

MINIFLEX® 3-BFN L-LK

Part No. 20584-0**E-01

Test Report

Product Specification no. PRS-1789

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6	T19109	September 27, 2019	S.Shigekoshi	M.Muro	H.Ikari
5	T19078	July 17, 2019	S.Shigekoshi	M.Muro	H.Ikari
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Purpose

To evaluate the performance of MINIFLEX 3-BFN L-LK Connector in accordance with PRS-1789.

2. Specimen

(1) MINIFLEX 3-BFN L-LK (Part No. 20584-0**E-01)

(2) FPC : Made by TAIYO TECHNOLEX CO.,LTD.

FPC Thickness : $t=0.20\pm 0.03$ (Actual measurement : 0.19~0.20mm)

3. Test Sequence

All the evaluations were performed in accordance with Table 1. Test Sequence.

4. Result

See Table 2-1 to 2-9, Graph 1 to 14. For the details of the testing conditions and requirements, see PRS-1789.

The "n" in the tables show the number of measurement points.

5. Conclusion

All the specimens met the requirements of PRS-1789.

Table1 Test Sequence

Test Items	Group															
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
C/T Resistance	2,7			1,3 5	1,3	1,3	1,3	1,5	1,5	1,3	1,3	1,3	1,3			
D.W.Voltage								2,6	2,6							
Insulation Resistance								3,7	3,7							
Temp. rising																1
Act Locking Force	1,5															
Act Un-locking Force	3,6															
FPC Retention Force		1,3														
Durability	4	2														
C/T & Lock Retention Force			1													
Vibration				2												
Shock				4												
Fretting corrosion					2											
Thermal Shock						2										
High Temp. Life							2									
High Temp & High Hum energizing								4								
High Temp & High Hum Life									4							
Cold Temp. Life										2						
Gas (H ₂ S)											2					
Gas (SO ₂)												2				
Salt Water Spray													2			
Solderability														1		
Soldering Heat Resist.															1	

Table 2-1 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
A Group Durability	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.909	29.99	19.02	3.619	34.766	○
			After 20th	ΔR=40mΩ MAX.			0.491	4.80	-3.60	1.608	5.315	○
		※L	Initial	60mΩ MAX.	5	195	15.059	18.97	11.05	2.387	22.220	○
			After 20th	ΔR=40mΩ MAX.			1.127	4.57	-1.85	1.368	5.231	○
	Act Locking Force (N)	30P	Initial	6.72N MAX. (0.21N/Pos.× (30+2)P)	5	5	3.492	3.75	3.24	0.221	4.155	○
			20th cycles				2.594	2.78	2.47	0.124	2.966	○
		31P	Initial	6.93N MAX. (0.21N/Pos.× (31+2)P)	5	5	3.638	3.88	3.46	0.194	4.220	○
			20th cycles				2.630	2.72	2.51	0.103	2.939	○
		40P	Initial	8.82N MAX. (0.21N/Pos.× (40+2)P)	5	5	4.552	4.92	4.36	0.216	5.200	○
			20th cycles				3.390	3.62	3.11	0.182	3.936	○
		41P	Initial	9.03N MAX. (0.21N/Pos.× (41+2)P)	5	5	4.848	4.94	4.77	0.077	5.079	○
			20th cycles				3.478	3.72	3.36	0.151	3.931	○
	45P	Initial	9.87N MAX. (0.21N/Pos.× (45+2)P)	5	5	5.208	5.47	5.03	0.173	5.727	○	
		20th cycles				3.930	4.00	3.84	0.069	4.137	○	
47P	Initial	10.29N MAX. (0.21N/Pos.× (47+2)P)	5	5	5.239	5.42	5.11	0.122	5.605	○		
	20th cycles				3.975	4.15	3.78	0.150	4.425	○		
50P	Initial	10.92N MAX. (0.21N/Pos.× (50+2)P)	5	5	5.642	5.97	5.45	0.208	6.266	○		
	20th cycles				4.006	4.24	3.91	0.134	4.408	○		

※U : Upper Contact L : Lower Contact

Table 2-2 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
A Group Durability	51P	Initial	11.13N MAX. (0.21N/Pos.× (51+2)P)	5	5	5.686	5.82	5.60	0.109	6.013	○
		20th cycles				4.232	4.37	4.00	0.143	4.661	○
	53P	Initial	11.55N MAX. (0.21N/Pos.× (53+2)P)	5	5	5.996	6.21	5.85	0.133	6.395	○
		20th cycles				4.314	4.49	4.12	0.154	4.776	○
	57P	Initial	12.39N MAX. (0.21N/Pos.× (57+2)P)	5	5	6.208	6.42	5.96	0.165	6.703	○
		20th cycles				4.700	4.96	4.36	0.233	5.399	○
	61P	Initial	13.23N MAX. (0.21N/Pos.× (61+2)P)	5	5	6.568	6.79	6.28	0.186	7.126	○
		20th cycles				4.914	5.24	4.78	0.187	5.475	○
	71P	Initial	15.33N MAX. (0.21N/Pos.× (71+2)P)	5	5	7.518	7.70	7.35	0.158	7.992	○
		20th cycles				5.894	6.16	5.71	0.180	6.434	○

Table 2-3 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
A Group Durability	Act Un-locking Force (N)	30P	Initial	0.448N MIN.	5	5	2.240	2.47	2.05	0.174	1.718	○
			After 20th	(0.014N/Pos.× (30+2)P)			2.054	2.20	1.95	0.113	1.715	○
		31P	Initial	0.462N MIN.	5	5	2.434	2.65	2.15	0.227	1.753	○
			After 20th	(0.014N/Pos.× (31+2)P)			2.212	2.44	2.01	0.176	1.684	○
		40P	Initial	0.588N MIN.	5	5	3.034	3.19	2.75	0.167	2.533	○
			20th cycles	(0.014N/Pos.× (40+2)P)			2.808	3.01	2.64	0.142	2.382	○
		41P	Initial	0.602N MIN.	5	5	3.146	3.39	2.80	0.270	2.336	○
			20th cycles	(0.014N/Pos.× (41+2)P)			2.820	2.95	2.65	0.140	2.400	○
		45P	Initial	0.658N MIN.	5	5	3.554	3.68	3.43	0.114	3.212	○
			20th cycles	(0.014N/Pos.× (45+2)P)			3.090	3.34	2.75	0.218	2.436	○
		47P	Initial	0.686N MIN.	5	5	3.603	3.79	3.47	0.115	3.258	○
			20th cycles	(0.014N/Pos.× (47+2)P)			3.147	3.24	2.87	0.160	2.667	○
		50P	Initial	0.728N MIN.	5	5	3.824	4.04	3.51	0.231	3.131	○
			20th cycles	(0.014N/Pos.× (50+2)P)			3.390	3.62	3.14	0.218	2.736	○
		51P	Initial	0.742N MIN.	5	5	3.896	4.03	3.65	0.159	3.419	○
			20th cycles	(0.014N/Pos.× (51+2)P)			3.522	3.67	3.30	0.141	3.099	○
53P	Initial	0.770N MIN.	5	5	3.946	4.20	3.73	0.175	3.421	○		
	20th cycles	(0.014N/Pos.× (53+2)P)			3.564	3.71	3.30	0.174	3.042	○		
57P	Initial	0.826N MIN.	5	5	4.224	4.47	4.08	0.157	3.753	○		
	20th cycles	(0.014N/Pos.× (57+2)P)			3.816	3.93	3.48	0.193	3.237	○		
61P	Initial	0.882N MIN.	5	5	4.568	4.76	4.40	0.173	4.049	○		
	20th cycles	(0.014N/Pos.× (61+2)P)			3.994	4.22	3.88	0.137	3.583	○		
71P	Initial	1.022N MIN.	5	5	5.336	5.48	5.12	0.143	4.907	○		
	20th cycles	(0.014N/Pos.× (71+2)P)			4.518	4.75	4.43	0.132	4.122	○		

Table 2-4 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
B Group FPC Retention Force(N)	30P	Initial	4.90N MIN. (0.13N/Pos.×30P+1.0N)	5	5	15.612	16.14	14.69	0.626	13.734	○
		20th cycles	4.00N MIN. (0.10N/Pos.×30P+1.0N)			14.996	15.30	14.35	0.375	13.871	○
	31P	Initial	5.03N MIN. (0.13N/Pos.×31P+1.0N)	5	5	15.896	16.76	15.40	0.545	14.261	○
		20th cycles	4.10N MIN. (0.10N/Pos.×31P+1.0N)			15.068	15.40	14.82	0.239	14.351	○
	40P	Initial	6.20N MIN. (0.13N/Pos.×40P+1.0N)	5	5	19.266	20.06	18.60	0.689	17.199	○
		20th cycles	5.00N MIN. (0.10N/Pos.×40P+1.0N)			18.094	18.71	17.59	0.412	16.858	○
	41P	Initial	6.33N MIN. (0.13N/Pos.×41P+1.0N)	5	5	19.617	20.44	18.94	0.707	17.496	○
		20th cycles	5.10N MIN. (0.10N/Pos.×41P+1.0N)			18.412	19.04	17.89	0.423	17.143	○
	45P	Initial	6.85N MIN. (0.13N/Pos.×45P+1.0N)	5	5	20.710	21.64	19.84	0.639	18.793	○
		20th cycles	5.50N MIN. (0.10N/Pos.×45P+1.0N)			19.764	20.42	19.29	0.472	18.348	○
	47P	Initial	7.11N MIN. (0.13N/Pos.×47P+1.0N)	5	5	21.351	21.78	20.45	0.530	19.761	○
		20th cycles	5.70N MIN. (0.10N/Pos.×47P+1.0N)			20.063	20.71	19.49	0.458	18.689	○
	50P	Initial	7.50N MIN. (0.13N/Pos.×50P+1.0N)	5	5	22.418	23.25	21.59	0.698	20.324	○
		20th cycles	6.00N MIN. (0.10N/Pos.×50P+1.0N)			21.060	21.75	20.28	0.576	19.332	○
	51P	Initial	7.63N MIN. (0.13N/Pos.×51P+1.0N)	5	5	22.558	23.25	22.07	0.461	21.175	○
		20th cycles	6.10N MIN. (0.10N/Pos.×51P+1.0N)			21.254	21.96	20.61	0.540	19.634	○

Table 2-5 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
B Group FPC Retention Force(N)	53P	Initial	7.89N MIN. (0.13N/Pos.×53P+1.0N)	5	5	23.872	24.51	22.76	0.681	21.829	○
		20th cycles	6.30N MIN. (0.10N/Pos.×53P+1.0N)			22.198	22.69	21.44	0.560	20.518	○
	57P	Initial	8.41N MIN. (0.13N/Pos.×57P+1.0N)	5	5	24.872	25.39	23.78	0.643	22.943	○
		20th cycles	6.70N MIN. (0.10N/Pos.×57P+1.0N)			23.310	24.09	22.61	0.555	21.645	○
	61P	Initial	8.93N MIN. (0.13N/Pos.×61P+1.0N)	5	5	26.170	26.71	25.38	0.581	24.427	○
		20th cycles	7.10N MIN. (0.10N/Pos.×61P+1.0N)			24.612	25.15	23.87	0.614	22.770	○
	71P	Initial	10.23N MIN. (0.13N/Pos.×71P+1.0N)	5	5	29.488	30.23	28.57	0.625	27.613	○
		20th cycles	8.10N MIN. (0.10N/Pos.×71P+1.0N)			27.614	28.27	26.72	0.627	25.733	○
C Group Retention Force	C/T		0.3N MIN	5	30	1.156	1.30	1.01	0.089	0.889	○
	Lock			5	10	1.017	1.13	0.96	0.050	0.867	○

Table 2-6 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge			
						AVE.(X)	MAX.	MIN.	s	X±3s				
D Group Vibration Shock	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.764	29.97	19.00	3.357	33.835	○		
			After Vibration	ΔR=40mΩ MAX.			0.653	4.55	-3.20	1.728	5.837	○		
			After Shock				0.587	4.69	-3.32	1.822	6.053	○		
		※L	Initial	60mΩ MAX.			5	195	14.986	18.99	11.06	2.259	21.763	○
			After Vibration	ΔR=40mΩ MAX.					1.143	4.14	-1.96	1.331	5.136	○
			After Shock						1.290	4.77	-1.82	1.429	5.577	○
	Discontinuity	In Vibration	1μsec. MAX.	10	10	No Discontinuity					○			
		In Shock				No Discontinuity					○			
	Appearance	After Vibration	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○			
		After Shock				No Abnormality					○			
E Group Fretting corrosion	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.857	29.96	19.01	3.474	34.279	○		
			After Test	ΔR=40mΩ MAX.			0.508	4.68	-3.79	1.750	5.758	○		
		L	Initial	60mΩ MAX.			5	195	14.925	18.95	11.10	2.184	21.477	○
			After Test	ΔR=40mΩ MAX.					1.276	4.85	-1.61	1.377	5.407	○
	Discontinuity	In Test	1μsec. MAX.	10	10	No Discontinuity					○			
	Appearance	After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○			
F Group Thermal Shock	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.885	29.86	19.08	3.422	34.151	○		
			After Test	ΔR=40mΩ MAX.			0.566	4.44	-3.45	1.657	5.537	○		
		L	Initial	60mΩ MAX.			5	195	14.930	18.98	11.07	2.335	21.935	○
			After Test	ΔR=40mΩ MAX.					1.235	4.65	-1.73	1.403	5.444	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○			

※U : Upper Contact L : Lower Contact

Table 2-7 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
G Group High Temp. Life	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.811	30.00	19.00	3.470	34.221	○
		After Test	ΔR=40mΩ MAX.	0.473			4.76	-3.35	1.740	5.693	○	
	※L	Initial	60mΩ MAX.	5	195	14.904	18.99	11.02	2.345	21.939	○	
		After Test	ΔR=40mΩ MAX.			1.335	4.77	-1.53	1.417	5.586	○	
Appearance		After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○	
H Group High Temp. & High Hum. energizing	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.801	29.99	19.03	3.637	34.712	○
			After Test	ΔR=40mΩ MAX.			0.484	4.53	-3.56	1.631	5.377	○
		L	Initial	60mΩ MAX.	5	195	14.844	18.97	11.01	2.428	22.128	○
			After Test	ΔR=40mΩ MAX.			1.363	4.66	-1.64	1.462	5.749	○
	D.W.Voltage	U	Initial	No abnormalities such as creeping discharge, flashover, insulator breakdown occur	5	190	No Abnormality					○
			After Test				No Abnormality					○
		L	Initial		5	190	No Abnormality					○
			After Test				No Abnormality					○
	Insulation Resistance (MΩ)	U	Initial	100MΩ MIN	5	190	MIN. 5.0×10 ⁵ MΩ					○
			After Test				MIN. 1.0×10 ⁵ MΩ					○
L		Initial	5		190	MIN. 4.0×10 ⁵ MΩ					○	
		After Test				MIN. 2.5×10 ⁵ MΩ					○	
Appearance		After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○	

※U : Upper Contact) L : Lower Contact

Table 2-8 Test Result

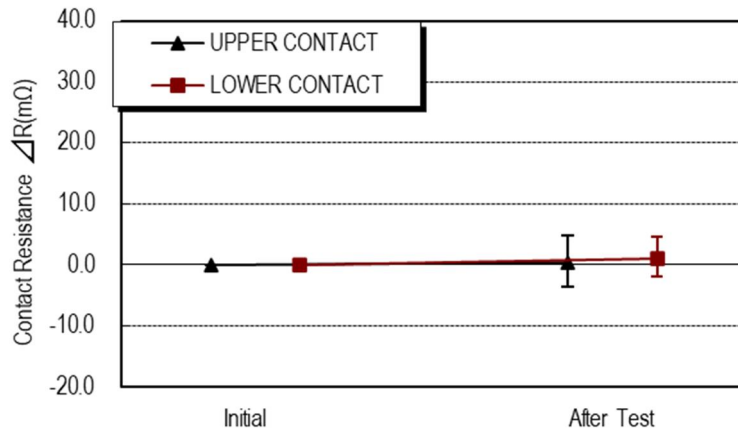
Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	S	X±3s		
J Group High Temp. & High Hum. Life	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.761	29.94	19.00	3.372	33.877	○
			After Test	ΔR=40mΩ MAX.			0.636	4.31	-3.37	1.674	5.658	○
		※L	Initial	60mΩ MAX.	5	195	15.145	19.00	11.08	2.326	22.123	○
			After Test	ΔR=40mΩ MAX.			1.079	4.60	-1.82	1.348	5.123	○
	D.W.Voltage	U	Initial	No abnormalities such as creeping discharge, flashover, insulator breakdown occur	5	190	No Abnormality					○
			After Test				No Abnormality					○
		L	Initial		5	190	No Abnormality					○
			After Test				No Abnormality					○
	Insulation Resistance (MΩ)	U	Initial	100MΩ MIN	5	190	MIN. 5.0×10 ⁴ MΩ					○
			After Test				MIN. 1.5×10 ⁴ MΩ					○
		L	Initial		5	190	MIN. 5.0×10 ⁴ MΩ					○
			After Test				MIN. 1.0×10 ⁴ MΩ					○
Appearance		After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○	
K Group Cold Temp. Life	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.741	29.94	19.00	3.614	34.583	○
			After Test	ΔR=40mΩ MAX.			0.626	4.08	-3.23	1.627	5.507	○
		L	Initial	60mΩ MAX.	5	195	15.008	18.99	11.00	2.228	21.692	○
			After Test	ΔR=40mΩ MAX.			1.191	4.71	-1.72	1.383	5.340	○
Appearance		After Test	No abnormality adversely affecting the performance shall occur.	5	5	No Abnormality					○	
L Group Gas(H ₂ S)	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.852	29.96	19.01	3.553	34.511	○
			After Test	ΔR=40mΩ MAX.			0.487	4.22	-3.28	1.661	5.470	○
		L	Initial	60mΩ MAX.	5	195	14.997	18.98	11.02	2.399	22.194	○
			After Test	ΔR=40mΩ MAX.			1.101	4.64	-1.97	1.393	5.280	○
Appearance		After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○	

※U : Upper Contact L : Lower Contact

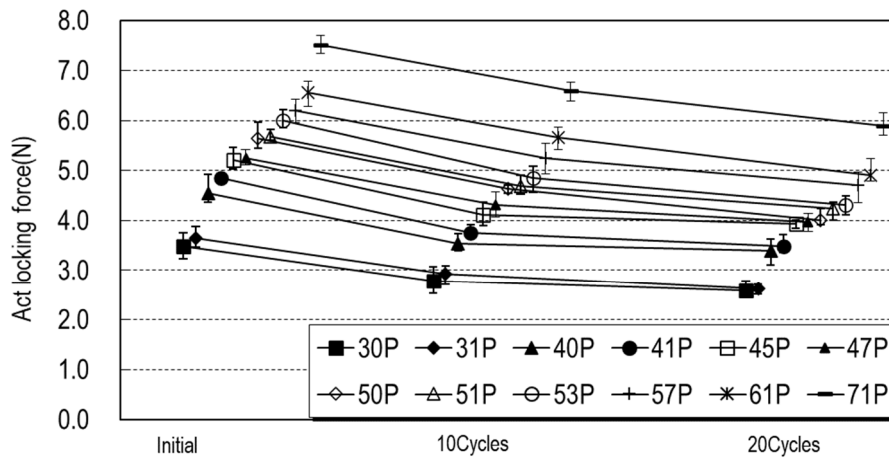
Table 2-9 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
M Group Gas (SO ₂)	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.723	29.87	19.03	3.539	34.340	○
			After Test	ΔR=40mΩ MAX.			0.589	4.66	-3.37	1.728	5.773	○
	※L	Initial	60mΩ MAX.	5	195	15.045	19.00	11.00	2.375	22.170	○	
		After Test	ΔR=40mΩ MAX.			1.117	4.23	-1.85	1.349	5.164	○	
Appearance		After Test	No abnormality adversely affecting the performance shall occur.		10	10	No Abnormality					○
N Group Salt Water Spray	Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.675	29.99	19.01	3.545	34.310	○
			After Test	ΔR=40mΩ MAX.			0.638	4.28	-3.86	1.687	5.699	○
	L	Initial	60mΩ MAX.	5	195	15.014	18.98	11.02	2.393	22.193	○	
		After Test	ΔR=40mΩ MAX.			1.281	4.26	-1.74	1.448	5.625	○	
Appearance		After Test	No abnormality adversely affecting the performance shall occur.		10	10	No Abnormality					○
P Group	Zerex Time (sec.)	C/T	3sec. MAX	5	5	MAX. 0.1sec.					○	
		LOCK		5	5	MAX. 0.1sec.					○	
Solderability	Appearance	C/T	Wetness: 95% MIN.	5	5	95%MIN.was wet.					○	
		LOCK		5	5	95%MIN.was wet.					○	
Q Group	Reflow twice		No Abnormality	5	5	No Abnormality					○	
Soldering Heat Resistance	Soldering iron											
R Group Temp. rising	0.3A/Contact		ΔT=30K MAX.	5	5	No Problem. MAX.ΔT=10.6K					○	

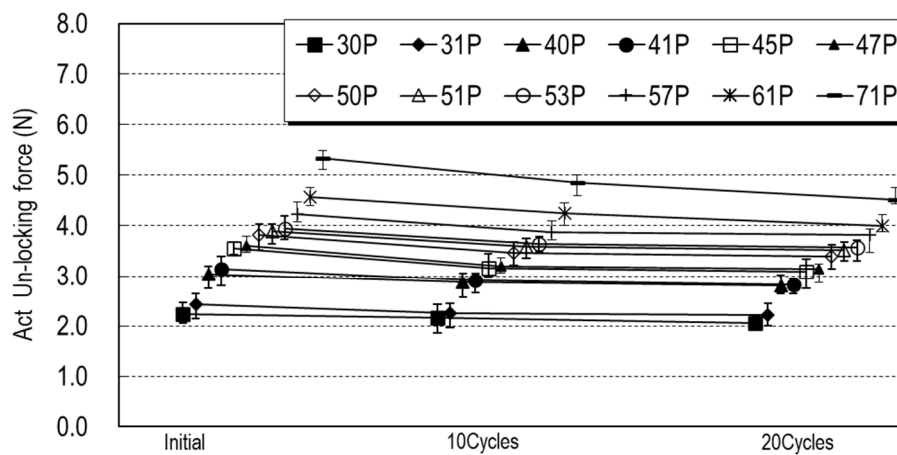
※U : Upper Contact L : Lower Contact



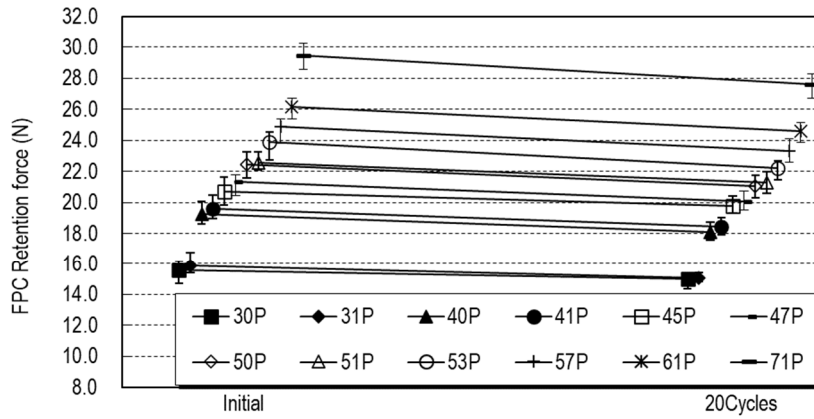
Graph.1 A change of contact resistance
A group : Durability



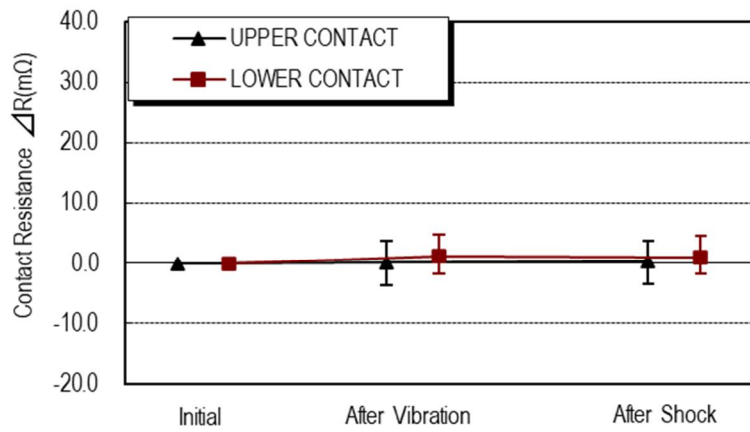
Graph.2 Act A change of Locking force
A group : Durability



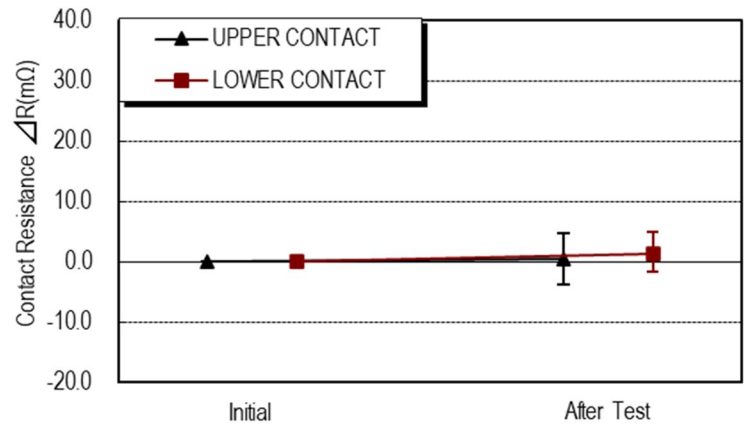
Graph.3 A change of Un-locking force
A group : Durability



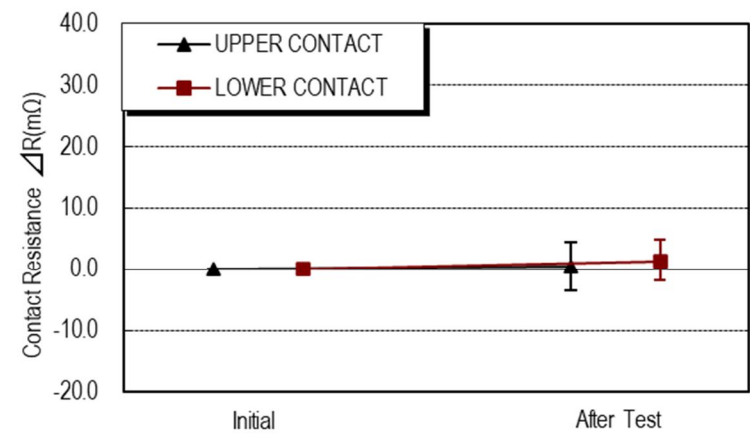
Graph.4 A change of FPC Retention Force
B group : FPC Retention Force



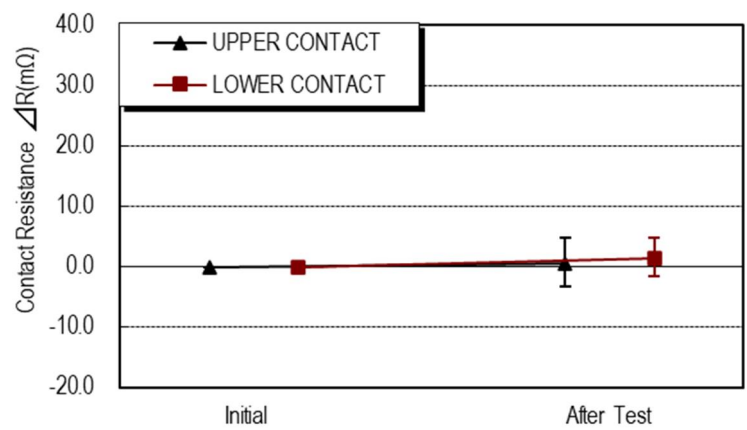
Graph.5 A change of contact resistance
D group : Vibration / Shock



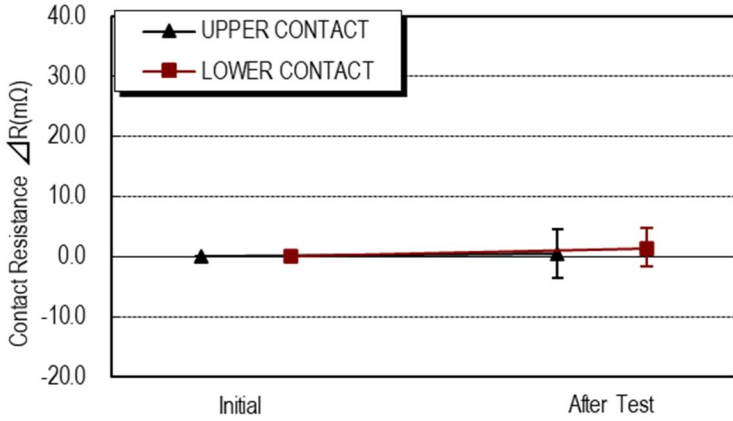
Graph.6 A change of contact resistance
E group : Fretting corrosion



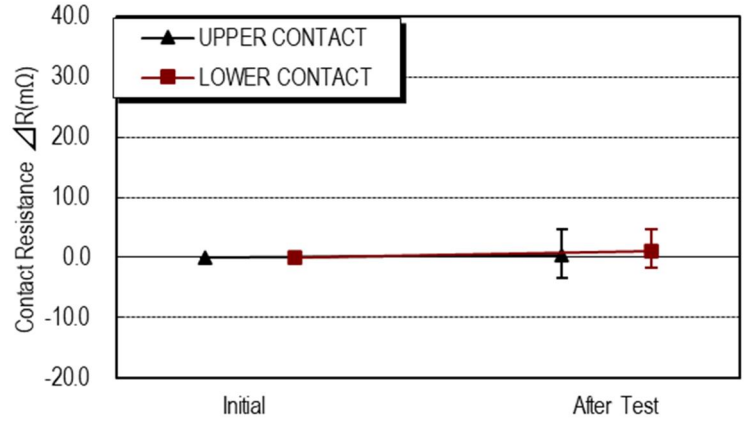
Graph.7 A change of contact resistance
F group : Thermal Shock



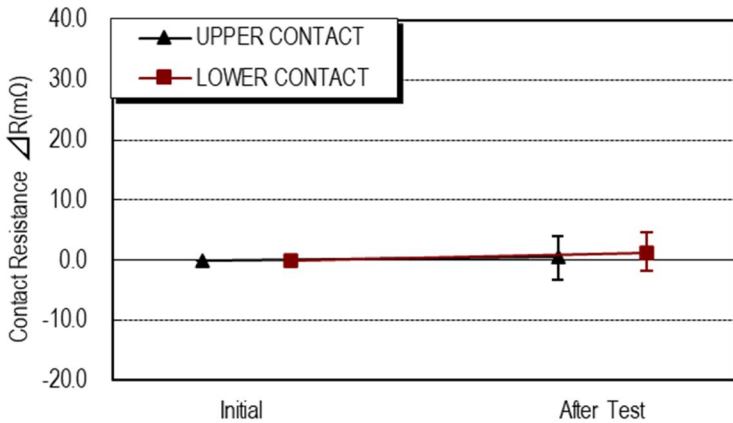
Graph.8 A change of contact resistance
G group : High Temp. Life



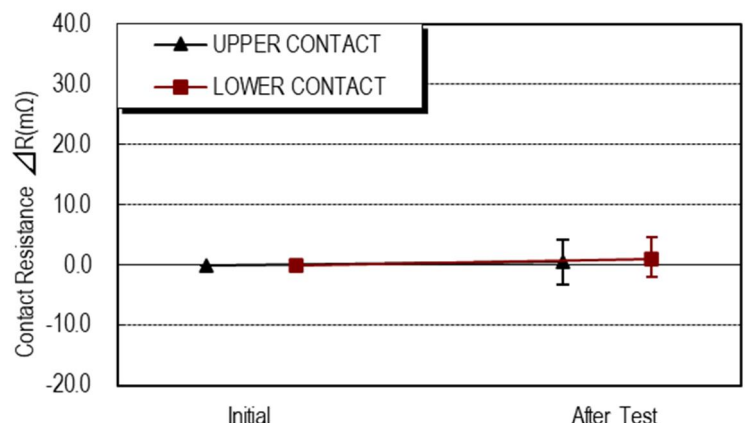
Graph.9 A change of contact resistance
H group : High Temp. & High Hum. energizing



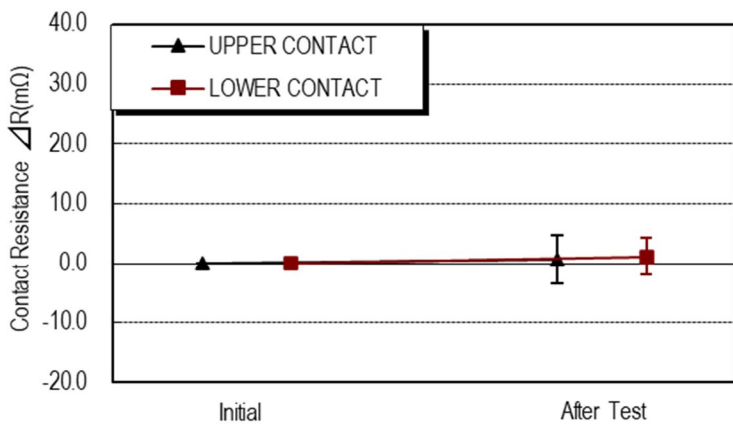
Graph. 10 A change of contact resistance
J group : High Temp. & High Hum. Life



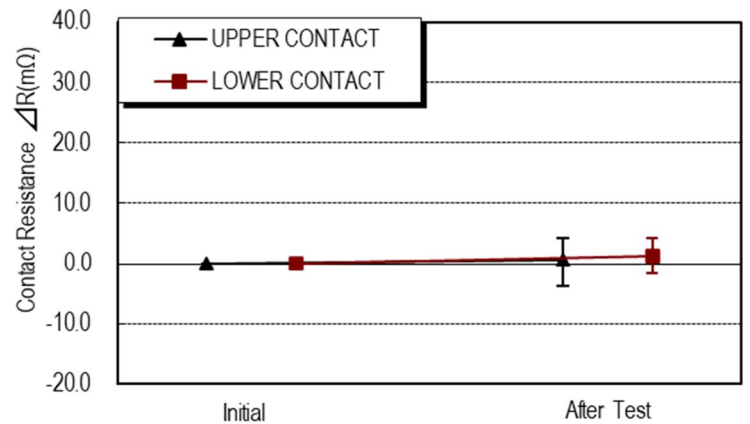
Graph. 11 A change of contact resistance
K group : Cold Temp. Life



Graph. 12 A change of contact resistance
L group : Gas(H₂S)



Graph. 13 A change of contact resistance
M group : Gas(SO₂)



Graph. 14 A change of contact resistance
N group : Salt Water Spray