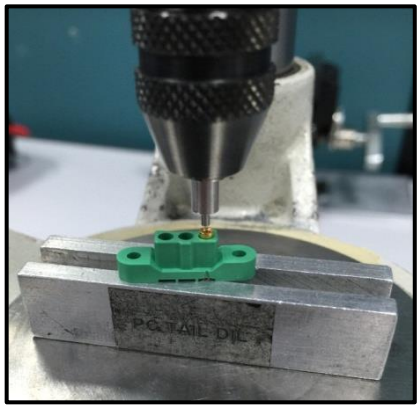
Specification: 50G (490m/s²), 5 minutes, 3 Axes, both directions in each axis.

Results:

| Mated Connector Pair Type | Pass/Fail | Visual Insp. | Observation |
|---|---|---|---|
| Female PC Tail / Male Cable SIL 3 Position, No Jackscrew | Pass | Pass | None |
| Female PC Tail / Male Cable DIL 6 Position, No Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail SIL 3 Position, With Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail DIL 6 Position, With Jackscrew | Pass | Pass | None |

### 2.3.2. Contact Insertion and Removal Force in Housing: EIA-364-05B: 1998

Methodology: 3 samples of all types of connectors listed in section 2.2 had contacts assembled to their specified assembly position in housings, while having the force required to insert each contact measured. Then the force required to remove the contact was also measured.

Specification: 75N max. insertion, 15N min. removal (specification will be increased).

Results:

| Connector Type | Insertion Force (N) | | Removal Force (N) | |
|---|---|---|---|---|
| | Average | Maximum | Minimum | Average |
| Female Vertical PC Tail | 73.1 | 93.3 | 49.5 | 61.1 |
| Male Vertical PC Tail | 53.3 | 67.7 | 33.5 | 43.2 |
| Female Cable | 57.2 | 71.1 | 33.1 | 45.6 |
| Male Cable | 59.4 | 72.3 | 61.2 | 72.3 |

### 2.3.3. Contact Replacement in Housing: EIA-364-05B: 1998

Method: 3 samples of all Cable types of connectors listed in section 2.2 had contacts assembled to their specified assembly position in housings, while having the force required to insert each contact measured. Then the force required to remove the contact also measured. This operation was then repeated using the same contacts and housings 10 times, or until the force required for removing contact fell below the minimum requirement of 15N.

Specification: 2 replacements minimum (specification will be increased).

Results:

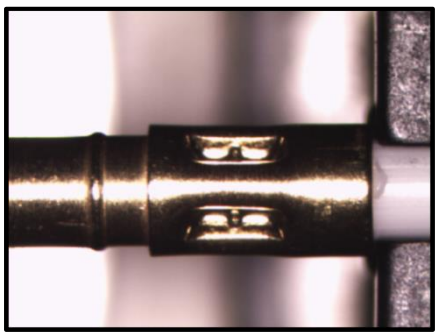
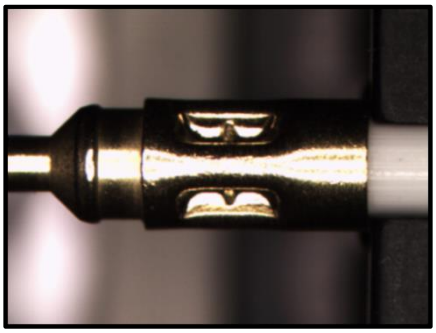
| Connector Type, Replacement Cycle | Insertion Force (N) | | Removal Force (N) | |
|---|---|---|---|---|
| | Average | Maximum | Minimum | Average |
| Female Cable 1st Operation | 52.6 | 63.1 | 31.6 | 44.7 |
| Female Cable 3rd Operation | 41.2 | 48.4 | 27.7 | 35.9 |
| Female Cable 10th Operation | 22.7 | 28.1 | 16.1 | 21.8 |
| Male Cable 1st Operation | 63.8 | 81.5 | 59.1 | 72.3 |
| Male Cable 3rd Operation | 45.1 | 53.9 | 30.6 | 44.2 |
| Male Cable 10th Operation | 23.4 | 29.9 | 20.1 | 23.8 |

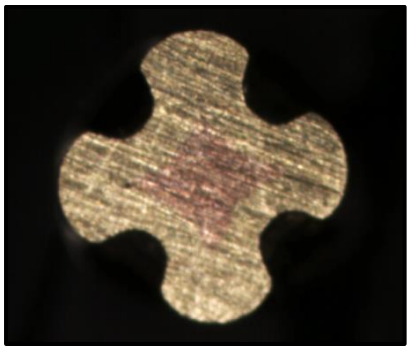
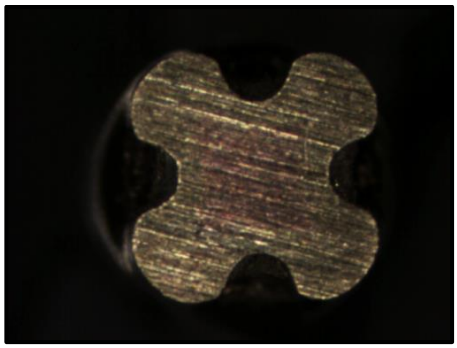
### 2.3.4. Contact Crimp Integrity: EIA-364-08B: 1998

Methodology: 3 Samples of all types of Cable Crimp contacts listed in section 2.2 were assembled with the following types of wire as applicable:

- 22 AWG (19x0.15) BS 3G 210 Type A
- 20 AWG (19x0.20) BS 3G 210 Type A
- 18 AWG (19x0.25) MIL-16878 Type E

Crimping was completed using crimp tool M22520/2-01 (position 8) fitted with Z80-058 positioner. Parts were inspected for cracks under at least 10x magnification. The wire was then separated from the contact at a speed of 25mm per minute, and the force required to achieve separation of wire from contact recorded, as well as the type of separation (Wire Break or Pull Out). Samples were also micro-sectioned to check for voids.

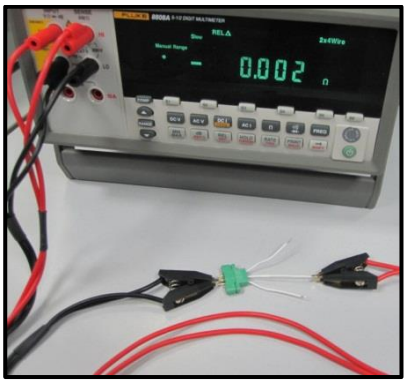
Specification: 22 AWG = 50N min., 20 AWG = 80N min., 18 AWG = 140N min.

Results:

| Contact and Wire Type | Crack Inspection (Pass/Fail) | Void Inspection (Pass/Fail) | Wire Separation Force (min.) | Separation Type |
|---|---|---|---|---|
| Female Contact with 18 AWG wire | Pass | Pass | 186N | Wire Break |
| Male Contact with 18 AWG wire | Pass | Pass | 150N | Wire Break |
| Female Contact with 20 AWG wire | Pass | Pass | 106N | Wire Break & Pull-Out |
| Male Contact with 20 AWG wire | Pass | Pass | 119N | Wire Break & Pull-Out |
| Female Contact with 22 AWG wire | Pass | Pass | 50N | Wire Break |
| Male Contact with 22 AWG wire | Pass | Pass | 57N | Wire Break |

### 2.3.5. Durability (Mechanical Operations): EIA-364-09C: 1999

Methodology: 3 sets of Female cable SIL 3 position connectors and mating Male PC Tail connectors were used (as listed in section 2.2). In separate tests, the mated pairs were clamped in a holding fixture, allowing one-half of the pair to float. Automatic of cycling took place at 25.4mm/minute, fully mating by 4.45mm after female enters male moulding, for 1,000 cycles.


Contact Resistance, Insulation Resistance and Dielectric Withstanding Voltage were measured prior to cycling. Mating/Un-Mating forces were measured throughout cycling. After 10, 30, 50, 100, 200, 300, 400, 500, 750 and 1,000 cycles, electrical tests and visual inspection took place. After 1,000 cycles and other tests completed, contact retention in housing also measured and recorded.

Specification: 1,000 Operations.

Result: No failures reported.

### 2.3.6. Mating and Un-mating Force: EIA-364-13C: 2006

Methodology: 3 samples of all types of connectors listed in section 2.2, in separate tests, were clamped in holding fixture allowing one half of set to float. The pairs were then fully mated and un-mated at 25.4mm/minute (same setup as Durability). Peak mating and un-mating forces measured and recorded.

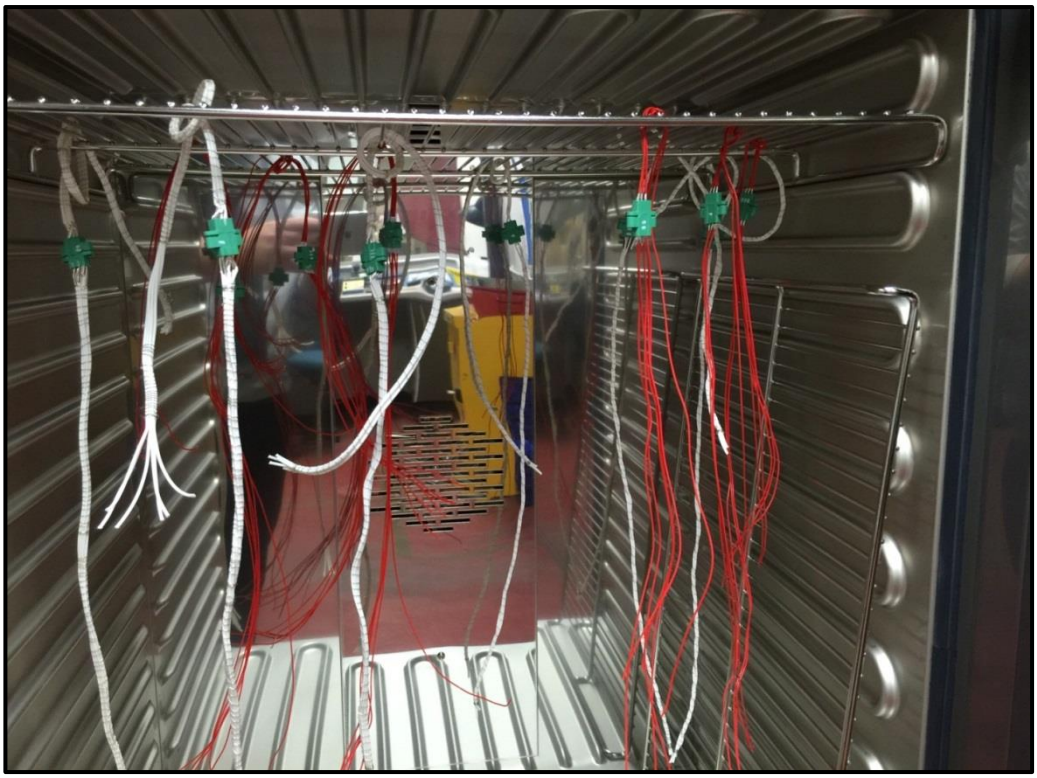
Specification: 9N max. mating (Insertion) force, 1N min. un-mating (Withdrawal) force per contact.

Results:

| Mated Connector Pair Type | Mating/Insertion Force (N) | | Un-mating/Withdrawal Force (N) | | Pass/ Fail |
|---|---|---|---|---|---|
| | Average | Maximum | Minimum | Average | |
| Female PC Tail / Male Cable SIL 3 Position | 10.6 | 11.5 | 7.7 | 8.3 | Pass |
| Female Cable / Male Cable SIL 3 Position | 15.0 | 16.9 | 9.5 | 10.8 | Pass |
| Female Cable / Male PC Tail SIL 3 Position | 13.1 | 15.4 | 8.4 | 9.2 | Pass |
| Female PC Tail / Male PC Tail SIL 3 Position | 10.6 | 11.6 | 8.2 | 9.2 | Pass |
| Female PC Tail / Male Cable DIL 6 Position | 24.3 | 26.7 | 17.4 | 18.5 | Pass |
| Female Cable / Male Cable DIL 6 Position | 21.2 | 21.7 | 14.9 | 15.6 | Pass |
| Female Cable / Male PC Tail DIL 6 Position | 31.2 | 36.6 | 16.1 | 18.3 | Pass |
| Female PC Tail / Male PC Tail DIL 6 Position | 21.0 | 23.1 | 16.0 | 17.2 | Pass |

### 2.3.7. Temperature Life: EIA-364-17B: 199, Test Method A, Condition 6D

Methodology: 12 samples of all cable connector assemblies listed in section 2.2 had 45cm of wire crimped to each contact: 6 with 18 AWG wire and 6 with 22 AWG. These were checked before conditioning that parts met specification. Half of these were then suspended as shown in an oven set at 175±5°C and remained there for 1,000 hours. The remaining samples were then suspended in a similar manner but at normal ambient temperature for the same period of time.



***Assemblies suspended in oven***

After conditioning, samples were removed, visually inspected and checked that all properties were in specification.

Specification: After conditioning at 175°C for 1,000 hours the following specifications must be met:

- Un-mating force per contact = 1N min
- Contact resistance per contact = 25mΩ max
- Visual inspection to reveal no sign of cracking, crazing, delamination or damage caused by fusing or seizure
- 15N min contact removal force in housing
- 50N min contact crimp integrity pull out force on 22AWG wire and 140N on 18AWG

Results: Visual Inspection showed housings conditioned at 175°C darkened in colour due to oxidation, but Electrical and Mechanical properties were not significantly affected.

| Mated Connector Pair Type | Un-mating Force | Contact Resistance | Contact Removal Force | Contact Crimp Integrity | Visual Inspection |
|---|---|---|---|---|---|
| Female/Male Cable SIL 3 Pos. 18 AWG | Pass | Pass | Pass | Pass | Pass |
| Female/Male Cable SIL 3 Pos. 22 AWG | Pass | Pass | Pass | Pass | Pass |
| Female/Male Cable DIL 6 Pos. 18 AWG | Pass | Pass | Pass | Pass | Pass |
| Female/Male Cable DIL 6 Pos. 22 AWG | Pass | Pass | Pass | Pass | Pass |

### 2.3.8. Withstanding Voltage (Proof): EIA-364-20C: 2004, Method B, Conditions I & IV

Methodology: 3 Samples of all types of connectors listed in section 2.2 were mated with connectors that had all adjacent contacts linked in series with 22 AWG wire. A voltage was passed through all contacts and maintained for 60 seconds – this was raised at 500V per second to various test voltages, each level maintained for 60 seconds. Voltage is then reduced back to zero, while being monitored for leakage current not to exceed 5mA, or evidence of disruptive discharge (Flashover or Spark).

Specification:

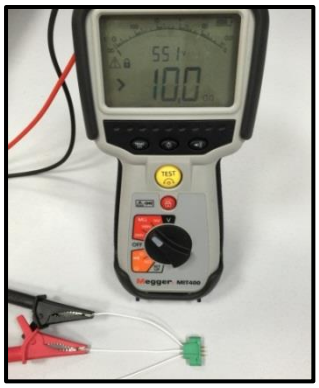
- Condition I (Sea Level 913/1,050mbar) = 1,200V DC min
- Condition IV (Altitude 70,000ft, 44mbar max) = 300V DC min
- Specification will be increased

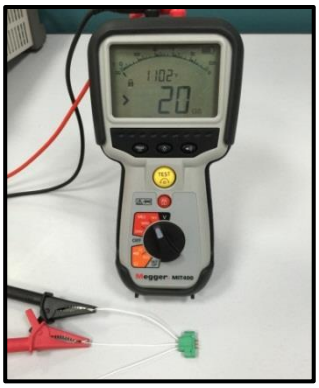
Results:

| Connector Type | Codition IV: At Altitude | | | Condition I: At Sea Level | | |
|---|---|---|---|---|---|---|
| | 300V DC | 400V DC | 450V DC | 1,200V DC | 1,600V DC | 1,800V DC |
| All Single Row Female Conn. | Pass | Pass | Pass | Pass | Pass | Pass |
| All Double Row Female Conn. | Pass | Pass | Pass | Pass | Pass | Pass |
| All Single Row Male Conn. | Pass | Pass | Pass | Pass | Pass | Pass |
| All Double Row Male Conn. | Pass | Pass | Pass | Pass | Pass | Pass |

### 2.3.9. Insulation Resistance: EIA-364-21C: 2000

Methodology: 3 Samples of all types of connectors listed in section 2.2 were assembled with 22 AWG, BS 3G 210 Type A wire, so a voltage could be passed through all adjacent contacts. Results were monitored using an insulation tester, set at 500V DC for a 2 minute period. The test was then repeated at 1,000V DC.



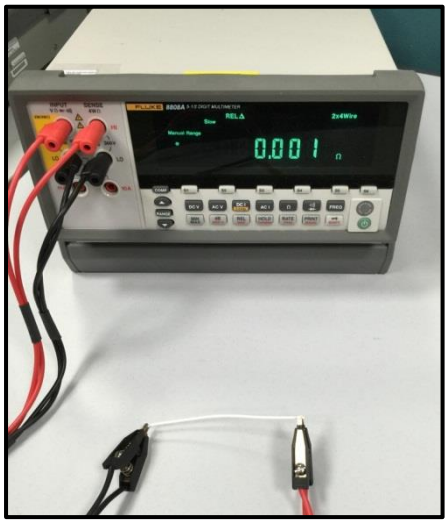
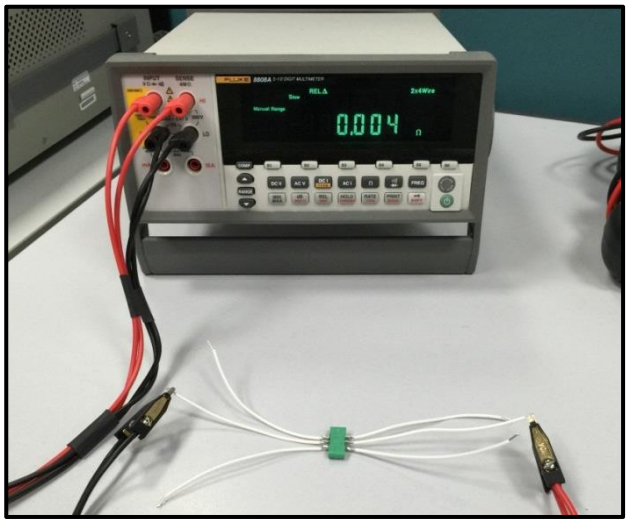

Specification: 100MΩ min at 500V DC (specification will be increased).

Results: All readings at 500V DC were greater than 10,000MΩ. All readings at 1,000V DC were greater than 20,000MΩ.

### 2.3.10. Low Level Contact Resistance: EIA-364-23C: 2000

Methodology: Unused mated combinations (shown in the table below), made from the connectors listed in section 2.2 were prepared by attaching 100mm of 18 AWG (19/30) MIL-16878E Type E wire to all contacts. The test current was set at 100mA max, 20mV max open circuit (source) voltage. The resistance of two of the 100mm lengths of the 18AWG wire were measured, to establish the wire resistance.

Connectors were mated for the first time, then each mated contact (including wire) measured for resistance. The connectors were then separated and mated for a second time, before re-measuring for an "After conditioning" result. All results were recorded minus the wire resistance.

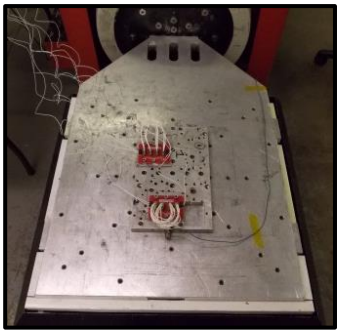
Specification: 25mΩ max (specification will be reduced)

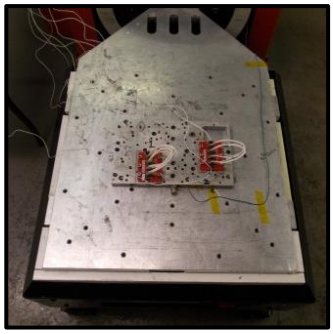
Results:

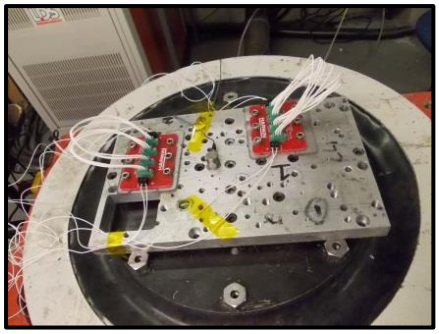
| Mated Connector Pair Type | Initial | After Conditioning | Pass/Fail |
|---|---|---|---|
| Female PC Tail / Male PC Tail SIL 3 Position | 2mΩ max | 2mΩ max | Pass |
| Female PC Tail / Male Cable DIL 6 Position | 2mΩ max | 2mΩ max | Pass |
| Female Cable / Male Cable DIL 6 Position | 3mΩ max | 3mΩ max | Pass |
| Female Cable / Male PC Tail DIL 6 Position | 3mΩ max | 3mΩ max | Pass |
| Female PC Tail / Male PC Tail DIL 6 Position | 3mΩ max | 3mΩ max | Pass |

### 2.3.11. Vibration: EIA-364-28D: 2006, Test Condition II and IV

Methodology: 2 samples of all types of connectors listed in section 2.2, in cable-to-board combinations, were subjected to Condition II vibration in all 3 axes. Connectors were monitored for discontinuities of 1 millisecond or more using a constant current source of 100mA. Parts were visually inspected for damage or wear before and after. The same samples were then tested again to Condition IV vibration.


***X-axis typical setup***


***Y-axis typical setup***


***Z-axis typical setup.***

Specification:

- Condition II = 10Hz to 500Hz, 1.52mm, 98.1m/s² (10G), 9 hours
- Condition IV = 10Hz to 2,000Hz, 1.52mm, 196.1m/ s² (20G), 12 hours
- Specification will be increased

Results:

| Mated Connector Pair Type | Condition II: 10G (Pass/Fail) | Condition IV: 20G (Pass/Fail) | Visual Insp. Damage/Wear | Observation |
|---|---|---|---|---|
| Female PC Tail / Male Cable SIL 3 Position, no Jackscrew | Pass: X, Z axes Fail: Y axis | Pass: X, Z axes Fail: Y axis | Pass | Fail: mated pair separated |
| Female PC Tail / Male Cable DIL 6 Position, no Jackscrew | Pass | Pass | Pass | None |
| Female Cable / Male PC Tail SIL 3 Position, with Jackscrew | Pass | Pass | Pass | None |
| Female Cable / Male PC Tail DIL 6 Position, with Jackscrew | Pass | Pass | Pass | None |

## 2.3.12. Humidity (Damp Heat): EIA-364-31B: 2000, Method II, Conditions A & D

Methodology: Samples of all cable-to-board, mated and un-mated pairs of connectors listed in section 2.2 were prepared with sufficient lengths of wire, and suspended vertically in a drying oven while having a polarising voltage applied. They were subject to 50°C for 24 hours. Immediately after conditioning, the samples were measured for bulk contact resistance (including test circuit) in ambient conditions. The samples were returned to the test chamber with a 100V DC polarising voltage, a relative humidity of 90-95% and 40±2°C.

After 96 hours, a sample of each type was removed, leaving the remaining samples to complete the 56 day period. Bulk contact resistance on 1 control sample was measured immediately after removal from the test chamber. All samples were measured after 5 hours (to recover to standard ambient conditions).

Specification: 96 hours or 56 days, 90% RH (relative humidity) at 40°C.

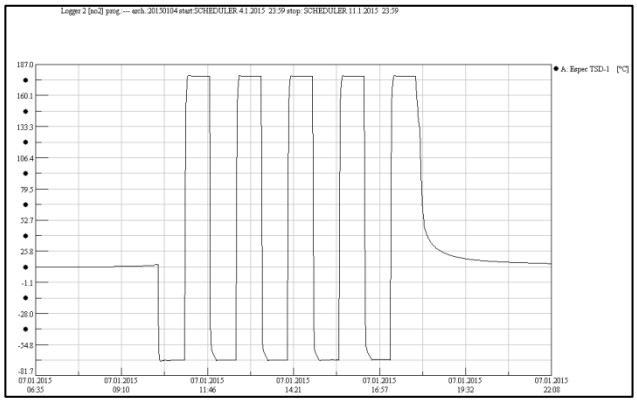
Results:

| Mated or Un-mated Connector Pair Type | Pre-Test bulk Contact Resistance | Post-Test bulk Contact Resistance | 5 hrs Post-Test bulk Contact Resistance | Observations |
|---|---|---|---|---|
| Female Cable / Male PC Tail SIL 3 Position, Mated | 0.138Ω max | n/a | 0.140Ω max | None |
| Female PC Tail / Male Cable SIL 3 Position, Un-mated | 0.138Ω max | n/a | 0.140Ω max | None |
| Female Cable / Male PC Tail DIL 6 Position, Mated | 0.138Ω max | 0.138Ω max. | 0.138Ω max | None |
| Female PC Tail / Male Cable DIL 6 Position, Un-mated | 0.139Ω max | n/a | 0.141Ω max | None |

### 2.3.13. Thermal Shock (Temperature Cycling): EIA-364-32C: 2000, Condition V

Methodology: Samples of all cable-to-board mated pairs of connectors listed in 2.2, prepared with sufficient lengths of wire, were checked for Mating/Un-mating force, Voltage Proof, Insulation Resistance and Contact Resistance. Parts were also visually inspected for signs of damage, cracking, crazing or delamination of surfaces or finishes.

These samples were then placed in a Temperature Cycling oven as shown, cycled 5 times from +175/178°C to -65/70°C with dwell time 30 minutes min. Parts were then removed from the oven and allowed to return to ambient temperature before final checks were made.




Specification: +175/-65°C.

Results:

| Mated Connector Pair Type | Mate / Un-Mate Force | Voltage Proof | Insulation Resistance | Contact Resistance | Visual Inspection |
|---|---|---|---|---|---|
| Female Cable / Male PC Tail SIL 3 Pos. | Pass | Pass | Pass | Pass | Pass |
| Female PC Tail / Male Cable SIL 3 Pos. | Pass | Pass | Pass | Pass | Pass |
| Female Cable / Male PC Tail DIL 6 Pos. | Pass | Pass | Pass | Pass | Pass |
| Female PC Tail / Male Cable DIL 6 Pos. | Pass | Pass | Pass | Pass | Pass |

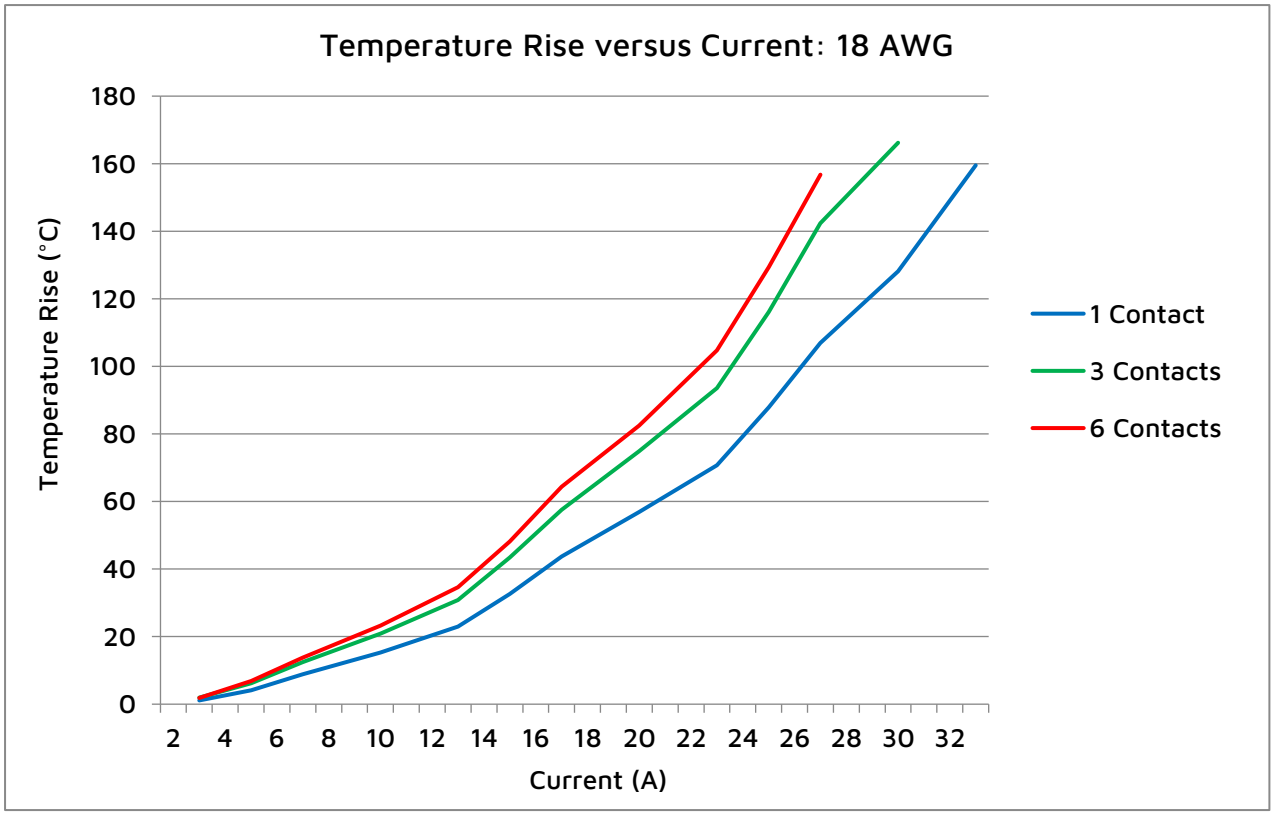
### 2.3.14. Temperature Rise v. Current (Power Rating): EIA-364-70A: 1998, Method 2

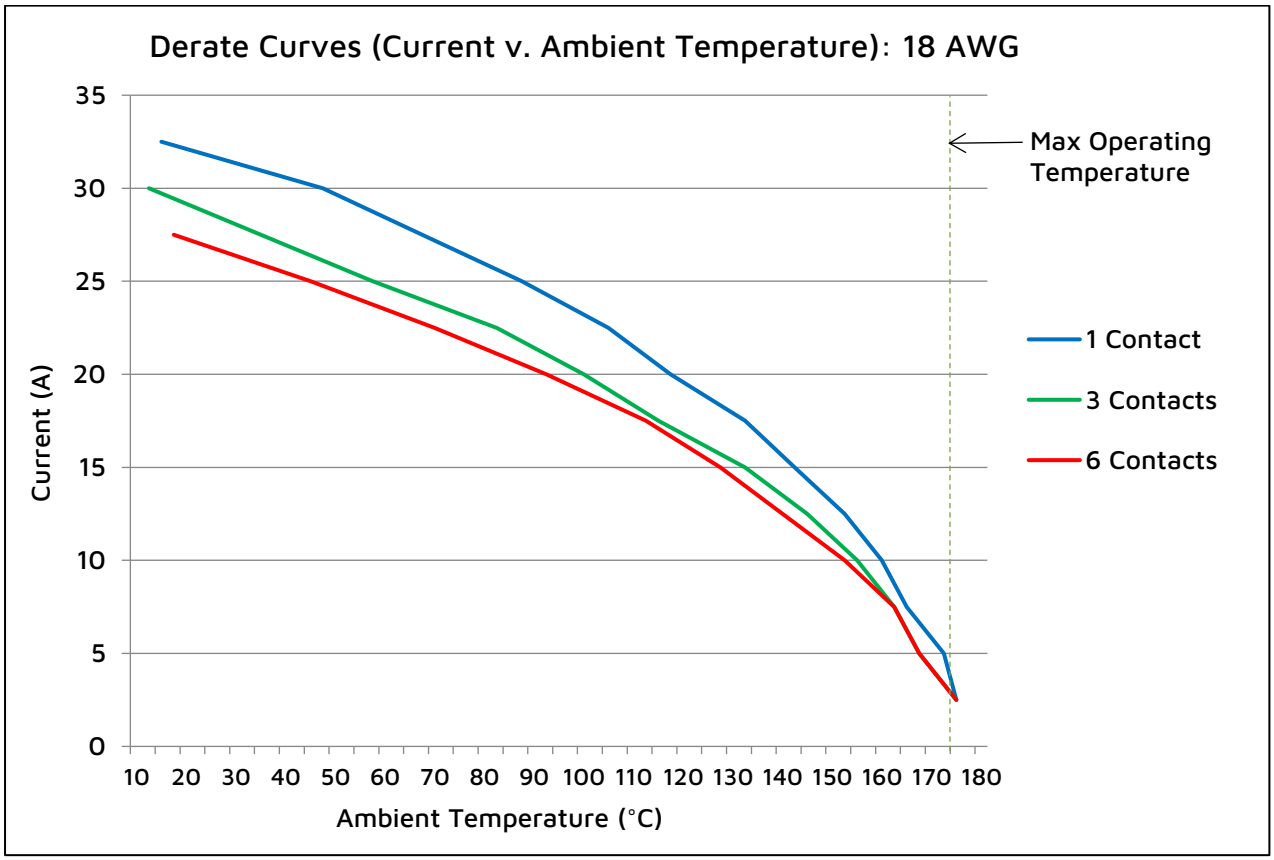
Methodology: 3 samples of all possible cable-to-cable mated variants listed in section 2.2 were prepared with 18 and 22 AWG wire. These samples were tested for temperature rise v. current, for a single contact through to all contacts. The test started with a load of 2A: after the temperature stabilised, it was recorded. The current was increased by a similar amount and left to stabilise before recording. This was repeated until the maximum working temperature of 175°C reached.

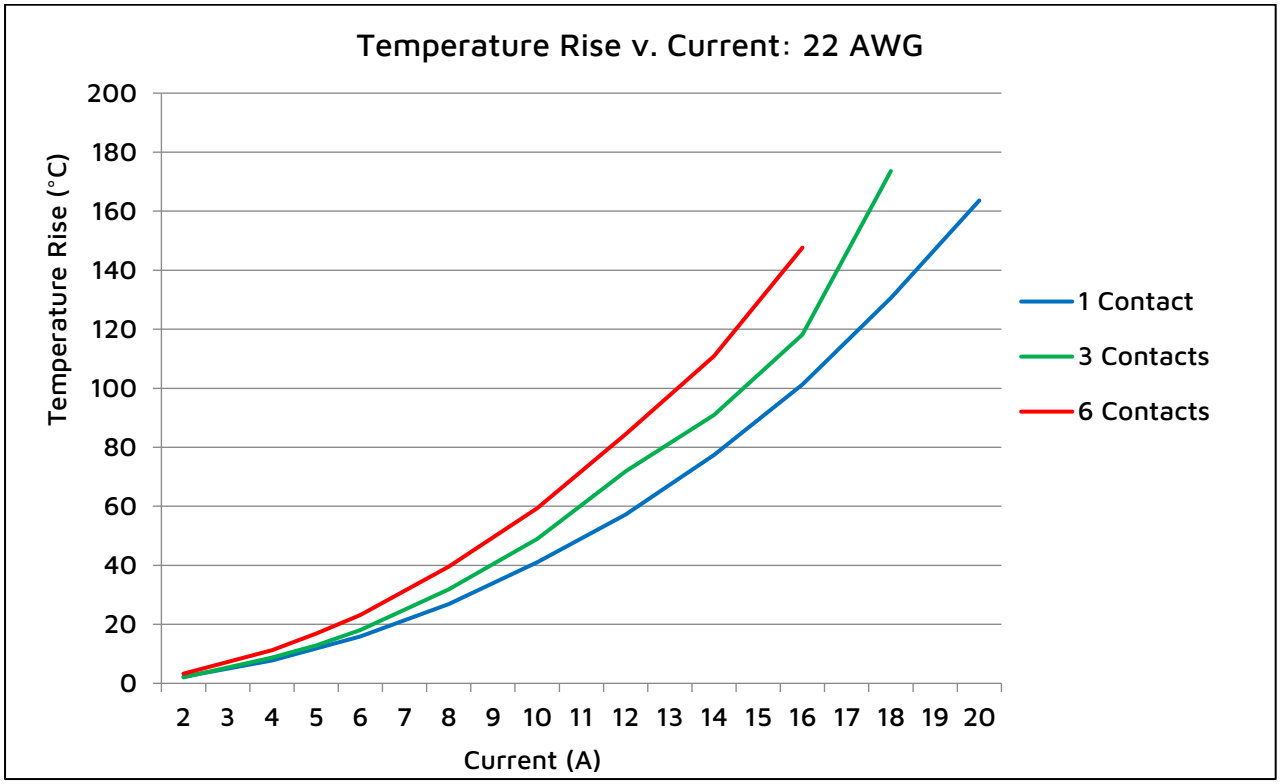
Specification: At 30°C max temperature rise:

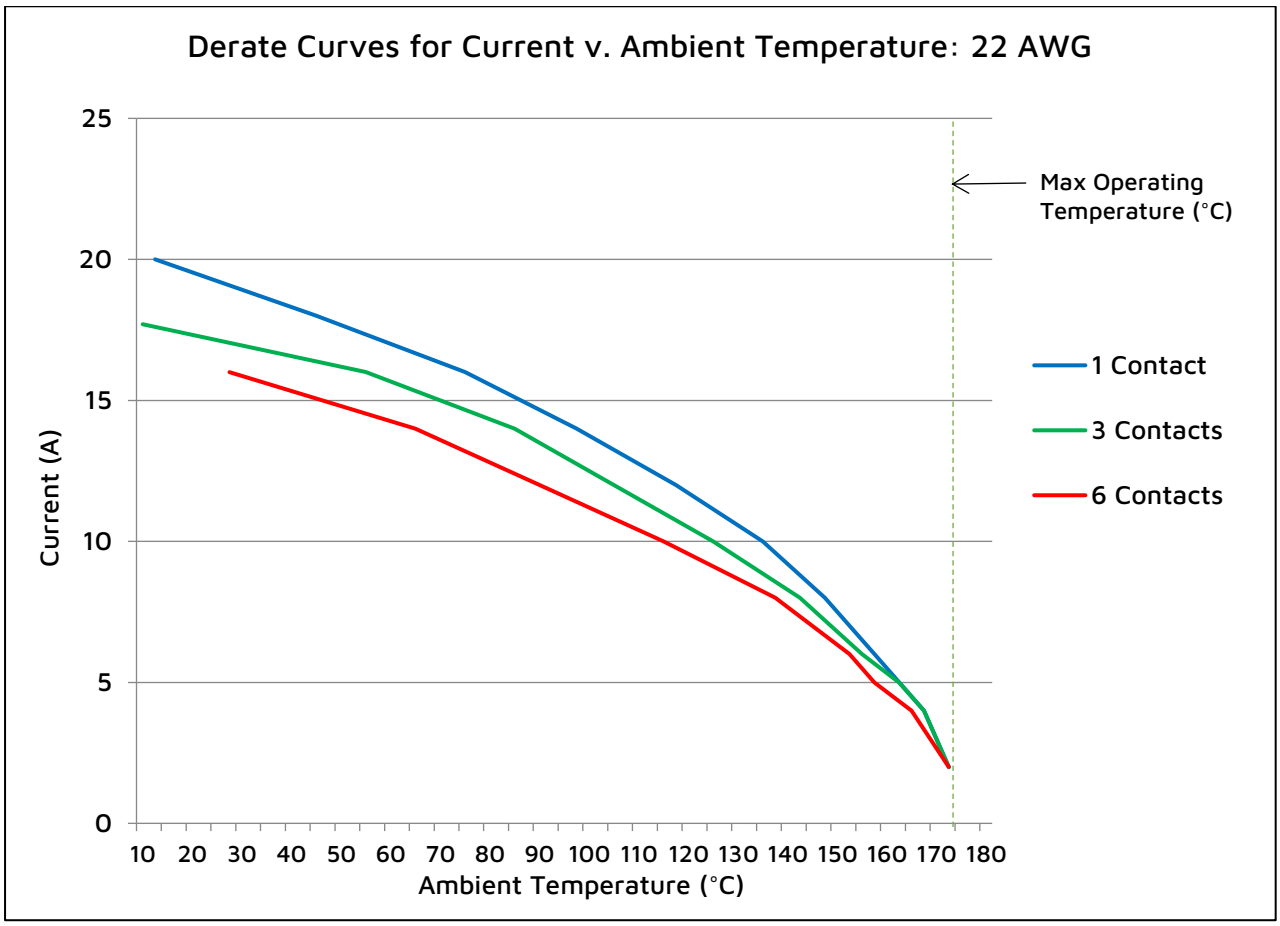
- 10A for contacts with 18 AWG wire
- 5A for contacts with 22 AWG wire

Results:


Temperature Rise versus Current: 18 AWG
Temperature Rise (°C)
180
160
140
120
100
80
60
40
20
0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32
Current (A)
1 Contact
3 Contacts
6 Contacts


Derate Curves (Current v. Ambient Temperature): 18 AWG
Current (A)
35
30
25
20
15
10
5
0
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Ambient Temperature (°C)
Max Operating Temperature
1 Contact
3 Contacts
6 Contacts


Temperature Rise v. Current: 22 AWG
Temperature Rise (°C)
200
180
160
140
120
100
80
60
40
20
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Current (A)
1 Contact
3 Contacts
6 Contacts


Derate Curves for Current v. Ambient Temperature: 22 AWG
Current (A)
25
20
15
10
5
0
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Ambient Temperature (°C)
Max Operating Temperature (°C)
1 Contact
3 Contacts
6 Contacts

### 2.3.15. Bump: BS EN 60068-2-27: 2009

Methodology: 2 samples of all types of connectors listed in section 2.2, in cable-to-board combinations, were subjected to the test specification. Test samples were monitored for discontinuities of 1 millisecond min, using a constant current source of 100mA. Parts were visually inspected for damage or wear before and after. The test setup was the same as the Vibration testing.

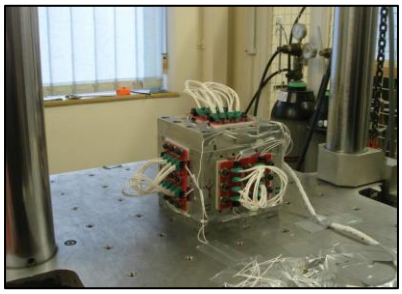
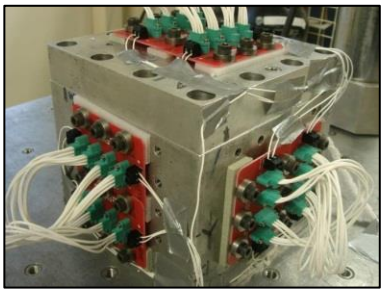
Specification: 40G (392m/s²), 6ms, Half-Sine, 4,000 Bumps (split between 3 axes, both directions).

Results:

| Mated Connector Pair Type | Pass/Fail | Visual Inspection: Damage/Wear | Observation |
|---|---|---|---|
| Female PC Tail / Male Cable SIL 3 Position, no Jackscrew | Pass: Z axis Fail: X,Y axes | Pass | Failure: mated pair separated |
| Female PC Tail / Male Cable DIL 6 Position, no Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail SIL 3 Position, with Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail DIL 6 Position, with Jackscrew | Pass | Pass | None |

### 2.3.16. Shock: BS EN 60068-2-27: 2009

Methodology: 2 samples of all types of connectors listed in section 2.2, in cable-to-board combinations, were subjected to the test specification. Test samples were monitored for discontinuities of 1 millisecond min, using a constant current source of 100mA. Parts were visually inspected for damage or wear before and after. The typical test setup is shown:


Specification: 100G (981m/s²), 6ms, Trapezoidal, 6 Shocks (one in all 3 axes, both directions).

Results:

| Mated Connector Pair Type | Pass/Fail | Visual Inspection: Damage/Wear | Observation |
|---|---|---|---|
| Female PC Tail / Male Cable SIL 3 Position, no Jackscrew | Pass: Z axis Fail: X,Y axes | Pass | Failure: mated pair separated |
| Female PC Tail / Male Cable DIL 6 Position, No Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail SIL 3 Position, with Jackscrew | Pass | Pass | None |
| Female Cable / Male PC Tail DIL 6 Position, with Jackscrew | Pass | Pass | None |