



HARWIN

Test Report Summary

HT07704

General Testing
Multi-Directional Spring Contacts

1. Introduction

1.1. Description and Purpose

The purpose of this test program is to confirm the environmental, mechanical, and electrical performance of the full Multi-Directional Spring Contact range (S19X1-46R).

1.2. Conclusion

This report is a summary of the testing documented in the following reports: Report_873, Report_939, Report_1394, QA000053, QA000054, QA000078, QA000149, QA000150, QA000169, QA000198, QA000273, QA000275, QA000276, QA000294, QA000354, QA000500, QA000168, QA000304, QA000508, QA000580 and QA000706.

For all contacts: under the specified conditions the requirements for environmental, mechanical, and electrical testing were met.

2. Test Method and Requirements

2.1. Specification Parameters

Testing Standard	Description of Test	Section	Page No.
EIA-364-06C: 2006	Contact Resistance	3.1	2
EIA-364-09C: 1999	Durability	3.2	3
EIA-364-70A:1998	Temperature vs Current	3.3	4-5
N/A	Force vs Deflection	3.4, 3.5	6
EIA-364-17B: 1999	Temperature Life (without loading)	3.6	7
EIA-364-32C: 2000 (BS EN 60068-2-14:2009)	Thermal Shock (Temperature Cycling)	3.7	7
EIA-364-31B: 1999 (BS EN 60068-2-78:2013)	Humidity	3.8	8
EIA-364-26B: 1999 (BS EN 60068-2-11:1999)	Salt Spray	3.9	9

2.2. List of Test Samples

For all these tests the clips had been mounted and reflow soldered to a test board, in the following configurations:

- S1921-46R (4.00mm high, Tin finish) mounted to H2355 PCB Test Board
- S1931-46R (5.50mm high, Tin finish) mounted to H2355 PCB Test Board
- S1941-46R (7.30mm high, Tin finish) mounted to Legacy PCB Test Board
- S1951-46R (7.30mm high, Tin finish) mounted to Legacy PCB Test Board
- S1961-46R (3.55mm high, Tin finish) mounted to HM2186 PCB Test Board
- S1971-46R (4.55mm high, Tin finish) mounted to HM2186 PCB Test Board
- S1981-46R (8.50mm high, Tin finish) mounted to HM2291 PCB Test Board
- S1991-46R (10.00mm high, Tin finish) mounted to HM2291 PCB Test Board

3. Test Results

3.1. Contact Resistance: EIA-364-06C: 1999

Methodology: The contact resistance of the spring contact was measured prior to any electrical, mechanical, or environmental testing. Samples were also tested post-conditioning.

Results: All values are in mΩ

Test	S1921-46R	S1931-46R	S1941-46R	S1951-46R
Initial	3.50	6.40	2.00	2.40
Durability	-	-	-	-
Humidity	5.69	7.45	-	-
Thermal Shock	9.90	11.90	-	-
Salt Spray	6.70	16.20	-	-
Temperature Life	96hrs	5.60	8.00	-
	500 hrs	8.30	8.30	-

Test	S1961-46R	S1971-46R	S1981-46R	S1991-46R
Initial	0.56	0.75	7.13	9.50
Durability	0.72	0.85	-	-
Humidity	0.76	0.68	7.70	9.20
Thermal Shock	0.79	0.87	6.00	10.30
Salt Spray	0.82	0.91	10.20	7.40
Temperature Life	96hrs	0.73	0.69	8.20
	500 hrs	0.74	0.79	8.70



3.2. Durability: EIA-364-09C: 1999

Methodology: Contacts assembled to boards were compressed vertically (by 0.6mm) and horizontally (by 0.5mm) under separate tests. The test was performed at a speed of 25mm/min for 5,000 cycles. Compression forces were measured. Samples were also tested post-conditioning.

Results: All values are the forces measured in N.

Compression Direction	Condition	S1921-46R				S1931-46R				
		Initial	Max	Min	Final	Initial	Max	Min	Final	
Vertical	Initial	5.07	5.81	4.08	4.14	3.42	5.11	2.93	3.65	
	Salt Spray	4.68	4.94	4.67	4.67	3.93	5.29	3.93	5.17	
	Humidity	3.56	3.75	3.37	3.55	4.66	5.13	4.32	4.80	
	Thermal Shock	3.88	4.16	3.83	3.97	4.18	5.47	4.04	4.84	
	Temp . Life	96 hrs	4.01	4.20	3.90	4.05	3.40	3.89	3.12	3.70
		500 hrs	5.44	5.70	5.00	5.15	3.78	5.61	3.38	5.17
Horizontal	Initial	1.70	2.21	1.66	2.08	2.54	2.78	2.47	2.57	
	Salt Spray	1.74	2.22	1.70	2.08	2.60	2.83	2.58	2.69	
	Humidity	1.88	2.25	1.87	2.13	2.52	2.68	2.44	2.46	
	Thermal Shock	1.72	2.19	1.72	2.10	2.35	2.65	2.31	2.47	
	Temp . Life	96 hrs	1.79	2.30	1.77	2.14	2.65	2.73	2.50	2.50
		500 hrs	1.71	2.23	1.71	2.17	2.58	2.76	2.49	2.61

Compression Direction	Condition	S1941-46R				S1951-46R			
		Initial	Max	Min	Final	Initial	Max	Min	Final
Vertical	Initial	3.85	5.57	-	5.57	3.28	4.77	-	3.16
Horizontal	Initial	3.46	4.46	-	5.61	3.53	4.87	-	4.23

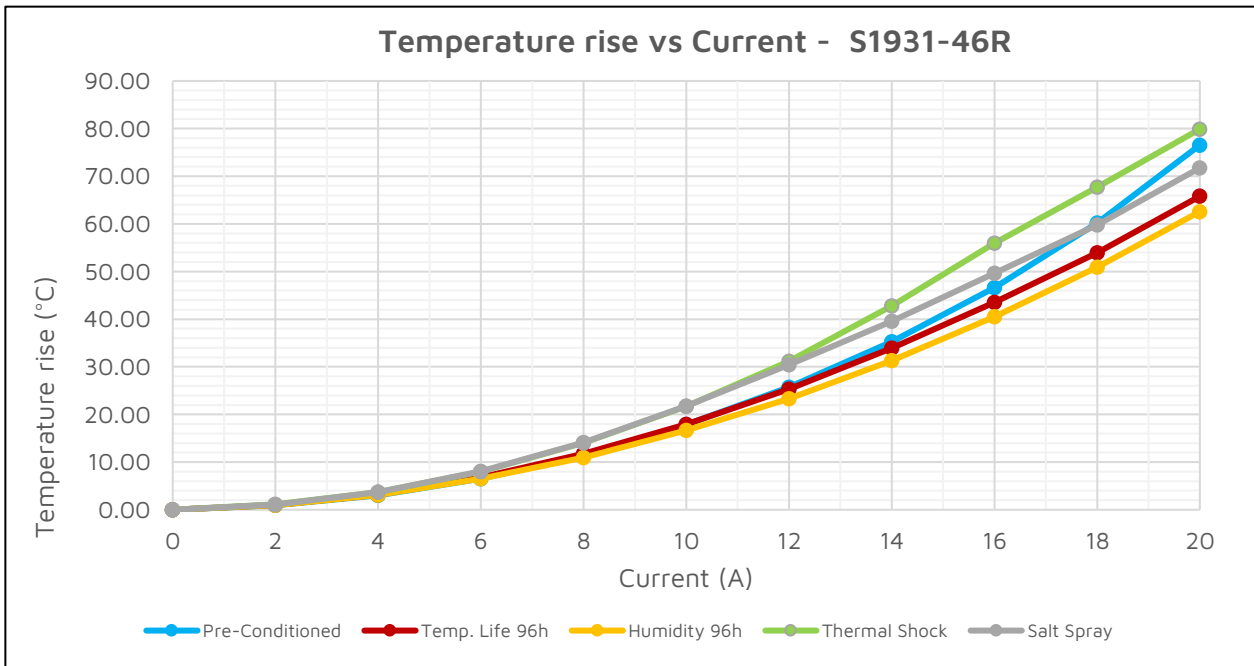
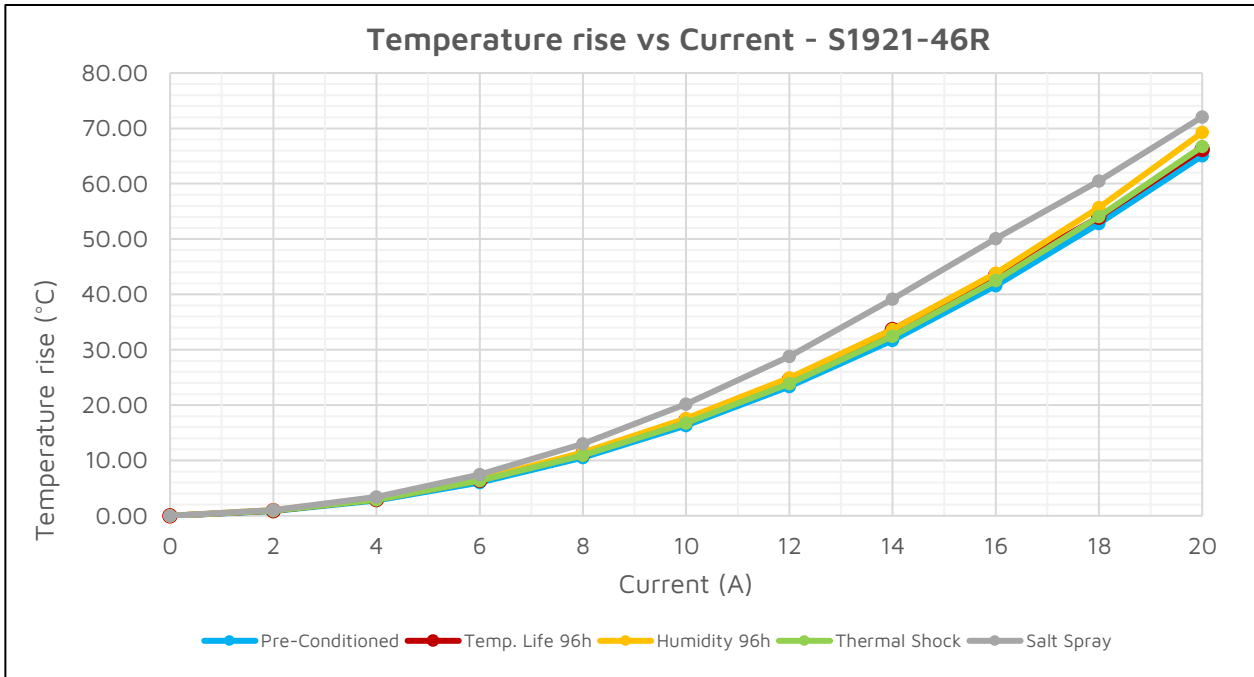
Compression Direction	Condition	S1961-46R				S1971-46R				
		Initial	Max	Min	Final	Initial	Max	Min	Final	
Vertical	Initial	4.29	6.80	4.18	4.07	5.00	5.90	5.00	5.57	
	Salt Spray	7.36	7.96	7.43	7.43	9.45	9.86	8.74	8.74	
	Humidity	5.16	6.46	4.89	4.89	8.78	9.04	8.33	8.74	
	Thermal Shock	8.40	8.51	8.25	8.25	5.34	6.20	5.23	5.23	
	Temp . Life	96 hrs	5.12	5.97	5.04	5.04	5.38	5.95	5.38	5.79
		500 hrs	5.08	6.35	5.08	5.23	5.27	5.86	5.12	5.23
Horizontal	Initial	3.81	4.30	3.40	3.40	2.91	3.18	2.51	2.51	
	Salt Spray	4.22	4.39	3.96	3.96	4.03	4.51	4.03	4.29	
	Humidity	4.00	4.34	3.47	3.47	3.40	3.51	2.95	2.95	
	Thermal Shock	4.10	4.48	3.55	3.55	3.47	3.62	3.07	3.07	
	Temp . Life	96 hrs	4.11	4.26	3.74	3.74	4.19	4.30	3.85	3.85
		500 hrs	3.77	4.18	3.40	3.40	3.51	3.66	3.03	3.03

Compression Direction	Condition	S1981-46R				S1991-46R				
		Initial	Max	Min	Final	Initial	Max	Min	Final	
Vertical	Initial	4.59	5.56	3.92	3.29	3.29	5.02	2.88	5.02	
	Salt Spray	5.11	5.36	5.11	5.23	4.56	4.96	4.60	4.77	
	Humidity	3.77	4.11	3.73	4.05	4.20	4.86	4.20	4.64	
	Thermal Shock	3.13	3.64	3.13	3.43	3.22	4.76	3.16	4.65	
	Temp . Life	96 hrs	4.80	5.12	4.61	4.64	4.31	4.53	4.00	4.26
		500 hrs	4.80	5.12	4.62	4.63	4.74	5.24	4.58	5.20
Horizontal	Initial	3.18	3.91	3.29	3.65	2.35	2.72	2.37	2.56	
	Salt Spray	3.36	4.03	3.36	3.69	2.43	2.78	2.43	2.65	
	Humidity	3.34	3.76	3.17	3.40	2.47	2.84	2.47	2.60	
	Thermal Shock	3.13	3.64	3.13	3.43	2.21	2.67	2.21	2.56	
	Temp . Life	96 hrs	3.40	3.93	3.42	3.65	2.39	2.81	2.39	2.70
		500 hrs	3.19	3.91	3.29	3.70	2.55	2.79	2.57	2.74

3.3. Temperature vs Current: EIA-364-70A:1998

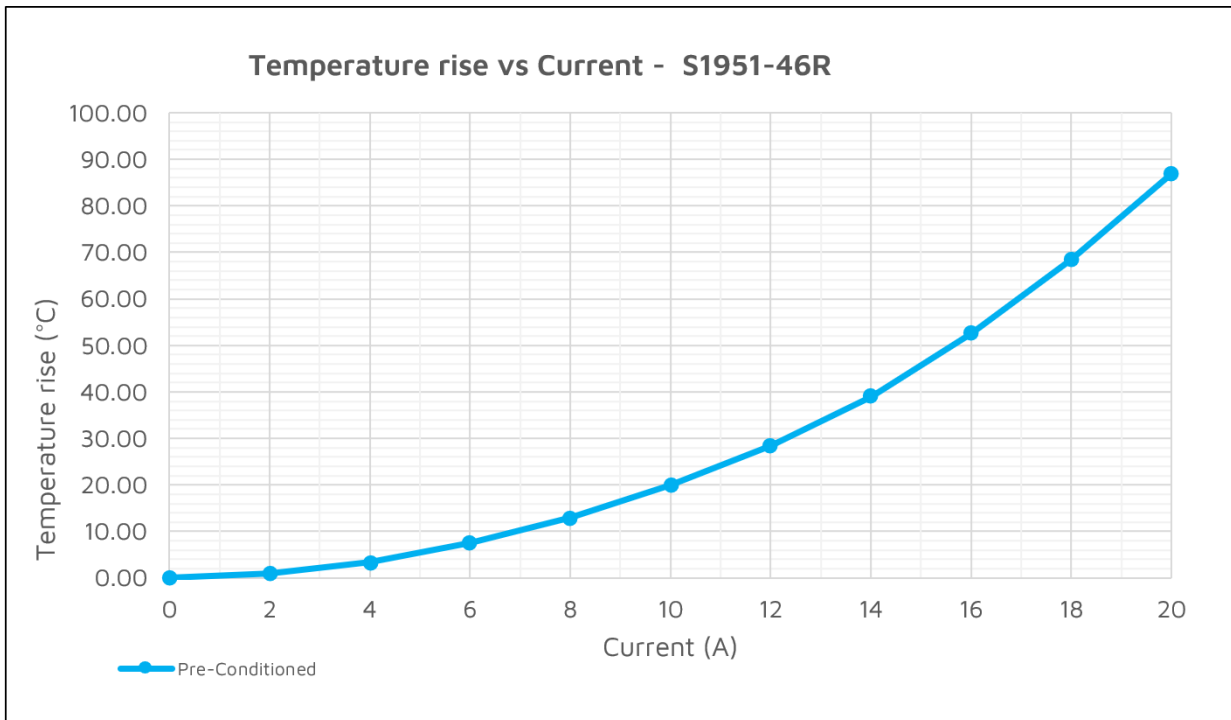
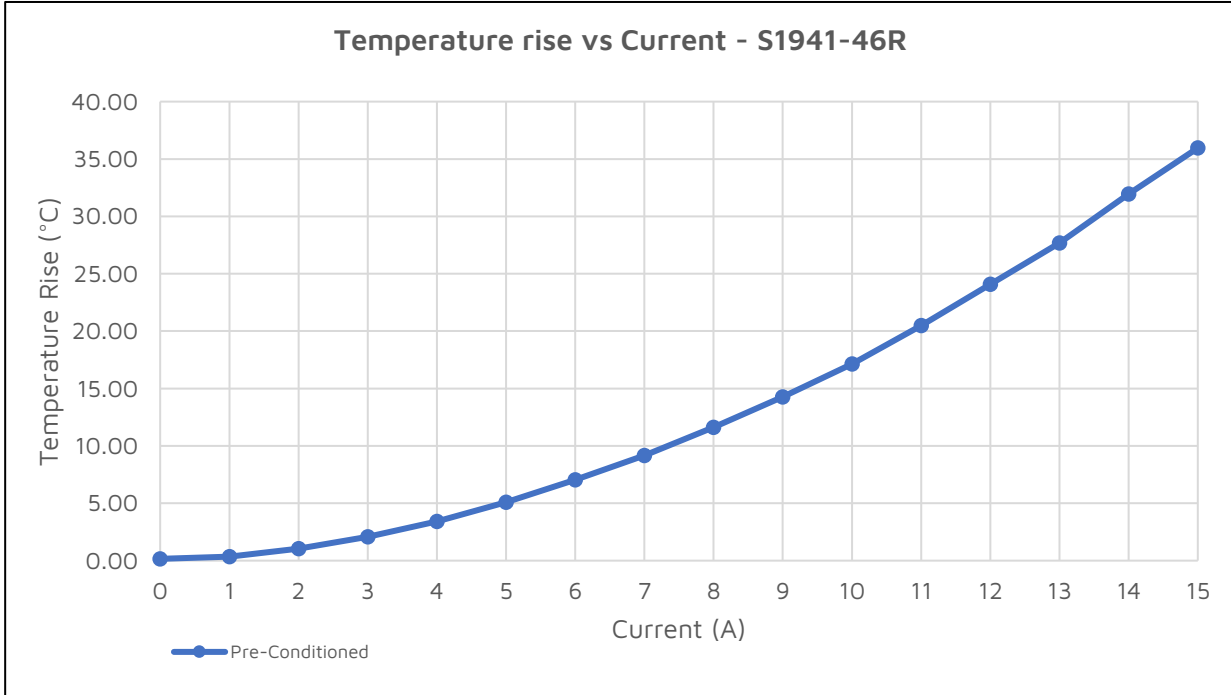
Methodology: Spring contacts were assembled to test boards and mated with an opposing test board which was wired to create a complete circuit. The spacing of the two boards was constrained at the respective recommended working height of the contact and a current was passed through to observe the corresponding temperature rise of the component. The current applied was increased in increments of 2A, leaving the temperature to stabilise between each stage.

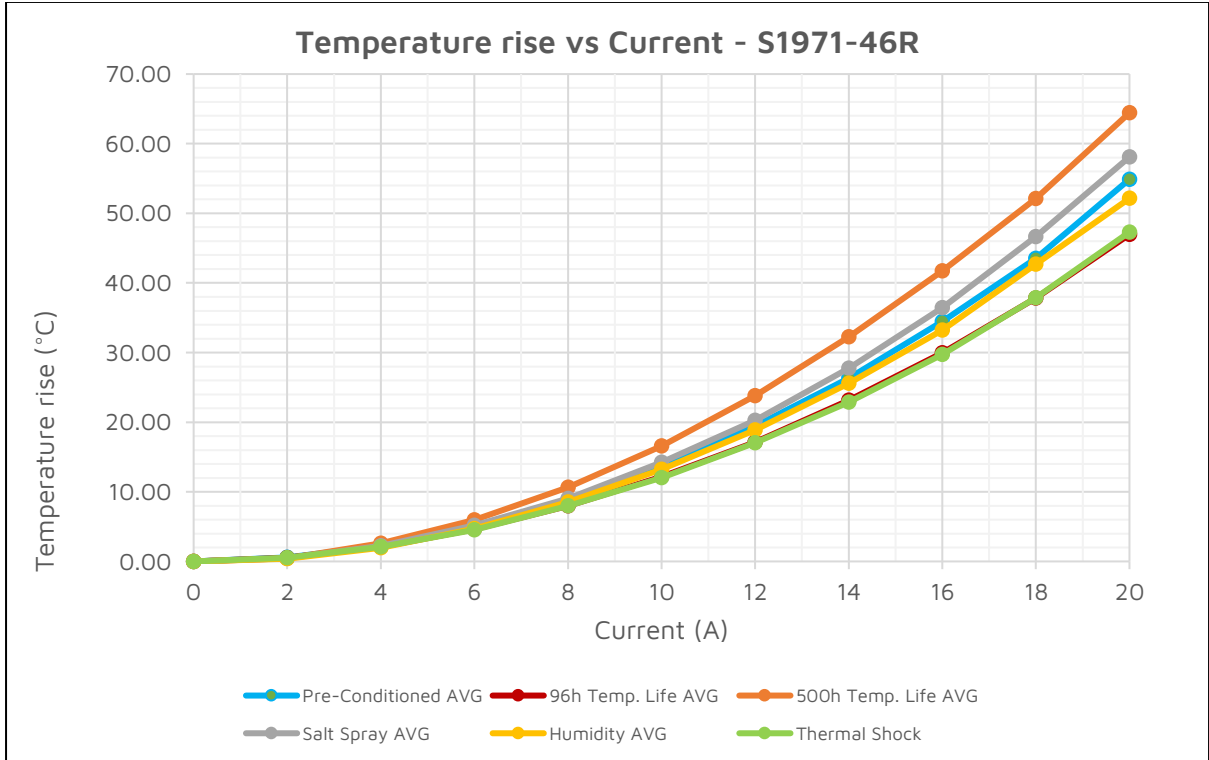
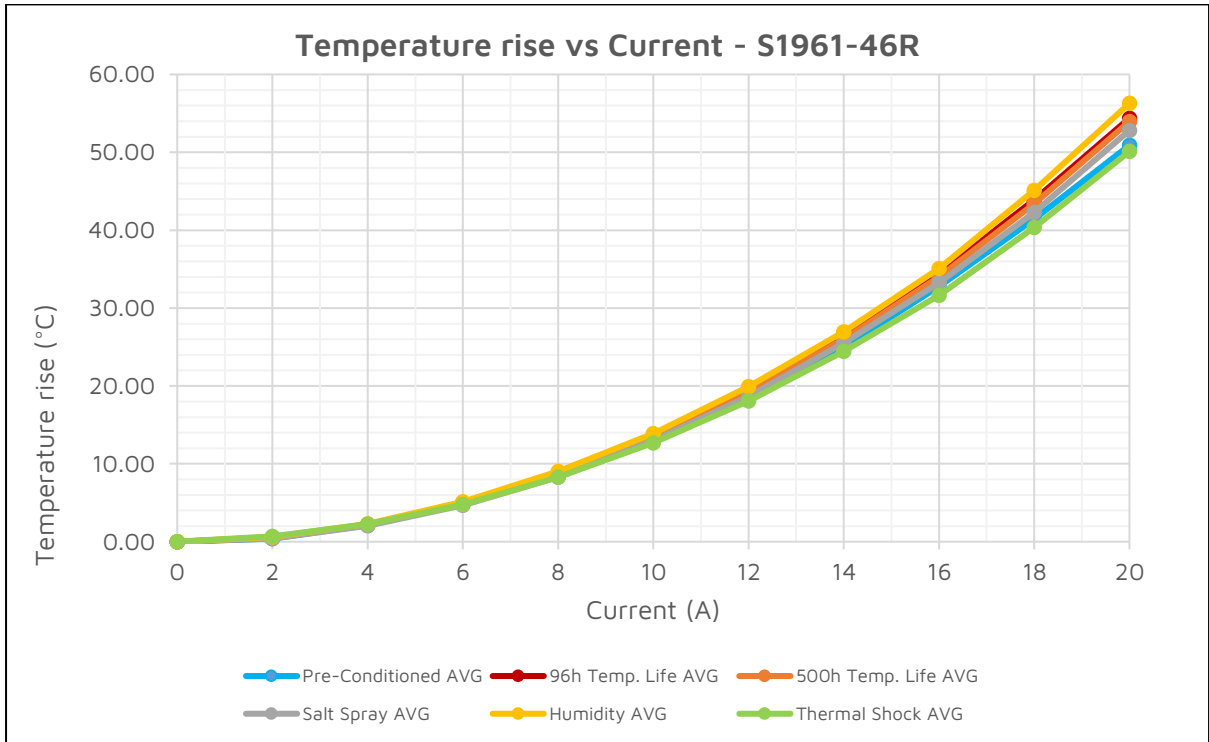
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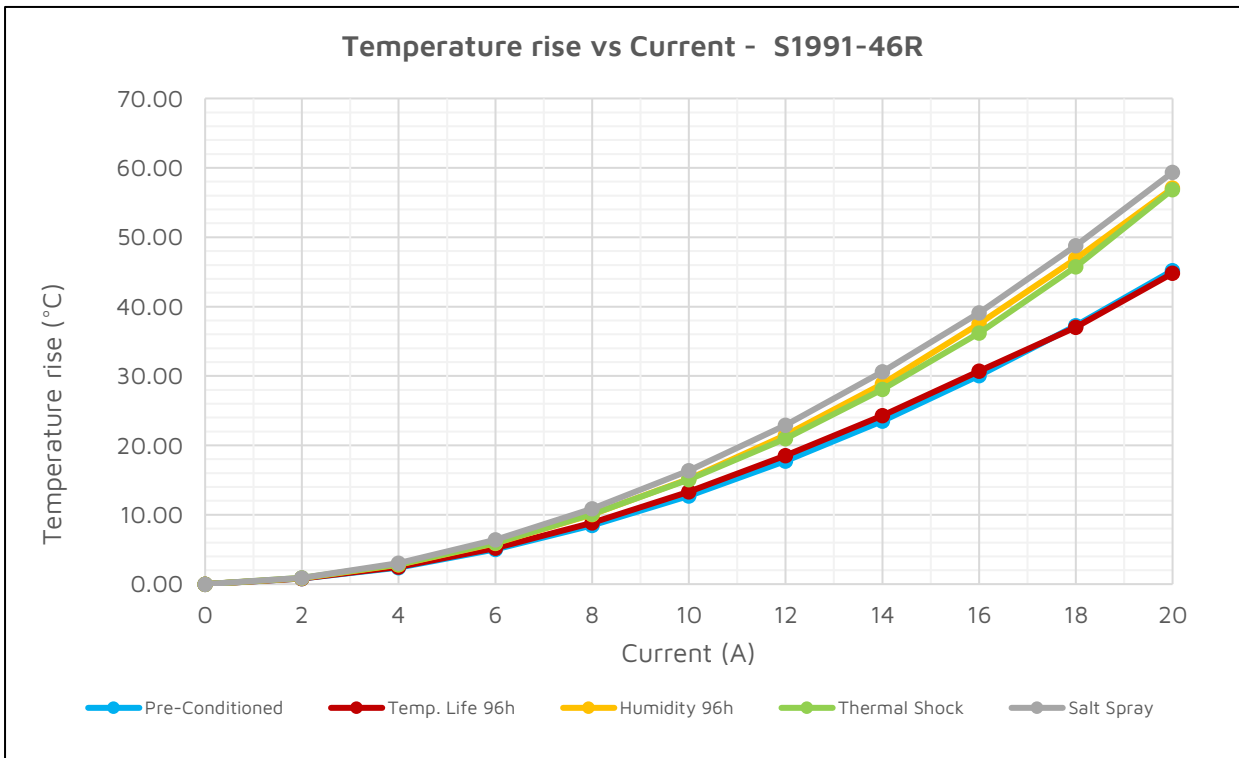
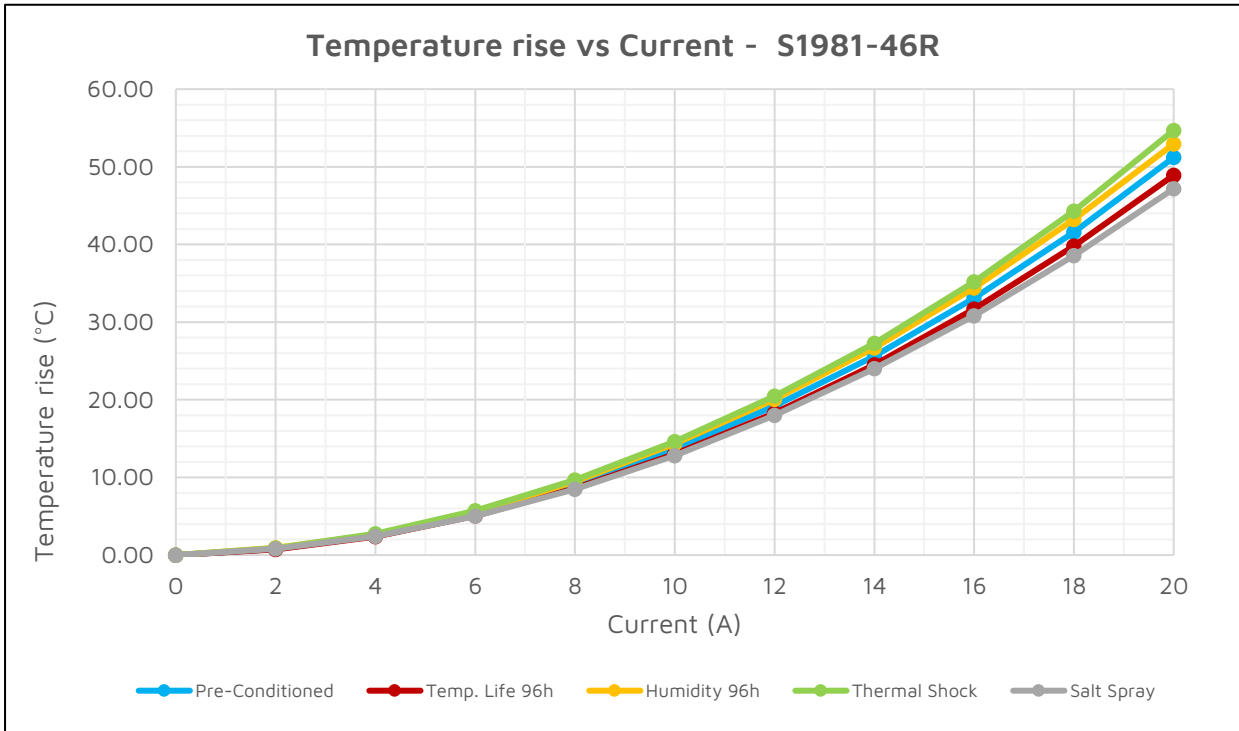




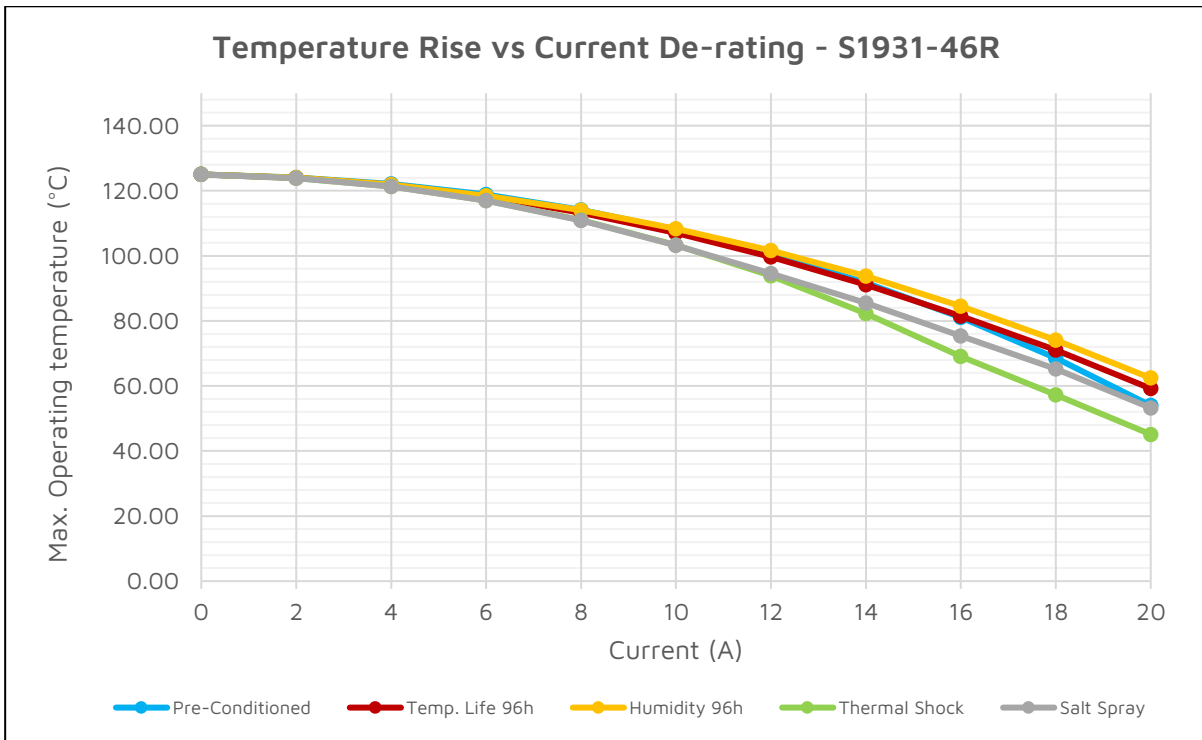
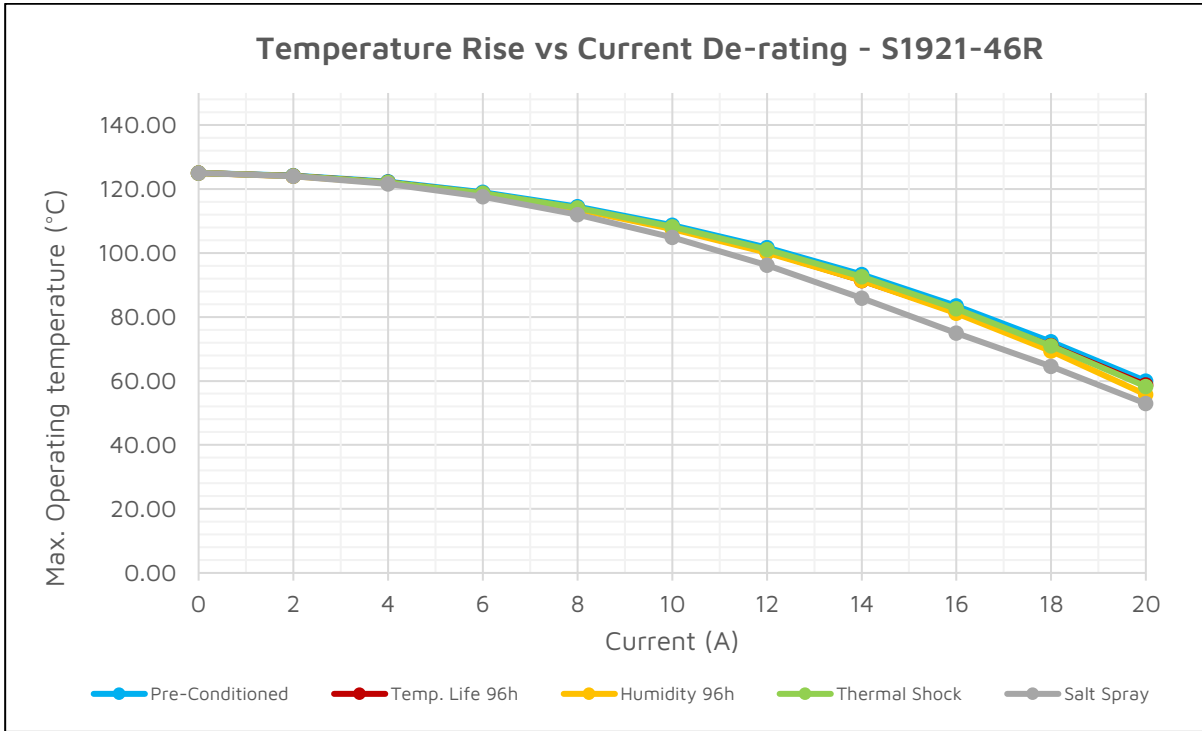
Note: Only 'pre-conditioning' results are currently available for S1941-46R & S1951-46R temperature vs current testing. Further environmental data will be included in a subsequent update.



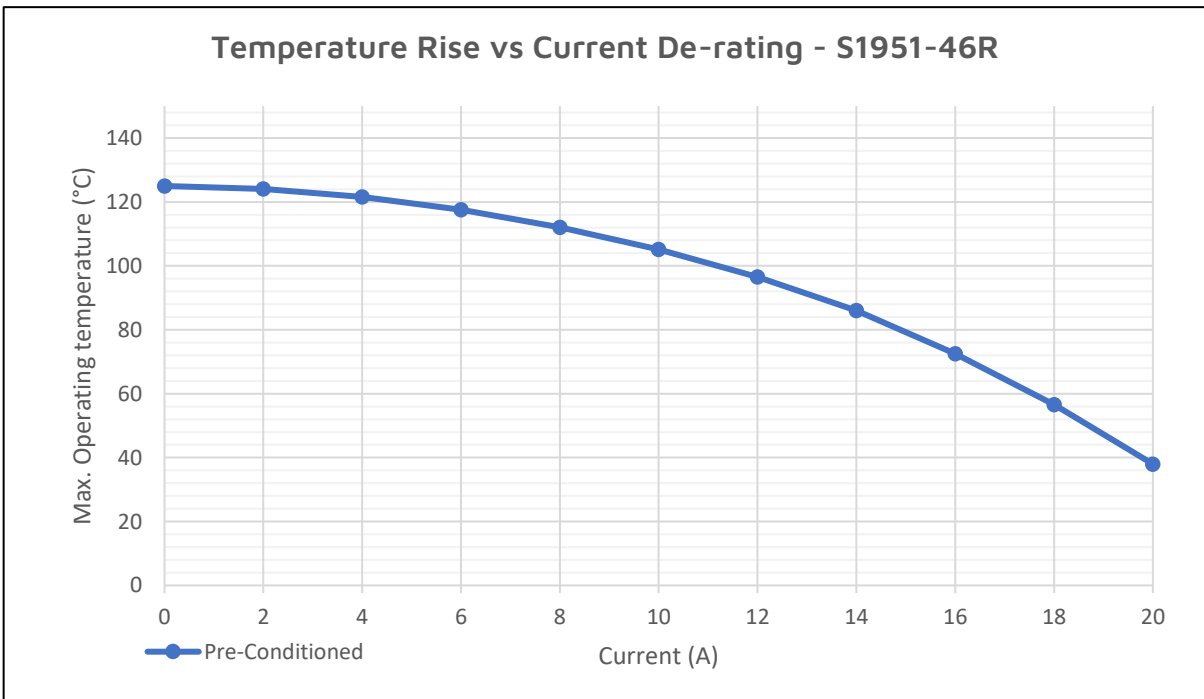
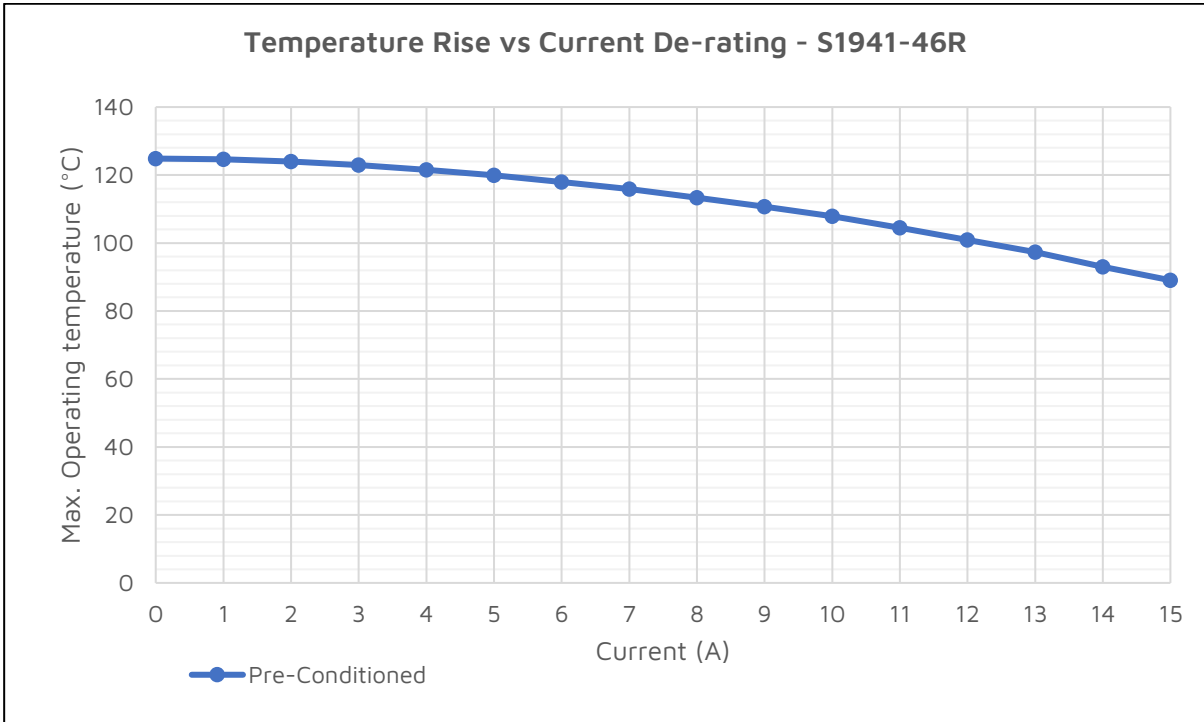


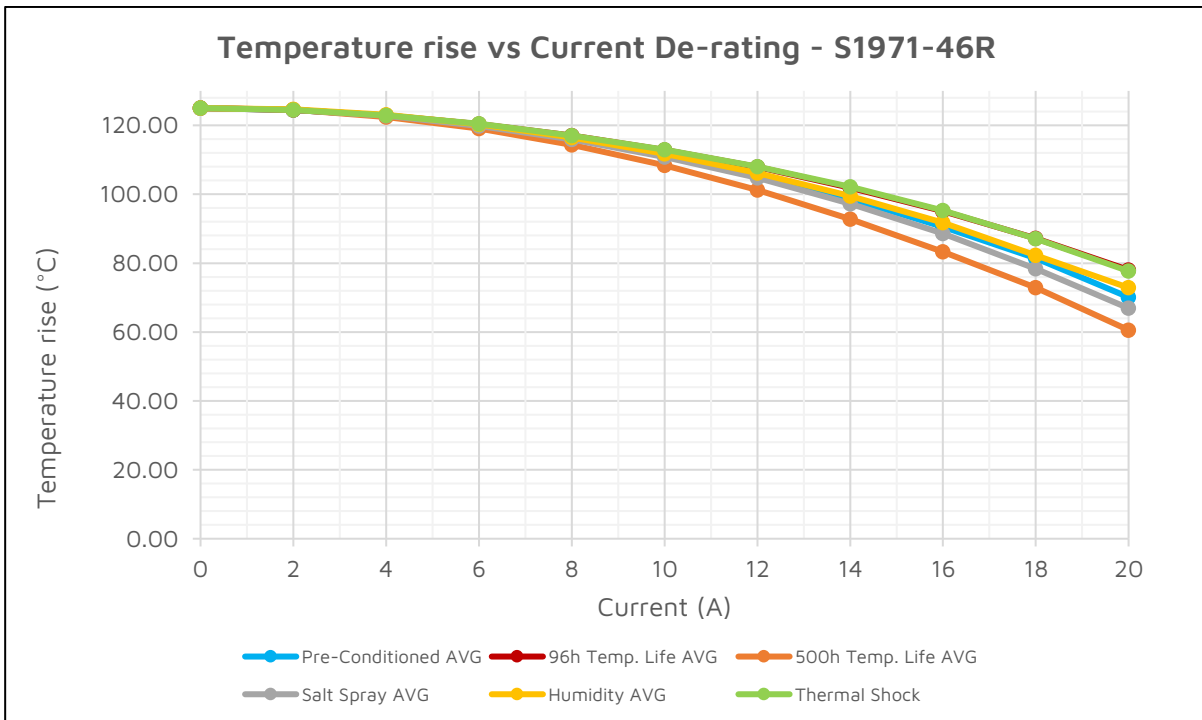
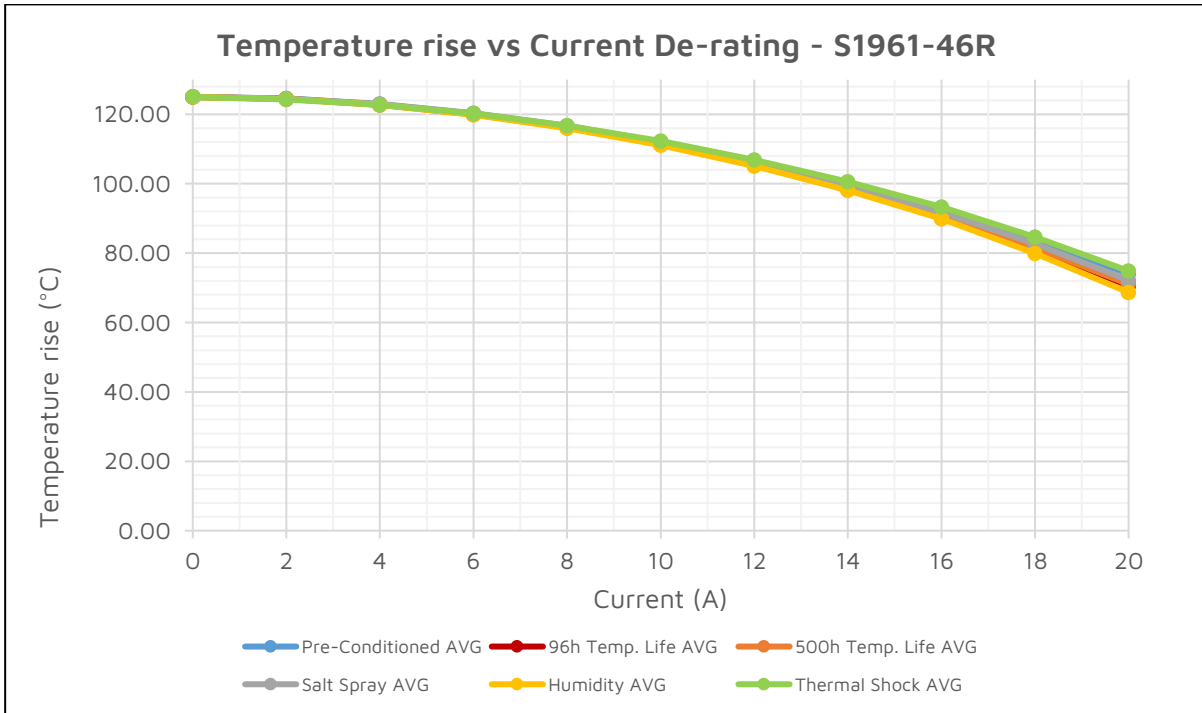


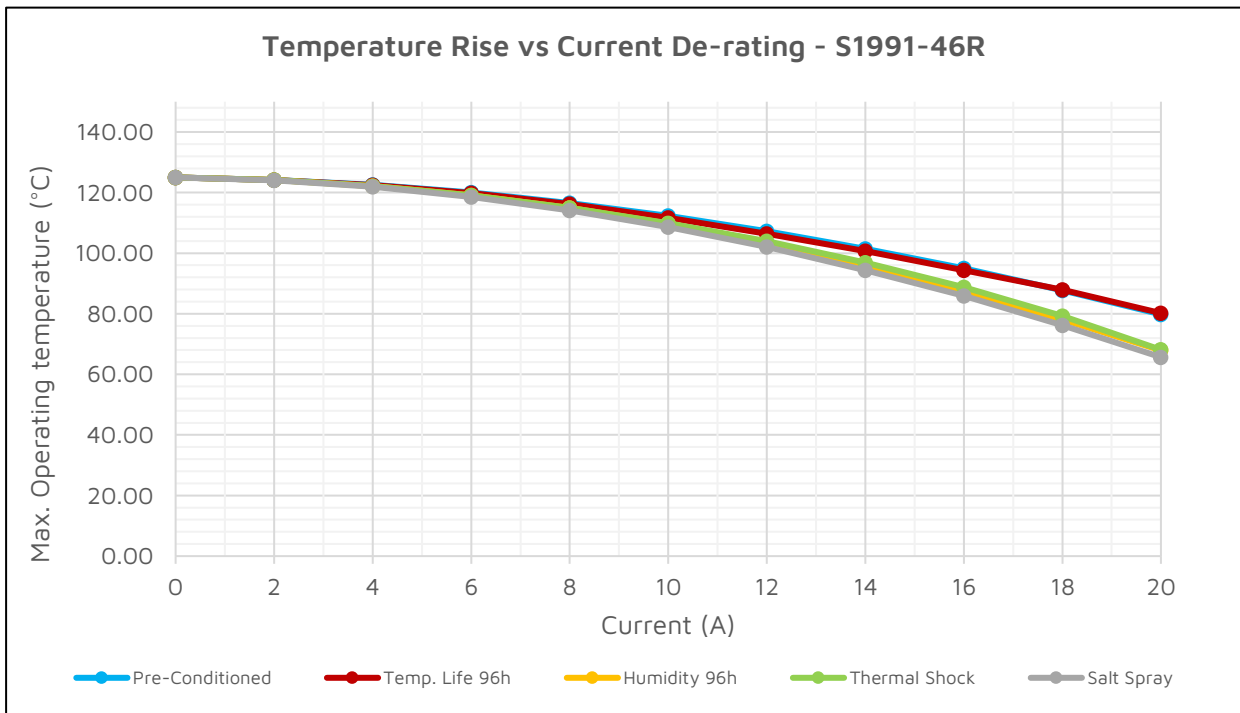
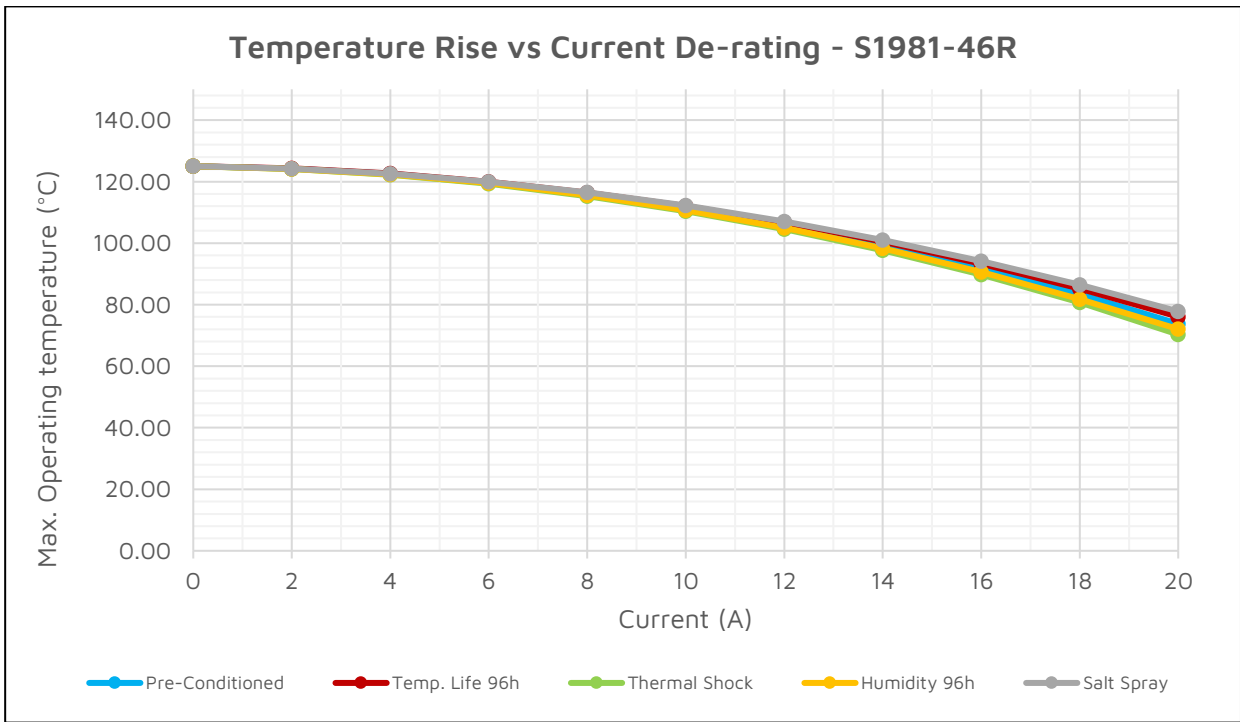
Results: Temperature vs current de-rating curves are based on the recommended maximum operating of 125°C.



Note: Only 'pre-conditioning' results are currently available for S1941-46R & S1951-46R temperature de-rating. Further environmental data will be included in a subsequent update.







3.4. Force vs Deflection

Methodology: Spring contacts were assembled onto test boards. Contacts were compressed to the maximum recommended distance and resultant force was measured.

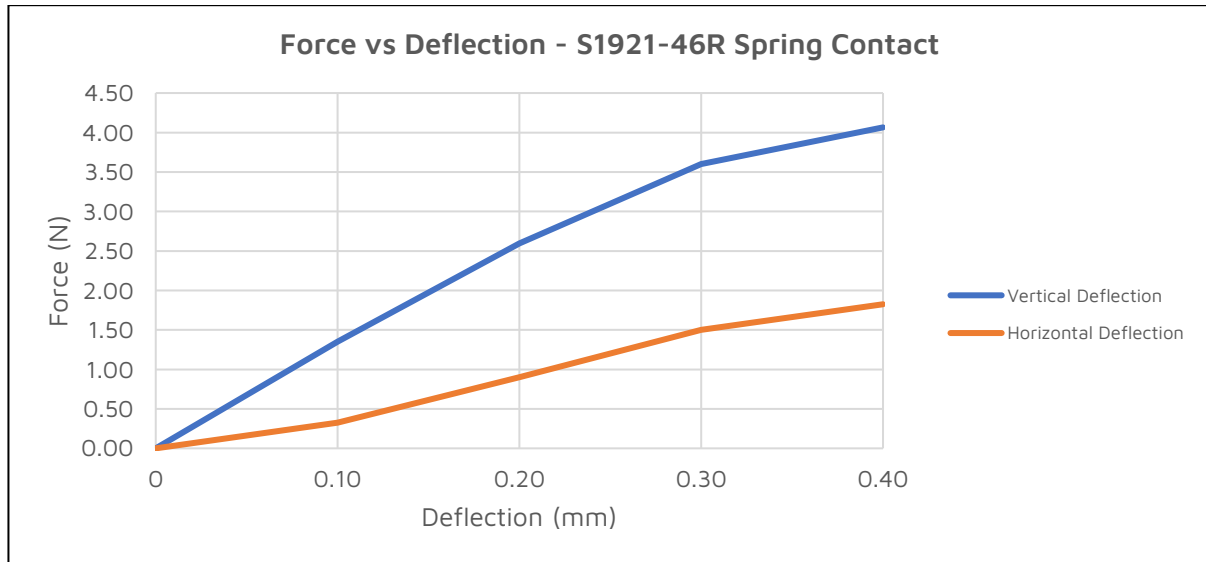
Results:

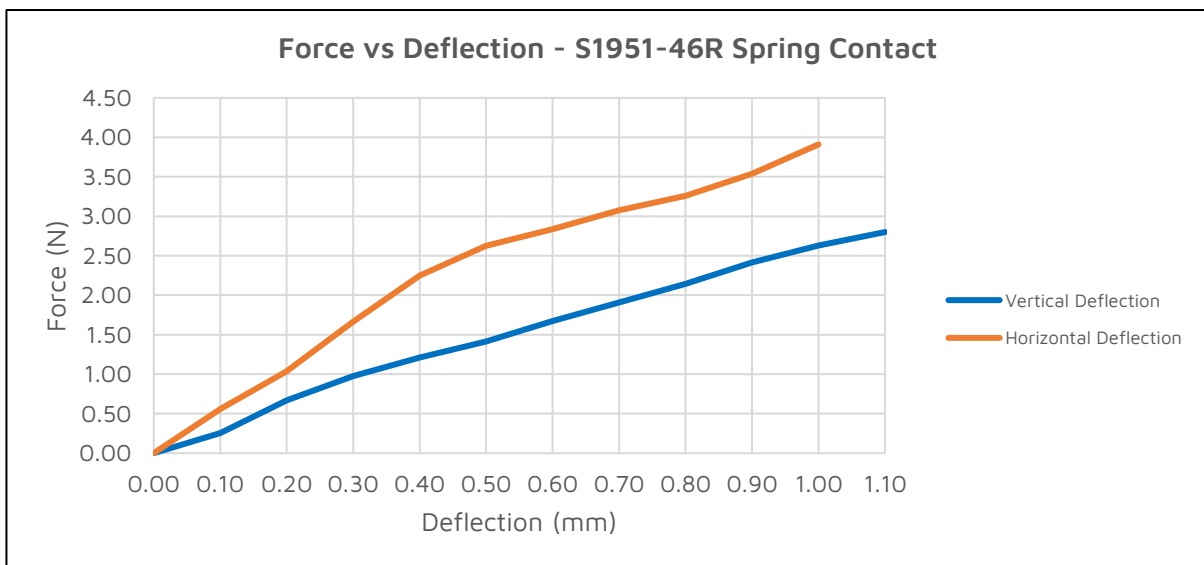
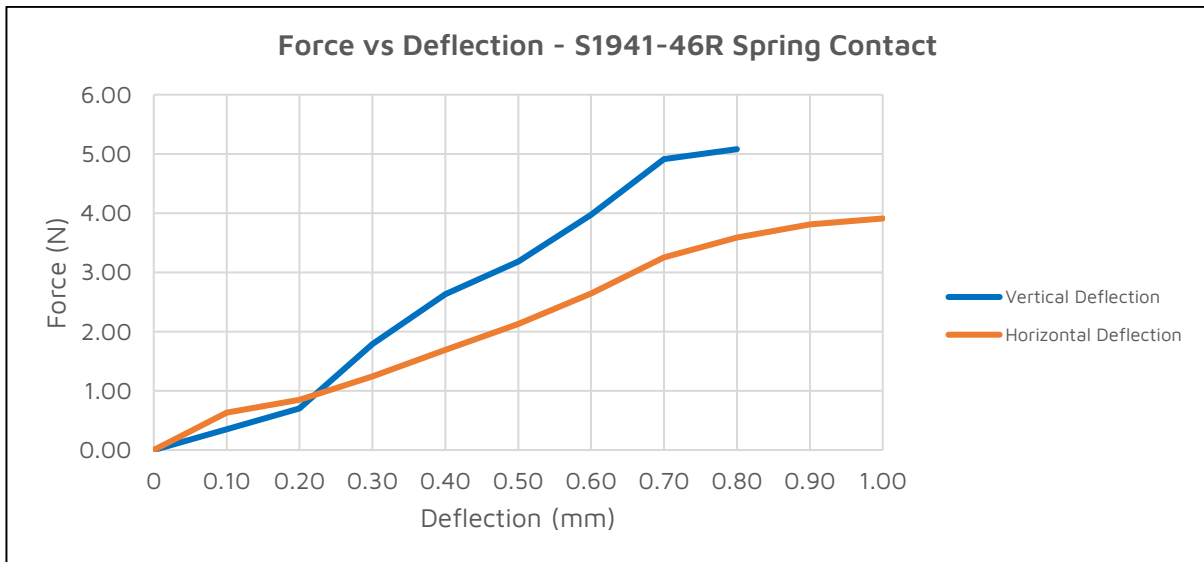
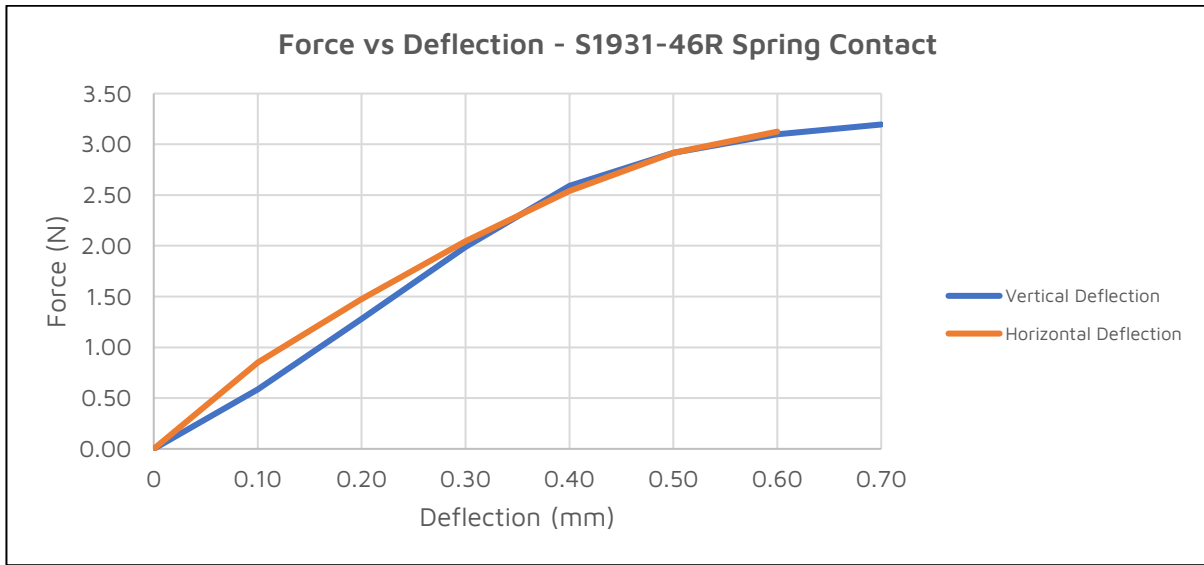
Compression Direction	Condition	S1921-46R	S1931-46R	S1941-46R	S1951-46R	S1981-46R	S1991-46R
Horizontal Compression (mm)		0.40	0.70	0.80	1.10	1.00	1.20
Vertical	Initial	6.27	3.14	3.91	3.50	4.09	2.82
	Salt Spray	6.36	3.48	-	-	5.11	4.89
	Humidity	5.77	3.56	-	-	5.51	4.64
	Thermal Shock	5.91	3.17	-	-	4.25	4.28
	Temp. Life	96 hrs	6.36	3.42	-	-	4.39
	500 hrs	6.06	3.45	-	-	5.53	4.76
Vertical Compression (mm)		0.40	0.60	1.00	1.00	0.90	1.10
Horizontal	Initial	1.75	2.55	4.46	3.70	3.30	2.50

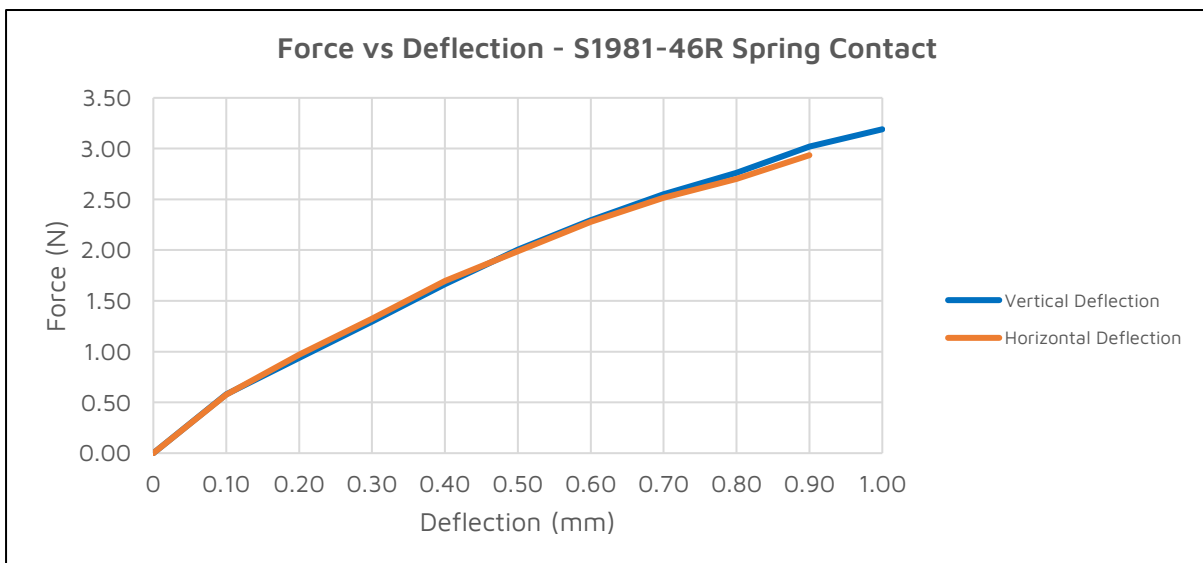
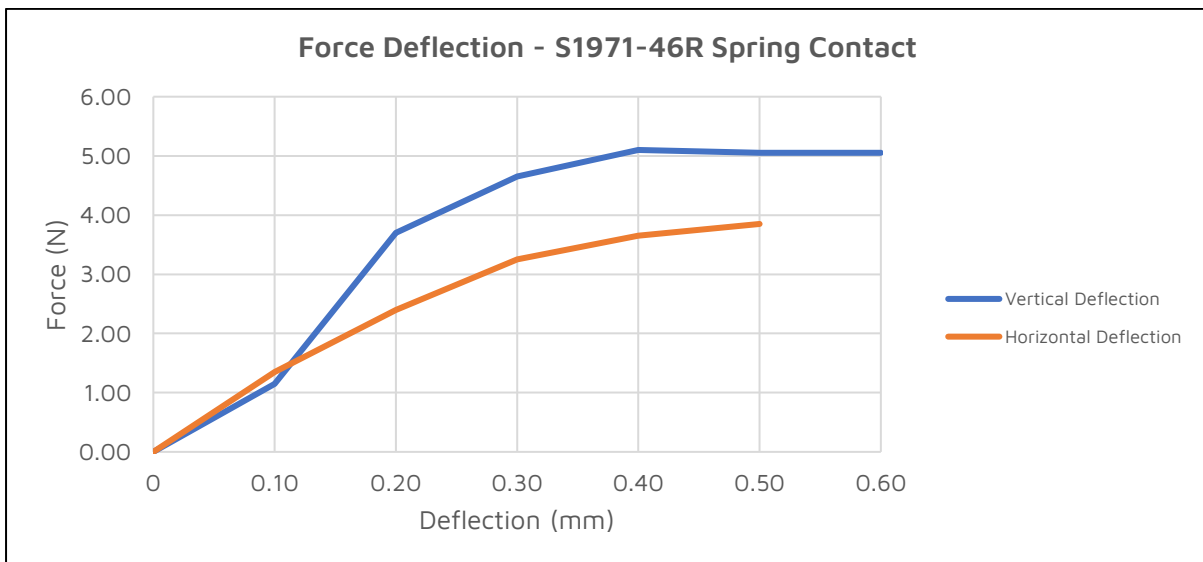
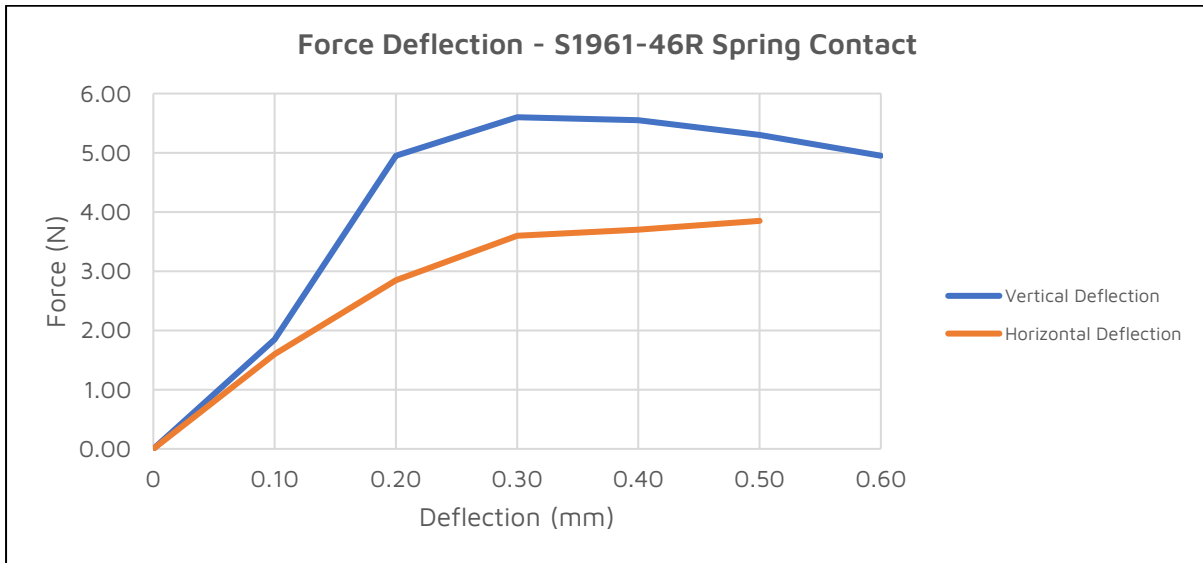
3.5. Incremental Force vs Deflection

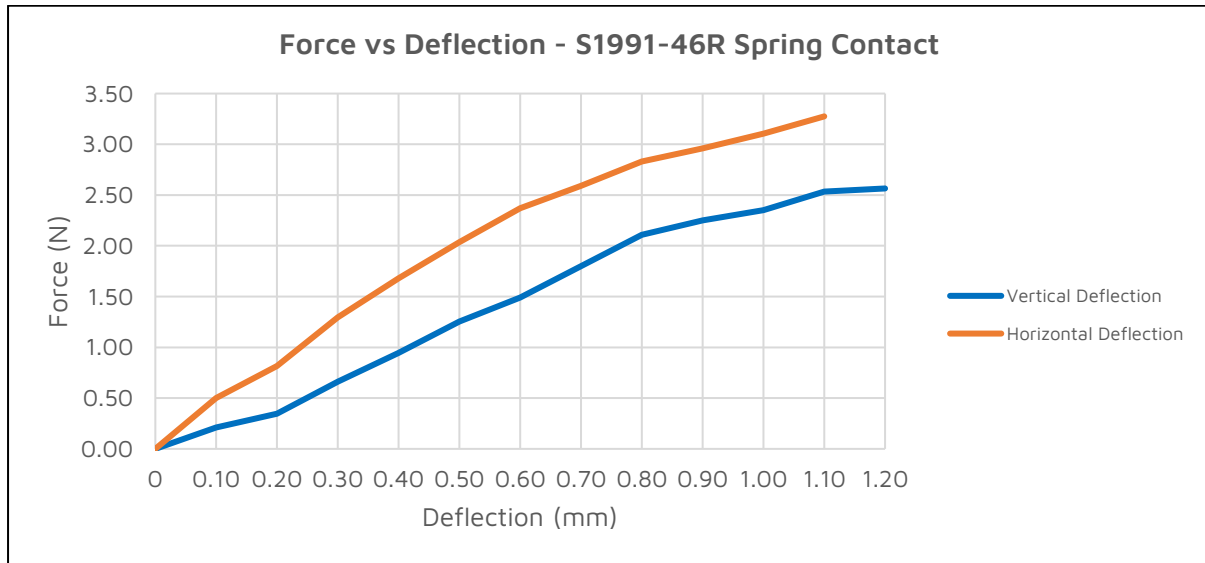
Methodology: Initial sample spring contacts were assembled on to test boards. A force was applied to both the front and top faces under separate tests (for horizontal & vertical respectively) at deflection increments of 0.10mm – the force at each step was noted. Deflection was continued up to the maximum rated deflection in both directions on all contacts. The distance of permanent set after maximum deflection was measured.

Results:









Results: Permanent set after specified maximum deflection

Part Number	Compression Direction	Max Deflection (mm)	Permanent Set (mm)
S1921-46R	Vertical	0.40	0.06
	Horizontal	0.40	0.16
S1931-46R	Vertical	0.70	0.15
	Horizontal	0.60	0.26
S1941-46R	Vertical	0.80	0.10
	Horizontal	1.00	0.07
S1951-46R	Vertical	1.10	0.09
	Horizontal	1.00	0.19
S1961-46R	Vertical	0.60	0.29
	Horizontal	0.50	0.25
S1971-46R	Vertical	0.60	0.25
	Horizontal	0.50	0.20
S1981-46R	Vertical	1.00	0.05
	Horizontal	0.90	0.10
S1991-46R	Vertical	1.20	0.03
	Horizontal	1.10	0.40

3.6. Temperature life (Without Load): EIA-364-17B:1999, Condition 5, Method A

Methodology: Spring contacts assembled to test boards were subjected to 96 hours and 500 hours at 125±5°C. The samples were measured for contact resistance, current vs temperature and durability, as well as a visual inspection after testing.

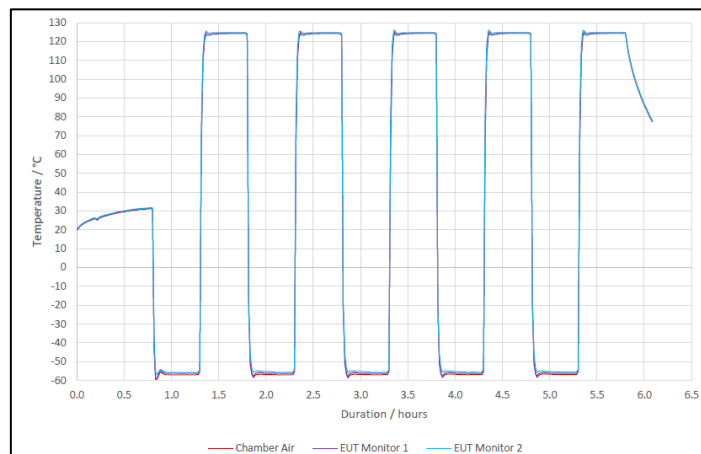
Results: No obvious visual changes were noted.

Part Number	Duration in Temperature Testing Oven	
	96 hours at +125°C	500 hours at +125°C
S1921-46R	Pass	Pass
S1931-46R	Pass	Pass
S1941-46R	Pass	Pass
S1951-46R	Pass	Pass
S1961-46R	Pass	Pass
S1971-46R	Pass	Pass
S1981-46R	Pass	Pass
S1991-46R	Pass	Pass

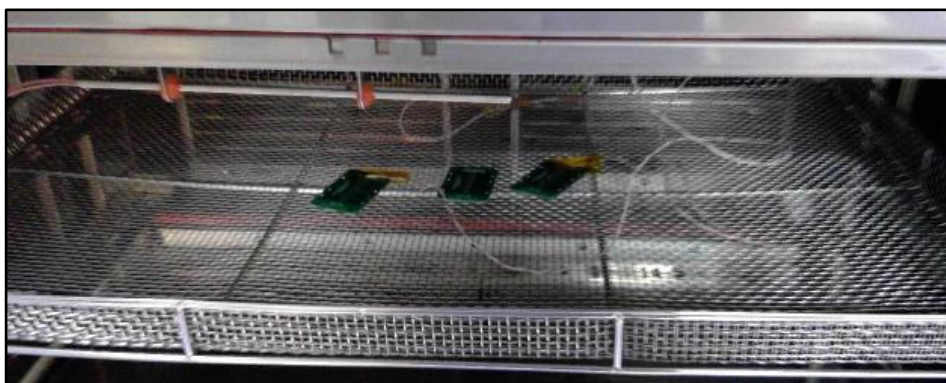
3.7. Thermal Shock: EIA-364-32C: 2000, Condition 3 / BS EN 60068-2-14:2009, Test Na

Methodology: Thermal Shock Testing was performed on the spring contacts assembled to the test boards, using the following conditions:

- Temperature Extremes = -55°C and +125°C
- Dwell times = 1 hr at each temperature extreme
- 5 cycles



The samples were measured for contact resistance, current vs temperature and durability, as well as a visual inspection after testing.



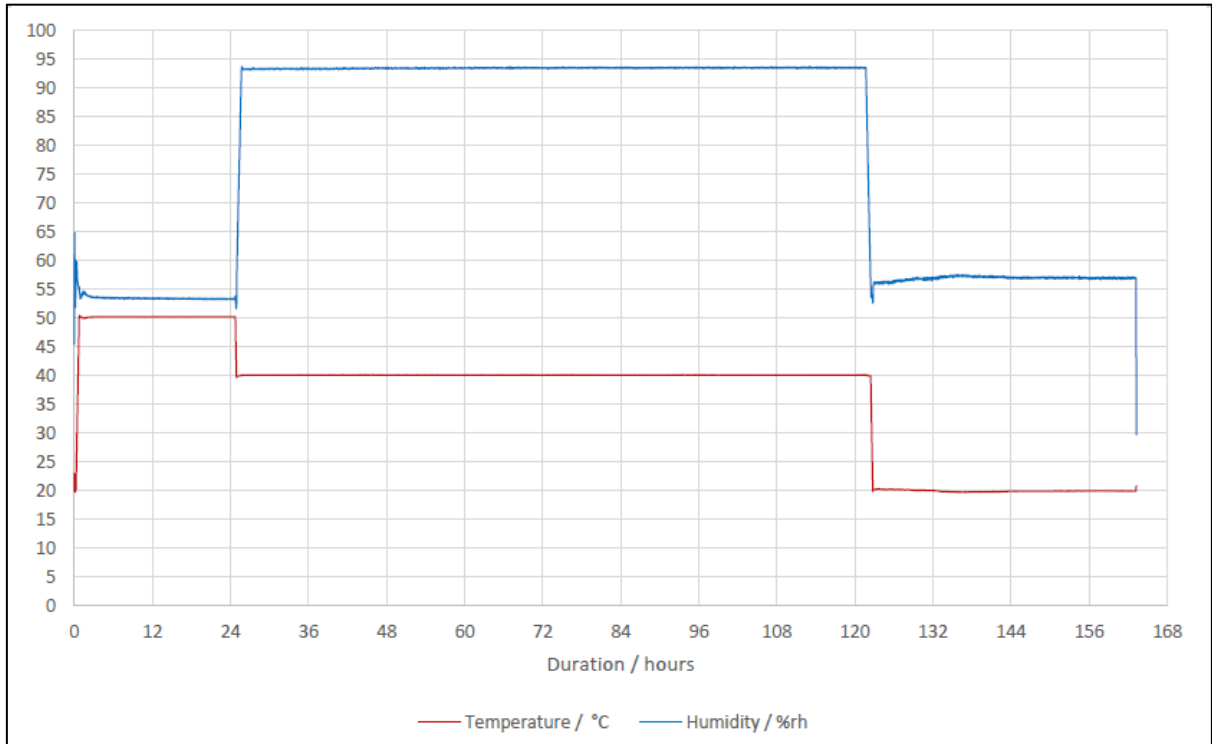
Samples in Thermal Shock Chamber

Results: There were no obvious changes as a result.

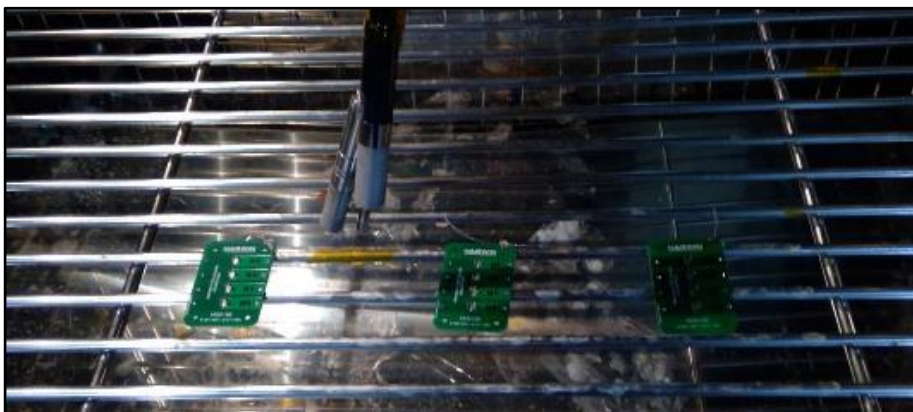
3.8. Humidity Steady State: EIA-364-31B: 1999, Method 2, Condition A / BS EN 60068-2-78-2013 Test Cab

Methodology: A Steady State Humidity test was performed on the two contacts assembled to test boards, using the following conditions:

- Ambient Temperature = +40°C
- Steady state humidity = 90% to 95% Rh
- Duration = 96hrs



The samples were measured for contact resistance, current vs temperature and durability, as well as a visual inspection after testing.



Samples in Humidity Chamber

Results: There were no obvious changes as a result.

3.9. Salt Spray: EIA-364-26B: 1999 / BS EN 60068-2-11:1999 Test Ka

Methodology: A salt mist test was performed on test boards including the two contacts, using the following conditions:

- Salt solution = 5% NaCl
- Salt Mist chamber temperature = +35°C
- Salt spray duration = 96hrs continuous
- Fallout rates = 0.5-3ml per hr
- pH level = 6.5 to 7.2



Samples in Salt Spray Chamber

On completion of the salt mist duration, the samples were dipped in running water and placed into a temperature chamber at +38°C for 16hrs. The samples were measured for contact resistance, current vs temperature and durability, as well as a visual inspection after testing.

Results: There were no obvious changes as a result.