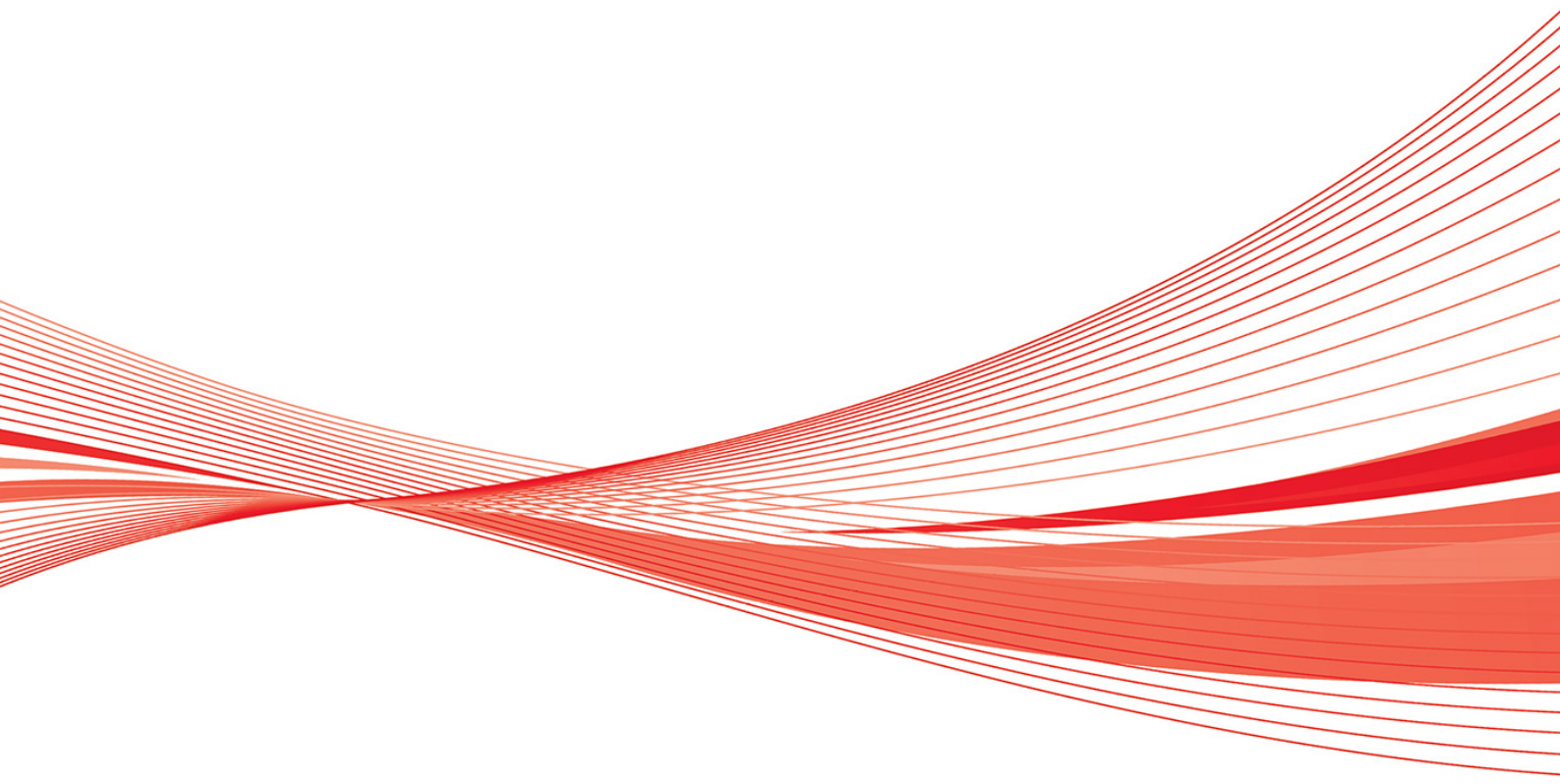
Harwin Test Report Summary

HT05001

Environmental & Mechanical Testing of SYCAMORE Contacts (S9111-45R, S9121-45R, S9131-45R, S9141-45R)



harwin.com

1. Introduction.

1.1. Description and Purpose.

The Harwin SYCAMORE Contacts are a range of vertical SMT sockets. The following tests were carried out to validate the performance against specification, through Insertion and Withdrawal forces, temperature rise and contact resistance before and after temperature life testing.

1.2. Conclusion.

The following data has been collated from Harwin test critical reports 1453, 1551, 1556, 1557 and 1772. The results were used to compile the Component Specification for the SYCAMORE Contact range. The contacts met the specification parameters set out in section 2.2 of this test report summary – all electrical and mechanical requirements were fulfilled. Further information available on request – please contact technical@harwin.com.

2. Test Samples and Parameters.

2.1. List of Test Samples.

a) S9111-45R – Vertical SMT SYCAMORE Contact, Top Entry for Ø1.50-1.90mm mating pin
b) S9121-45R – Vertical SMT SYCAMORE Contact, Bottom Entry for Ø1.50-1.90mm mating pin
c) S9131-45R – Vertical SMT SYCAMORE Contact, Top Entry for Ø0.80-1.30mm mating pin
d) S9141-45R – Vertical SMT SYCAMORE Contact, Bottom Entry for Ø0.80-1.30mm mating pin

2.2. Specification Parameters.

The proposed product specification includes the following relevant parameters:

- Current Rating: 6A
- Contact Resistance: 15mΩ MAX
- Maximum Insertion Force:
  - S9111-45R, S9121-45R: Ø1.50mm pin = 3.5N, Ø1.90mm pin = 17.0N
  - S9131-45R, S9141-45R: Ø0.80mm pin = 3.0N, Ø1.30mm pin = 6.0N
- Minimum Withdrawal Force:
  - S9111-45R, S9121-45R: Ø1.50mm pin = 0.5N, Ø1.90mm pin = 1.0N
  - S9131-45R, S9141-45R: Ø0.80mm pin = 0.3N, Ø1.30mm pin = 0.6N
- Durability ≥ 500 cycles
- Operating Temperature = -50°C to +125°C

Tests were performed in accordance with EIA-364 standards, as follows:

Testing Standard	Description of Test	Page No.
EIA-364-06C: 2006	Contact Resistance	3
EIA-364-70A: 1998	Temperature Rise versus Current - Method 2	4
EIA-364-13C: 2006	Mating and Un-Mating Forces - Method B	7
EIA-364-09C: 1999	Durability (Mechanical Operations)	8

3. Test Method and Results.

3.1. Contact Resistance (EIA-364-06C):

The resistance across a mated socket and pin was tested before and after durability testing to determine the effect of plating wear on contact resistance.

- Virgin Contacts:

Mating Pin	Sample Part No.	Contact Resistance (mΩ)	
		Sample 1	Sample 2
Ø1.90mm	S9111-45R	2.34	2.17
	S9121-45R	2.24	2.28
Ø1.50mm	S9111-45R	3.04	3.22
	S9121-45R	3.82	3.69
Ø1.30mm	S9131-45R	3.47	3.45
	S9141-45R	4.00	4.26
Ø0.80mm	S9131-45R	4.03	4.11
	S9141-45R	3.93	4.76

- Pre-durability:

Mating Pin	Sample Part No.	Contact Resistance (mΩ)			
		96hrs @ 125°C		1000hrs @ 125°C	
		Sample 1	Sample 2	Sample 3	Sample 4
Ø1.90mm	S9111-45R	1.98	2.00	1.90	2.03
	S9121-45R	1.99	2.05	2.08	2.02
Ø1.50mm	S9111-45R	1.95	2.09	2.00	1.97
	S9121-45R	2.17	2.02	2.16	2.00
Ø1.30mm	S9131-45R	1.99	1.97	1.96	1.94
	S9141-45R	1.91	2.11	2.08	2.01
Ø0.80mm	S9131-45R	2.00	2.10	2.14	2.01
	S9141-45R	2.05	2.02	1.99	2.02

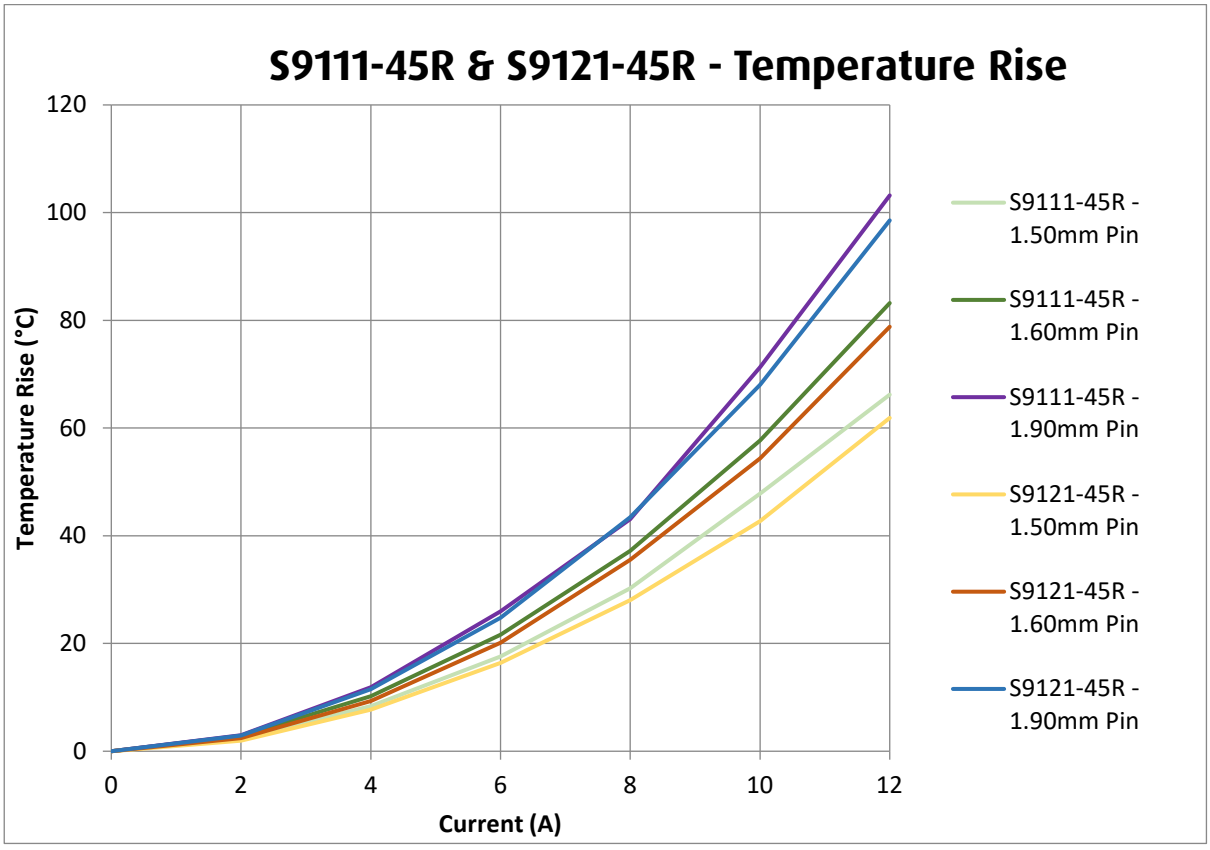
- Post-durability:

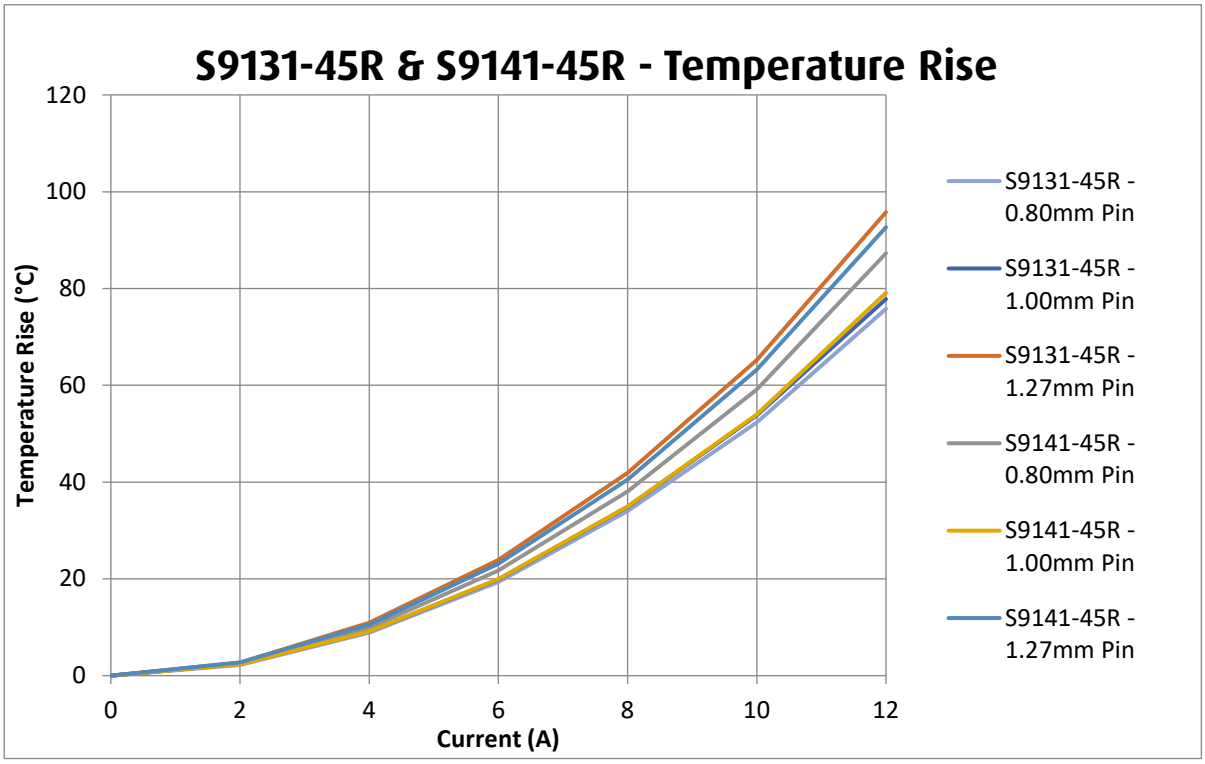
Mating Pin	Sample Part No.	Contact Resistance (mΩ)			
		96hrs @ 125°C		1000hrs @ 125°C	
		Sample 1	Sample 2	Sample 3	Sample 4
Ø1.90mm	S9111-45R	2.03	2.02	1.94	2.17
	S9121-45R	2.03	2.13	2.15	2.18
Ø1.50mm	S9111-45R	2.04	2.12	2.02	2.01
	S9121-45R	2.20	2.16	2.21	2.08
Ø1.30mm	S9131-45R	2.10	2.04	1.96	1.99
	S9141-45R	2.04	2.14	2.18	2.04
Ø0.80mm	S9131-45R	2.01	2.15	2.12	1.98
	S9141-45R	2.00	2.03	2.06	2.02

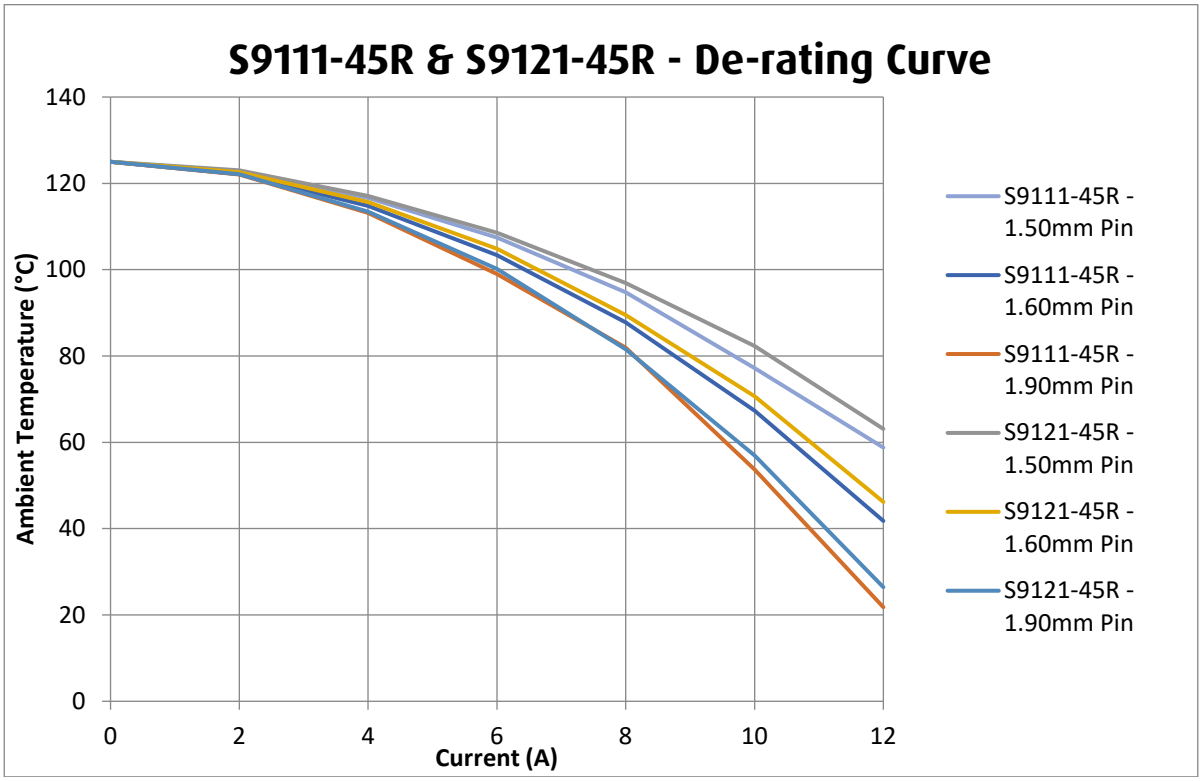
3.2 Current Rating (EIA-364-70A):

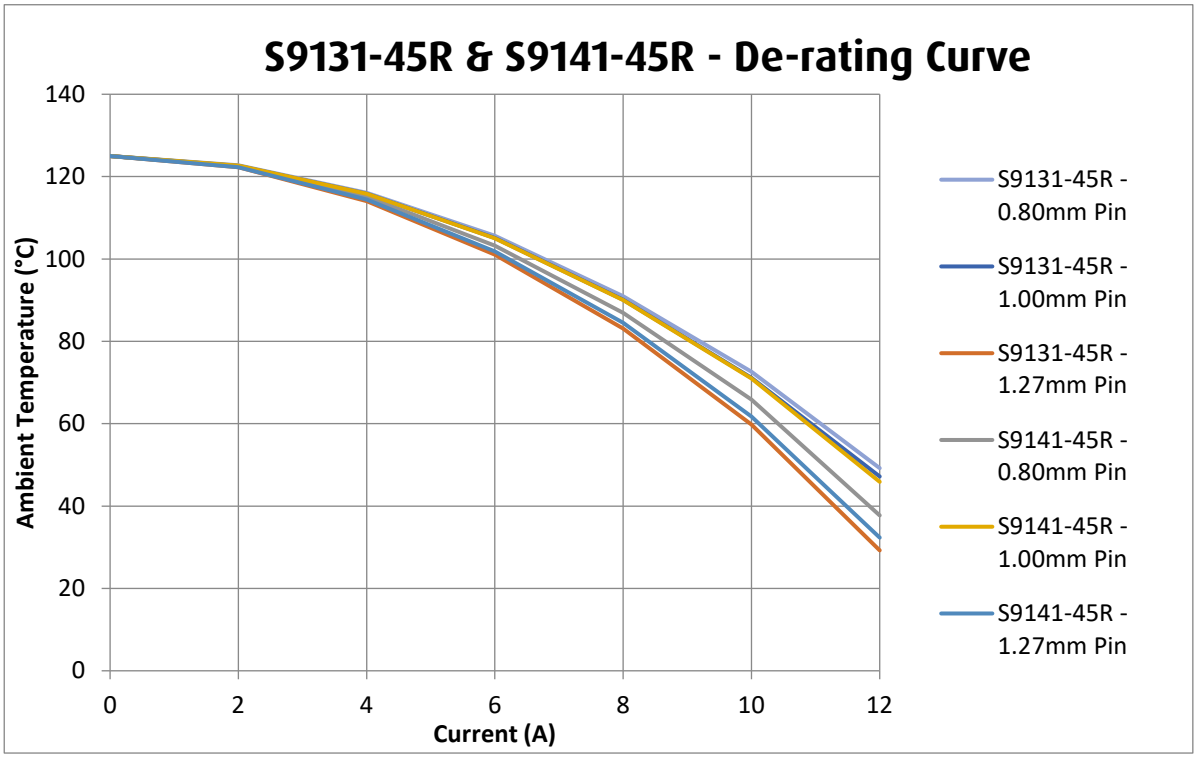
Four virgin samples of each SYCAMORE contact were tested with three mating pin diameters for temperature rise under load. Test conducted at 25±5°C with a variable current of 0-12 amps. Visual checks for defects were performed before and after testing.

Part No.	Pin Diameter (mm)	Average Current causing 30°C Rise (A)
S9111-45R	1.50	8.0
	1.60	8.0
	1.90	8.0
S9121-45R	1.50	10.0
	1.60	8.0
	1.90	8.0
S9131-45R	1.50	8.0
	1.60	8.0
	1.90	8.0
S9141-45R	1.50	8.0
	1.60	8.0
	1.90	8.0




S9131-45R & S9141-45R - Temperature Rise
Temperature Rise (°C)
120
100
80
60
40
20
0
0
2
4
6
8
10
12
Current (A)
S9131-45R - 0.80mm Pin
S9131-45R - 1.00mm Pin
S9131-45R - 1.27mm Pin
S9141-45R - 0.80mm Pin
S9141-45R - 1.00mm Pin
S9141-45R - 1.27mm Pin


S9111-45R & S9121-45R - De-rating Curve
Ambient Temperature (°C)
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
Current (A)
S9111-45R - 1.50mm Pin
S9111-45R - 1.60mm Pin
S9111-45R - 1.90mm Pin
S9121-45R - 1.50mm Pin
S9121-45R - 1.60mm Pin
S9121-45R - 1.90mm Pin



3.3 Insertion & Withdrawal, Durability Testing (EIA-364-13C):

Eight samples of each SYCAMORE Contact were cycled 500 times using an auto-load cycling machine at 25.4mm/minute. Insertion and withdrawal forces were recorded. Tests were conducted at 25±5°C at a relative humidity of 60±20%.

- S9111-45R:

Mating pin	Insertion Force (N)			Withdrawal Force (N)		
	Max	Min	Average	Max	Min	Average
1.27mm	1.05	0.88	0.97	0.98	0.75	0.86
1.50mm	2.43	2.04	2.20	1.45	0.70	0.97
1.60mm	4.39	3.07	3.78	2.72	1.04	1.85
1.90mm	15.58	11.20	13.99	7.60	5.10	5.92

- S9121-45R:

Mating pin	Insertion Force (N)			Withdrawal Force (N)		
	Max	Min	Average	Max	Min	Average
1.27mm	1.11	0.94	1.04	1.40	1.24	1.32
1.50mm	2.45	2.18	2.32	1.14	0.90	1.02
1.60mm	4.91	4.01	4.50	2.30	1.34	1.75
1.90mm	10.60	9.08	9.89	5.00	3.10	3.99

- S9131-45R:

Mating pin	Insertion Force (N)			Withdrawal Force (N)		
	Max	Min	Average	Max	Min	Average
0.80mm	2.21	1.90	2.08	3.40	2.44	2.85
1.00mm	2.68	2.34	2.44	3.74	2.88	0.86
1.27mm	4.22	3.93	4.10	3.08	2.71	2.88
1.50mm	7.05	6.57	6.80	2.02	1.64	1.77

- S1941-45R:

Mating pin	Insertion Force (N)			Withdrawal Force (N)		
	Max	Min	Average	Max	Min	Average
0.80mm	1.90	1.51	1.67	3.23	1.62	2.76
1.00mm	2.67	2.13	2.50	3.46	2.97	3.17
1.27mm	4.41	4.00	4.14	3.32	2.65	2.92

3.4 Durability Testing Post-Temperature Life (EIA-364-09C):

Samples of each SYCAMORE contact were tested for durability post-temperature life conditioning, using an auto-load cycling machine operating at 25.4mm/minute for 500 cycles. Contact resistance was measured across the contact and pin system before and after cycling. Tests were conducted at 25±5°C at a relative humidity of 60±20%.

- S9111-45R:

Mating pin	Temperature Life Duration (@125°C)	Insertion Force (N)			Withdrawal Force (N)		
		Initial	Max	Min	Initial	Max	Min
Ø1.50mm	96hrs	1.02	1.89	1.02	0.54	0.54	1.64
		0.86	2.27	0.76	0.52	0.52	2.00
	1000hrs	0.79	1.90	0.61	0.53	2.39	0.53
		3.43	7.21	3.43	1.17	4.50	1.17
Ø1.90mm	96hrs	5.04	13.88	5.02	3.11	11.67	3.11
		3.90	8.62	3.61	1.63	7.28	1.63
	1000hrs	5.14	10.99	4.84	1.85	9.92	1.69
		4.04	7.41	3.64	1.43	6.19	1.36

- S9121-45R:

Mating pin	Temperature Life Duration (@125°C)	Insertion Force (N)			Withdrawal Force (N)		
		Initial	Max	Min	Initial	Max	Min
Ø1.50mm	96hrs	1.01	2.10	0.83	0.60	2.30	0.60
		1.40	2.55	1.40	0.80	2.75	0.78
	1000hrs	0.84	1.63	0.62	0.91	2.29	0.91
		2.43	4.88	2.38	1.49	4.54	1.49
Ø1.90mm	96hrs	5.27	10.00	5.05	3.44	6.58	3.47
		5.62	11.42	5.62	2.32	7.31	2.12
	1000hrs	6.27	16.46	6.08	2.75	9.35	2.75
		5.71	11.93	5.52	3.00	7.08	3.00

- S9131-45R:

Mating pin	Temperature Life Duration (@125°C)	Insertion Force (N)			Withdrawal Force (N)		
		Initial	Max	Min	Initial	Max	Min
Ø0.80mm	96hrs	1.17	1.76	1.15	0.54	1.54	1.05
		1.07	1.54	1.05	0.50	1.40	0.50
	1000hrs	1.06	2.06	0.95	0.53	1.58	0.50
		0.88	1.53	0.76	0.83	1.89	0.80
Ø1.30mm	96hrs	1.84	3.29	1.41	1.10	3.04	1.10
		1.77	3.69	1.77	0.94	3.16	0.89
	1000hrs	1.29	3.16	1.29	1.00	3.32	0.96
		1.20	3.22	1.08	1.60	3.45	1.60

- S9141-45R:

Mating pin	Temperature Life Duration (@125°C)	Insertion Force (N)			Withdrawal Force (N)		
		Initial	Max	Min	Initial	Max	Min
Ø0.80mm	96hrs	0.80	0.96	0.72	0.61	1.06	0.53
		1.03	1.30	0.92	0.53	1.28	0.48
	1000hrs	0.87	1.80	0.84	0.47	1.35	0.47
		1.08	1.45	1.08	0.58	1.36	0.58
Ø1.30mm	96hrs	1.04	2.71	0.95	1.07	2.49	1.03
		1.45	2.81	1.31	2.06	3.30	1.53
	1000hrs	1.25	3.11	1.14	1.21	4.02	1.21
		1.28	2.62	1.28	0.65	3.23	0.65