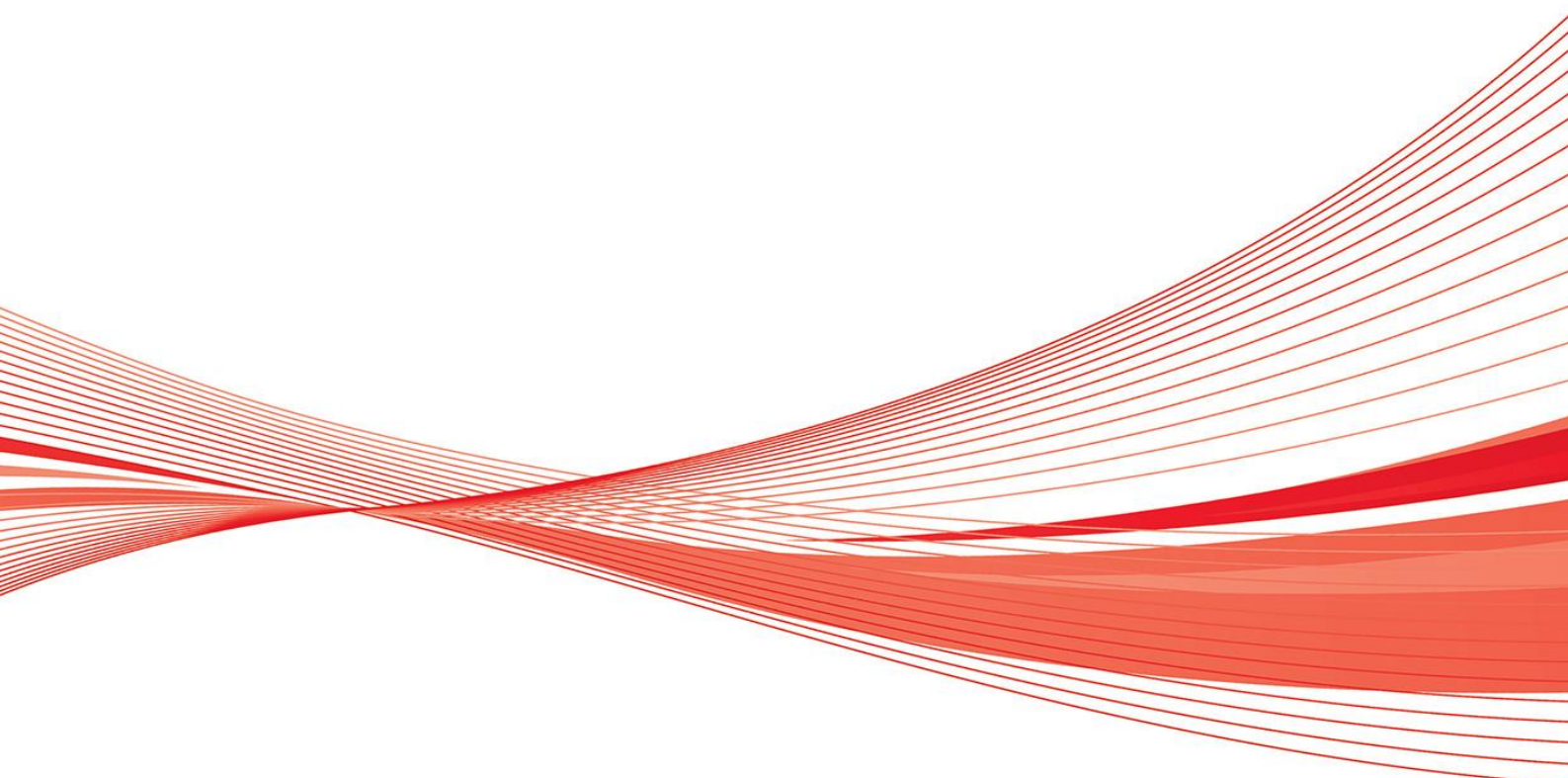




# Harwin Test Report Summary

**HT07403**

Flex Circuits (Datamate & Gecko)  
Electrical Testing



## 1. Introduction

### 1.1. Description and Purpose

The Harwin Flex Circuit ranges aim to provide an extra degree of design flexibility for off-the-shelf connector assemblies, providing a compact and reliable alternative to cable assemblies within the Gecko and Datamate, High Reliability Connector ranges.

### 1.2. Conclusion

The following data has been collated from Harwin test report QA000020. The tests indicate that the Datamate and Gecko Flex assemblies perform as required to the existing M80 and G125 Component Specifications respectively.

## 2. Test Method and Requirements

### 2.1. Specification Parameters

Tests were carried out in general accordance with EIA-364 (or equivalent BS EN 60068). The list of tests covered in this summary are as follows:

Testing Standard	Description of Test	Section	Page No.
EIA-364-32C: 2000 (BS EN 60068-2-14:2009)	Thermal Shock	3.1	2
EIA-364-20C: 2004	Withstand Voltage	3.2	3
EIA-364-21C: 2000	Insulation Resistance	3.3	4
EIA-364-17B: 1999	Temperature Life (without loading)	3.4	4
EIA-364-70A: 1998	Power Rating	3.5	5
EIA-364-28D: 1999	Vibration	3.6	6
EIA-364-27B (BS EN 60068-2-27:2009)	Mechanical Shock	3.7	7
EIA-364-26B: 1999	Salt Spray	3.8	7
EIA-364-31B: 2000	Humidity	3.9	8

### 2.2. List of Connectors & Assemblies

The following assemblies were used throughout the testing:

- M80-F150210-100-402 – 10-way Double-ended Male-to-Female Flexible Circuit assembly (100mm length).
- M80-F150210-100-L – 10-way Single-ended Male Flexible Circuit assembly (100mm length).
- G125-F1MS110-075-FS1 – 10-way Double-ended Male-to-Female Flexible Circuit assembly (75mm length).
- G125-F1MS110-075-L – 10-way Single-ended Male Flexible Circuit assembly (75mm length).

The following mating connectors were used to test withstand voltage and insulation resistance:

- M80-5101042 – 10-way Datamate Male PC Tail Connector
- M80-4101042 – 10-way Datamate Female PC Tail Connector
- G125-MV11005L0P – 10-way Gecko Male Vertical Through Board Connector
- G125-FV11005L0P – 10-way Gecko Female Vertical Through Board Connector

### 3. Test Results

#### 3.1. Thermal Shock to EIA-364-32C: 2000

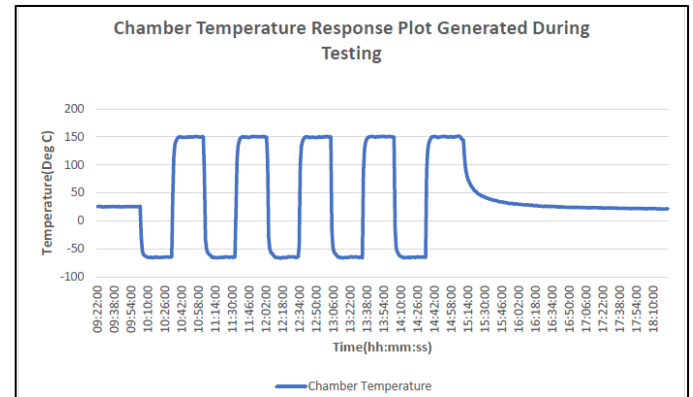
**Specification:**

Gecko (G125): Temperature extremes = -65°C to +150°C

Datamate (M80): Temperature extremes = -55°C to +125°C

**Methodology:** Flex cable assemblies with 10-way connectors were subjected to temperature extremes, as detailed above, in 30-minute dwells for 5 cycles. Cable assemblies were tested in unmated conditions and visual inspection was carried out prior to testing and once it was complete, with no obvious visual changes occurring as a result of thermal shock testing.

Fig.1: Graph illustrating the thermal cycling and dwell periods for Gecko Flex PCB assemblies.



#### 3.2. Withstand Voltage to EIA-364-20C: 2004

**Specification:** Gecko (G125): Working voltage (Sea level) = 600Vdc/ac pk.

Datamate (M80): Working voltage (Sea level) = 1200Vdc/ac pk.

**Methodology:** The above specified voltage was applied to connector pairs wired in two series circuits to determine whether breakdown or flashover occurred. Samples were visually inspected following the test, with no obvious changes to the majority connectors occurring. Some issues were observed with the Salt Spray conditioned Datamate samples, with the connectors only passing at lower withstand voltage levels, having an impact on performance in applications where heavy salt spray is likely (passing levels are shown in brackets).

Connector Part No.	Test Description		Withstand Voltage (600V DC)	Withstand Voltage (1200V DC)
G125-F1MS110-075-L	Pre-Conditioning	Initial	PASS	N/A
	Post-Conditioning	Thermal Shock	PASS	N/A
		Temp. Life	PASS	N/A
		Humidity	PASS	N/A
		Salt Spray	PASS	N/A
G125-F1MS11-075-FS1	Pre-Conditioning	Initial	PASS	N/A
	Post-Conditioning	Thermal Shock	PASS	N/A
		Temp. Life	PASS	N/A
		Humidity	PASS	N/A
		Salt Spray	PASS	N/A
M80-F150210-100-L	Pre-Conditioning	Initial	N/A	PASS
	Post-Conditioning	Thermal Shock	N/A	PASS
		Temp. Life	N/A	PASS
		Humidity	N/A	PASS
		Salt Spray	N/A	FAIL (PASS @ 1.1Kv DC)
M80-F150210-100-402	Pre-Conditioning	Initial	N/A	PASS
	Post-Conditioning	Thermal Shock	N/A	PASS
		Temp. Life	N/A	PASS
		Humidity	N/A	PASS
		Salt Spray	N/A	FAIL (PASS @ 0.65kV)

**3.3. Insulation Resistance to EIA-364-21C: 2000**

**Specification:** Gecko (G125): Initial = 10GΩ min. Post-conditioning = 1GΩ min.

Datamate (M80): Initial = 1GΩ min. Post-Conditioning = 100MΩ min.

**Methodology:** Voltage specified in each respective component specification was applied to connector pairs wired in two series for two minutes to determine whether the resistance satisfies the respective required specification values. Samples were visually inspected following the test, with no obvious changes to the connectors occurring other than a continuation of the issues discovered during voltage breakdown testing where salt spray samples display lower post-conditioning performance (passing levels are shown in brackets).

Connector Part No.	Test Description		Insulation Resistance
G125-F1MS110-075-L	Pre-Conditioning	Initial	PASS
	Post-Conditioning	Thermal Shock	PASS
		Temp. Life	PASS
		Humidity	PASS
		Salt Spray	FAIL (PASS @ <200MΩ)
G125-F1MS11-075-FS1	Pre-Conditioning	Initial	PASS
	Post-Conditioning	Thermal Shock	PASS
		Temp. Life	PASS
		Humidity	PASS
		Salt Spray	FAIL (PASS @ <500MΩ)
M80-F150210-100-L	Pre-Conditioning	Initial	PASS
	Post-Conditioning	Thermal Shock	PASS
		Temp. Life	PASS
		Humidity	PASS
		Salt Spray	FAIL (PASS @ <200MΩ)
M80-F150210-100-402	Pre-Conditioning	Initial	PASS
	Post-Conditioning	Thermal Shock	PASS
		Temp. Life	PASS
		Humidity	PASS
		Salt Spray	FAIL (PASS @ <300MΩ)

**3.4. Temperature Life (without load) to EIA-364-17B: 1999**

**Specification:** Gecko (G125): Operating temperature = -65°C to +150°C

Datamate (M80): Operating temperature = -55°C to +125°C

**Methodology:** The test was carried out to Condition 10 and Method A of EIA-364-17B; mated pairs of Gecko and Datamate connectors were subjected to 96 hours and 250 hours at 150±5°C and 125±5°C respectively. The change in contact resistance must be less than 10mΩ, and the connectors must show no evidence of physical damage. The samples were inspected post-conditioning for any significant changes.

Connector Part No.	Duration in Temperature Testing Oven	
	96hrs	250hrs
G125-F1MS110-075-L	PASS	PASS
G125-F1MS11-075-FS1	PASS	PASS
M80-F150210-100-L	PASS	PASS
M80-F150210-100-402	PASS	PASS

3.5. Power Rating (Current versus Temperature Rise) to EIA-364-70A: 1998

**Specification:** Gecko (G125): Current Rating (per track) = 0.4A Max.

Datamate (M80): Current Rating (per track) = 1.0A Max.

**Methodology:** The test demonstrates the current carrying capability of the Flex systems, both pre and post-environmental conditioning and is carried out in accordance with EIA-364-70A, Method 2. The mated connector pairing was wired into a series circuit via a custom PCB. Thermocouples were secured to a middle track in the centre of the flexible section of PCB.

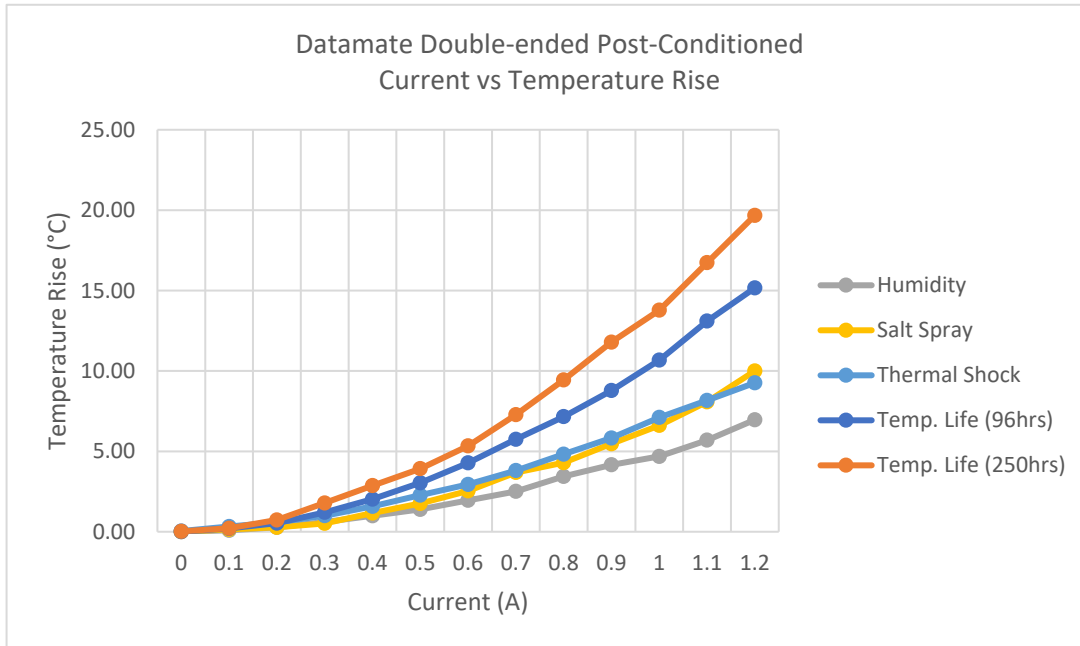


Fig. 2: Graph illustrating temperature rise as a result of increasing current for Double-ended Datamate Connectors

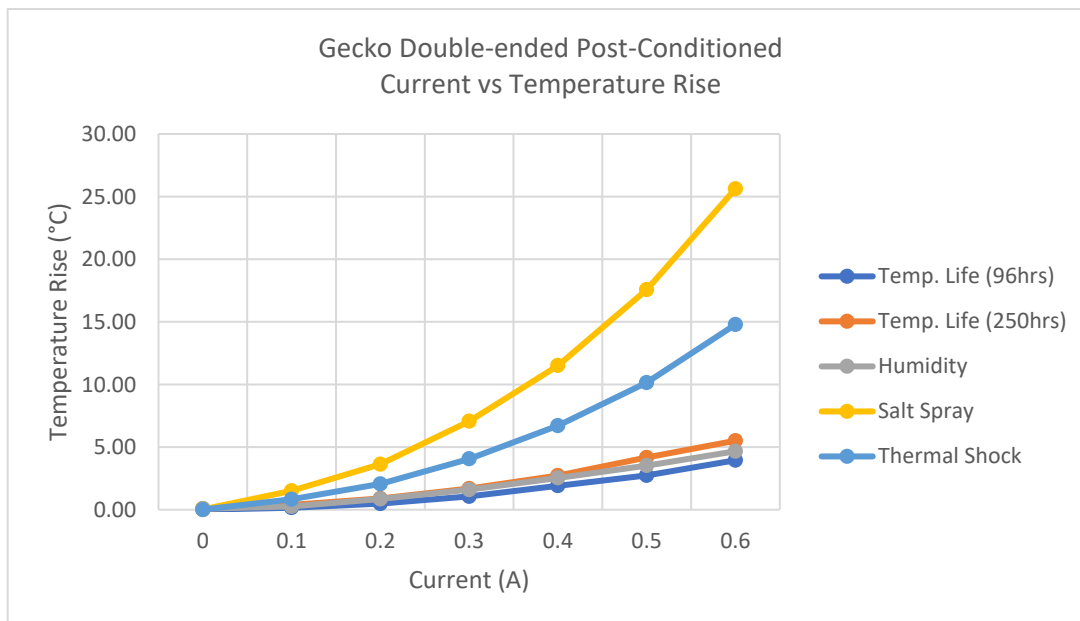


Fig. 3: Graph illustrating temperature rise as a result of increasing current for Double-ended Gecko Connectors

### 3.6. Vibration Testing to EIA-364-28D: 1999

**Specification:** 10Hz to 2kHz, 1.52mm pk-pk displacement or 20gn pk (whichever is less), 198m/s<sup>2</sup> (20G), 12 cycles per axis, 20 minutes per cycle.

**Methodology:** Samples were tested in general accordance with BS EN 60068-2-6: 2008 Test Fc and EIA-364-28D Test Condition 4. The samples were subjected to a Swept Sine Test with continuous monitoring at  $\geq 1$  microsecond. During testing in all axes, no triggers were noted. No triggers were noted on any sample during the test process. Upon completion of testing the samples were visually inspected, no obvious changes to the samples were noted. Each sample was subjected to voltage breakdown and insulation resistance tests post-vibration, with no significant changes being observed.

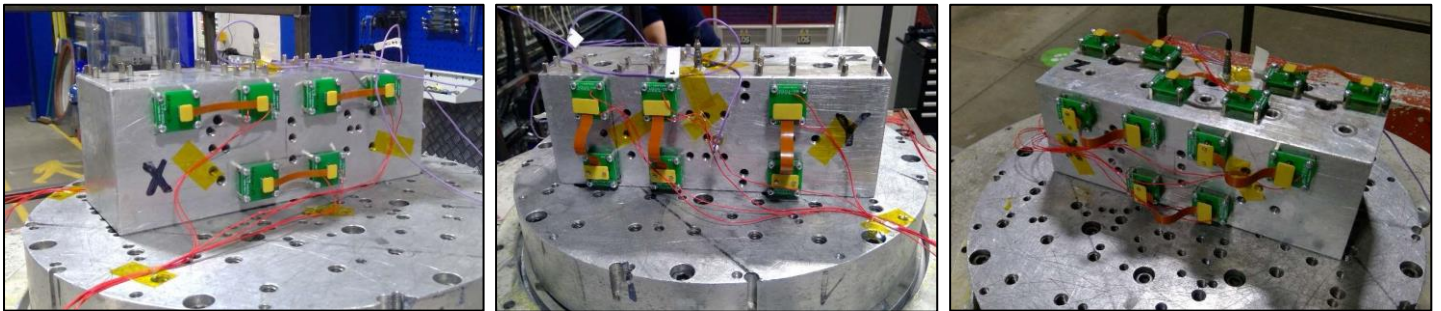


Fig.4: Double-ended Gecko samples mounted in the lateral, longitudinal and vertical axes

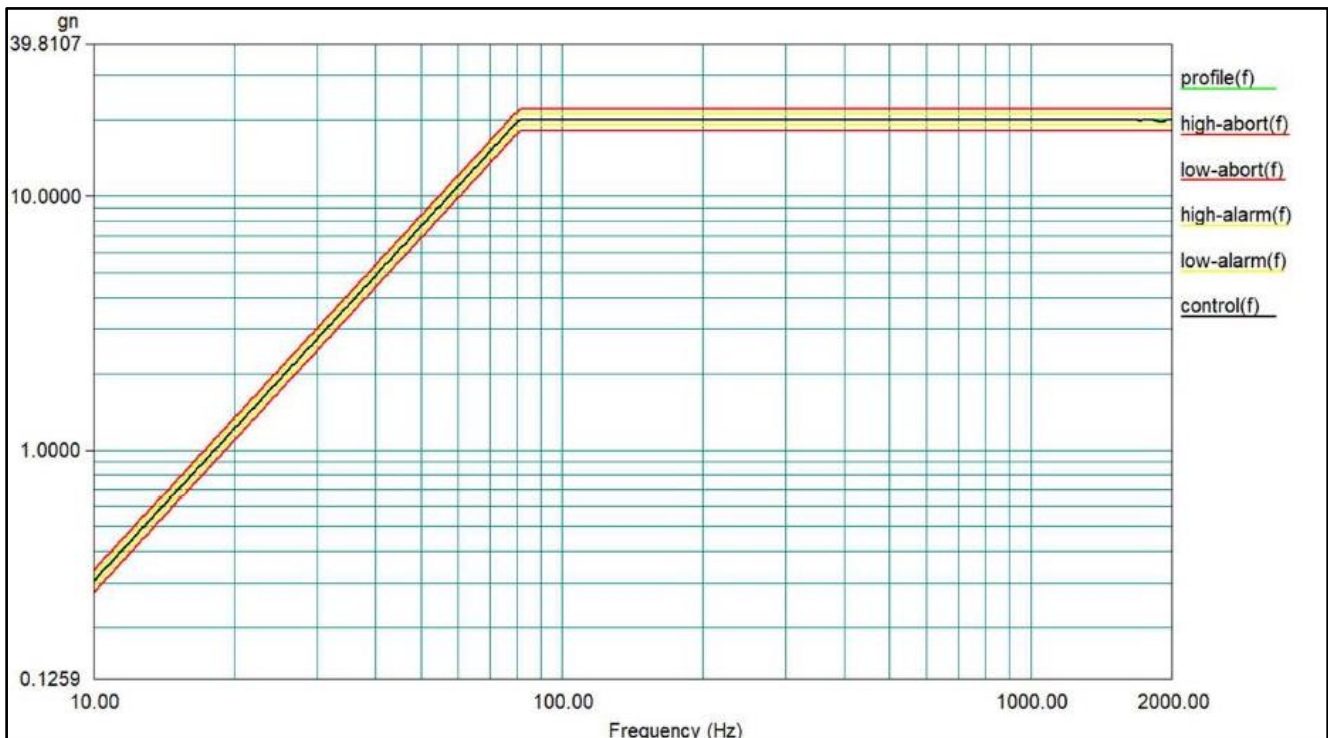


Fig. 5: Graph illustrating vibration characteristics of the above Double-ended Datamate assemblies



**3.7. Mechanical Shock to EIA-364-27B (BS EN 60068-2-27:2009)**

**Specification:** Acceleration: 100gn, Shock Duration: 3ms, Shock Shape: Half Sine Pulse, 3 shocks in each axis.

**Methodology:** Samples were wired in series circuits. Shock Test Sequence was carried out on all samples. During the test, the samples were monitored continuously for discontinuities of  $\geq 1$  microsecond, using a constant current source of 100mA. No triggers were noted on any sample during the test process. Upon completion of testing the samples were visually inspected, no obvious changes to the samples were noted. Each sample was subjected to voltage breakdown and insulation resistance tests post vibration.

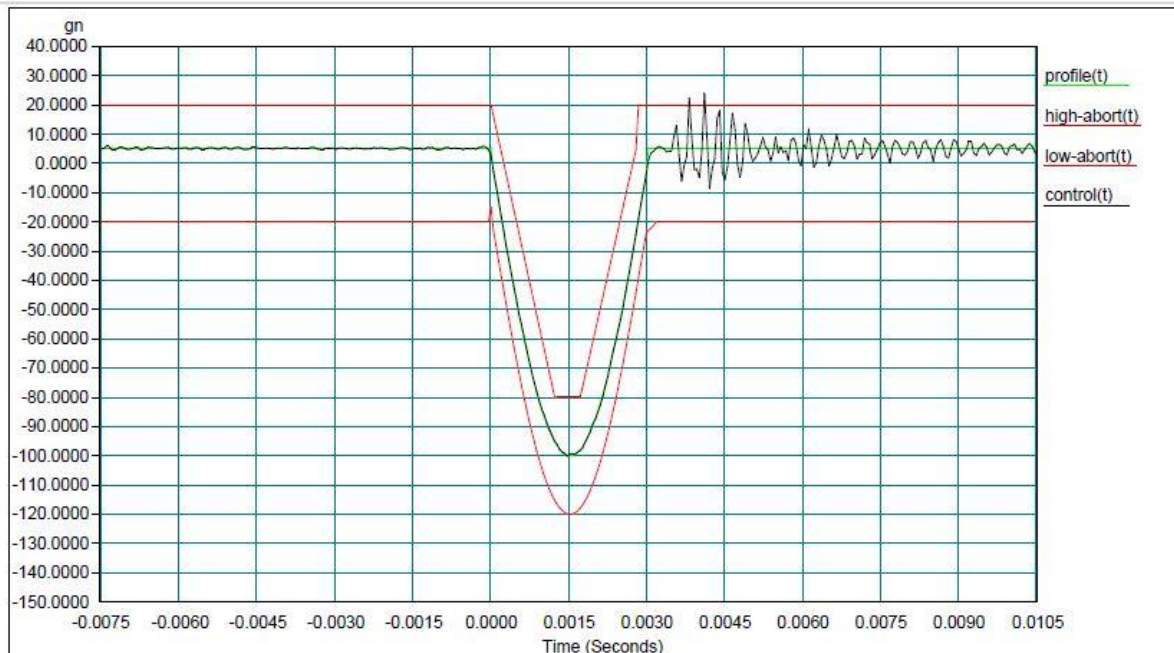


Figure 6: Negative mechanical shock plot for Double-ended Datamate Flex Circuits

**3.8. Salt Spray to EIA-364-26B: 1999**

**Specification:** 96hrs continuous salt spray, Salt Solution: 5% NaCl, Salt Mist Chamber Temp.: +35°C, Fallout rates: 0.5-3ml/hr, Ph level: 6.5-7.2 @ 35°C.

**Methodology:** Samples were tested in general accordance with BS EN 60068-2-11: 1999 Test Ka and EIA-364-26B Test Condition B. The samples were placed into the salt mist chamber for 48hrs and measured for contact resistance, power, voltage breakdown, insulation resistance and durability, as well as visual inspection post-testing. Some changes were noted during the visual inspection and insulation resistance testing (see sections 3.2 & 3.3).

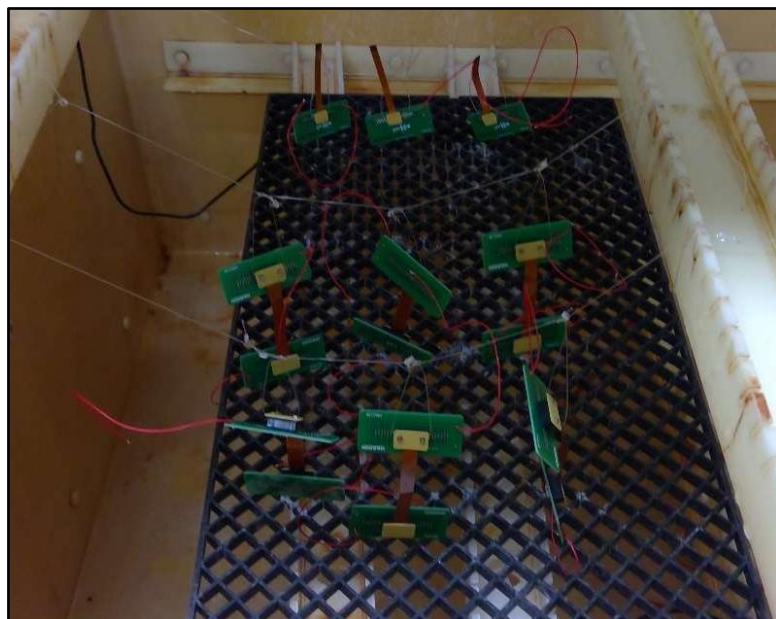


Figure 7: Double-ended Datamate samples in Salt Spray chamber

3.9. Humidity to EIA-364-31B: 2000 (BS EN 60068-2-78: 2013)

**Specification:** 24hrs pre-conditioning at +50°C, Humidity: 90-95%, Temperature: +40°C, Duration: 96hrs + 1344hrs

**Methodology:** Samples were tested in general accordance with BS EN 60068-2-78: 2013 Test Cab and EIA-364-31B: 1999 Method 2 Test Condition A. The samples were preconditioned for 24 hours at 50°C then suspended in a humidity chamber for 96 and 1344 hours at 40°C with 90-95% relative humidity. The connector assemblies were measured for contact resistance, power and durability, as well as a visual inspection post-testing. There were no obvious changes as a result.

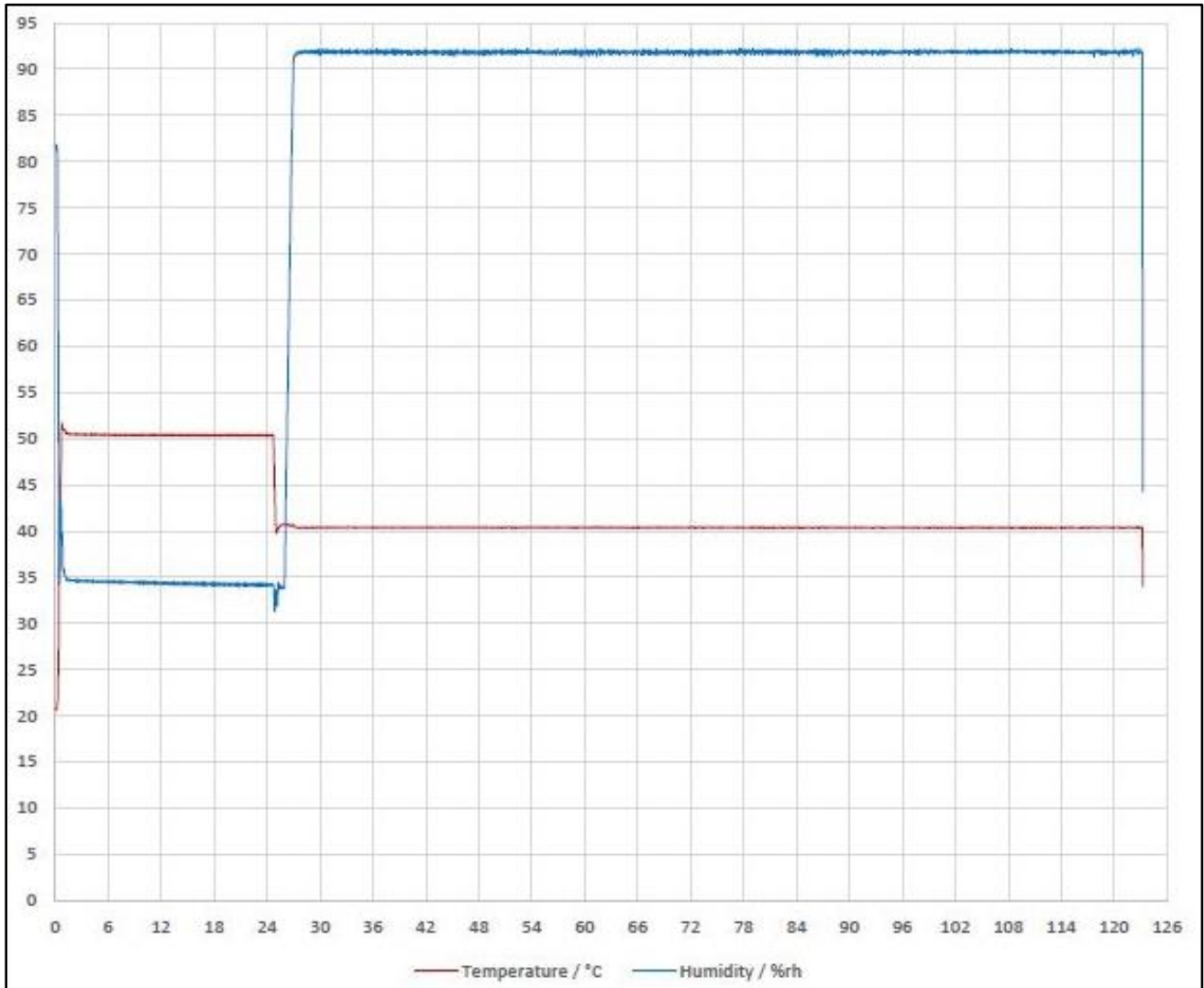


Figure 8: Plot of relative humidity ('%rh') against temperature (°C) for both Gecko and Datamate Assemblies