

# MINIFLEX® 3-BFN L-LK-HD TYPE

Part No. 20655-0\*\*E-01

## Test Report

Product Specification no. PRS-2077

3	T21155	November 9, 2021	S.Shigekoshi	M.Muro	H.Ikari
2	T19111	September 27, 2019	S.Shigekoshi	M.Muro	H.Ikari
1	T15091	June 25, 2015	D.F		E.K
0	T15045	April 14, 2015	S.A	Y.S	E.K
Rev.	ECN	Date	Prepared by	Checked by	Approved by

## 1. Purpose

To evaluate the performance of MINIFLEX 3-BFN Connector L-LK-HD TYPE in accordance with PRS-2077.

## 2. Specimen

(1) Connector : MINIFLEX 3-BFN L-LK-HD TYPE... P/N 20655-0\*\*E-01

(2) FPC : Made by Taiyo Industrial 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 2-7, Graph 1 to 14. For the details of the testing conditions and requirements, see PRS-2077.

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

## 5. Conclusion

All the specimens met the requirements of PRS-2077.

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													
H/D Retention Force			2													
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 <sub>2</sub> S)											2					
Gas (SO <sub>2</sub> )												2				
Salt Water Spray													2			
Solderability														1		
Soldering Heat Resist.															1	

Table2-1 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	Δ R=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	Δ R=40mΩ MAX.			1.127	4.57	-1.85	1.368	5.231	○
	Act Locking Force (N)	11P	Initial	2.73N MAX. (0.21N/Pos.× (11+2)P)	5	5	1.296	1.42	1.14	0.127	1.677	○
			After 20th				1.092	1.26	0.93	0.152	1.548	○
		30P	Initial	6.72N MAX. (0.21N/Pos.× (30+2)P)	5	5	3.492	3.75	3.24	0.221	4.155	○
			After 20th				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	○
			After 20th				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	○
			After 20th				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	○
			After 20th				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	○		
	After 20th				3.930	4.00	3.84	0.069	4.137	○		
50P	Initial	10.92N MAX. (0.21N/Pos.× (50+2)P)	5	5	5.642	5.97	5.45	0.208	6.266	○		
	After 20th				4.006	4.24	3.91	0.134	4.408	○		
51P	Initial	11.13N MAX. (0.21N/Pos.× (51+2)P)	5	5	5.686	5.82	5.60	0.109	6.013	○		
	After 20th				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	○		
	After 20th				4.314	4.49	4.12	0.154	4.776	○		

※U : Upper Contact L : Lower Contact

Table2-2 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
A Group Durability	11P	Initial	0.182N MIN. (0.014N/Pos.x (11+2)P)	5	5	0.939	0.99	0.85	0.052	0.783	○
		After 20th				0.869	0.93	0.82	0.044	0.737	○
	30P	Initial	0.448N MIN. (0.014N/Pos.x (30+2)P)	5	5	2.240	2.47	2.05	0.174	1.718	○
		After 20th				2.054	2.20	1.95	0.113	1.715	○
	31P	Initial	0.462N MIN. (0.014N/Pos.x (31+2)P)	5	5	2.434	2.65	2.15	0.227	1.753	○
		After 20th				2.212	2.44	2.01	0.176	1.684	○
	40P	Initial	0.588N MIN. (0.014N/Pos.x (40+2)P)	5	5	3.034	3.19	2.75	0.167	2.533	○
		After 20th				2.808	3.01	2.64	0.142	2.382	○
	41P	Initial	0.602N MIN. (0.014N/Pos.x (41+2)P)	5	5	3.146	3.39	2.80	0.270	2.336	○
		After 20th				2.820	2.95	2.65	0.140	2.400	○
	45P	Initial	0.658N MIN. (0.014N/Pos.x (45+2)P)	5	5	3.554	3.68	3.43	0.114	3.212	○
		After 20th				3.090	3.34	2.75	0.218	2.436	○
	50P	Initial	0.728N MIN. (0.014N/Pos.x (50+2)P)	5	5	3.824	4.04	3.51	0.231	3.131	○
		After 20th				3.390	3.62	3.14	0.218	2.736	○
	51P	Initial	0.742N MIN. (0.014N/Pos.x (51+2)P)	5	5	3.896	4.03	3.65	0.159	3.419	○
		After 20th				3.522	3.67	3.30	0.141	3.099	○
53P	Initial	0.770N MIN. (0.014N/Pos.x (53+2)P)	5	5	3.946	4.20	3.73	0.175	3.421	○	
	After 20th				3.564	3.71	3.30	0.174	3.042	○	

Table2-3 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
B Group FPC Retention Force(N)	11 P	Initial	2.43N MIN. (0.13N/Pos. ×11P+1.0N)	5	5	10.230	10.83	9.82	0.470	8.820	○
		After 20th	2.10N MIN. (0.10N/Pos. ×11P+1.0N)			9.756	10.28	8.90	0.566	8.058	○
	30P	Initial	4.90N MIN. (0.13N/Pos. ×30P+1.0N)	5	5	15.612	16.14	14.69	0.626	13.734	○
		After 20th	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	○
		After 20th	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	○
		After 20th	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	○
		After 20th	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	○
		After 20th	5.50N MIN. (0.10N/Pos.× 45P+1.0N)			19.764	20.42	19.29	0.472	18.348	○
	50P	Initial	7.50N MIN. (0.13N/Pos.× 50P+1.0N)	5	5	22.418	23.25	21.59	0.698	20.324	○
		After 20th	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	○
		After 20th	6.10N MIN. (0.10N/Pos.× 51P+1.0N)			21.254	21.96	20.61	0.540	19.634	○
	53P	Initial	7.89N MIN. (0.13N/Pos.× 53P+1.0N)	5	5	23.872	24.51	22.76	0.681	21.829	○
		After 20th	6.30N MIN. (0.10N/Pos.× 53P+1.0N)			22.198	22.69	21.44	0.560	20.518	○
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	○
	H/D			5	10	0.494	0.61	0.43	0.060	0.314	○

Table2-4 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	Δ R=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	Δ R=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	1 μ sec. 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	Δ R=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	Δ R=40mΩ MAX.					1.276	4.85	-1.61	1.377	5.407	○
	Discontinuity	In Test	1 μ sec. 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	Δ R=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	Δ R=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

Table2-5 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	Δ R=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	Δ R=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	Δ R=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	Δ R=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 <sup>5</sup> MΩ					○
			After Test				MIN. 1.0×10 <sup>5</sup> MΩ					○
		L	Initial		5	190	MIN. 4.0×10 <sup>5</sup> MΩ					○
			After Test				MIN. 2.5×10 <sup>5</sup> MΩ					○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur.	10	10	No Abnormality					○	

※U : Upper Contact    L : Lower Contact



Table2-6 Test Result

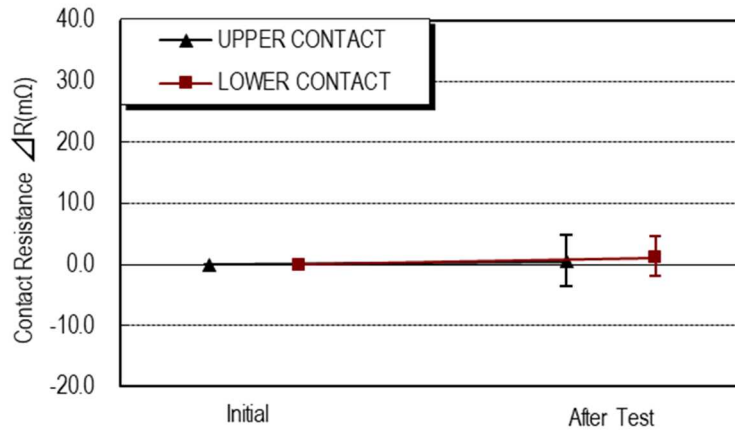
Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
J Group High Temp. & High Hum. Life	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.761	29.94	19.00	3.372	33.877	○
			After Test	Δ R=40mΩ MAX.			0.636	4.31	-3.37	1.674	5.658	○
		※L	Initial	60mΩ MAX.	5	195	15.145	19.00	11.08	2.326	22.123	○
			After Test	Δ R=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 <sup>4</sup> MΩ					○
			After Test				MIN. 1.5×10 <sup>4</sup> MΩ					○
		L	Initial		5	190	MIN. 5.0×10 <sup>4</sup> MΩ					○
			After Test				MIN. 1.0×10 <sup>4</sup> 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	Δ R=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	Δ R=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 <sub>2</sub> S)		Contact Resistance (mΩ)	U	Initial	60mΩ MAX.	5	195	23.852	29.96	19.01	3.553	34.511
			After Test	Δ R=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	Δ R=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

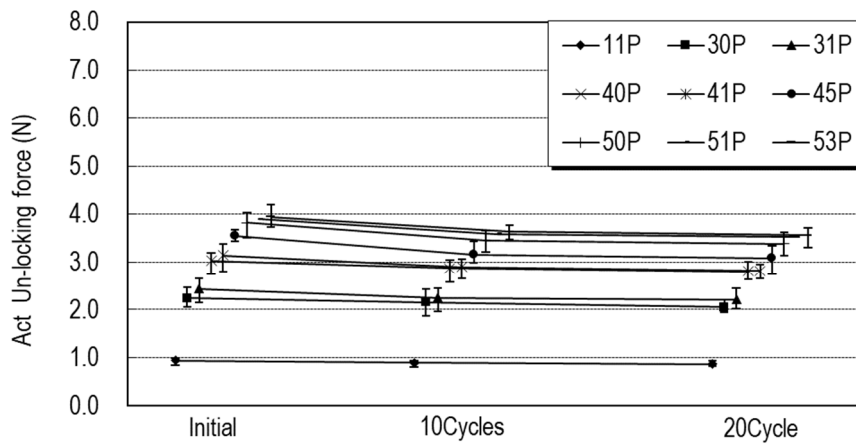
Table2-7 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX.	MIN.	s	X±3s		
M Group Gas(SO <sub>2</sub> )	Contact Resistance (mΩ)	※U	Initial	60mΩ MAX.	5	195	23.723	29.87	19.03	3.539	34.340	○
			After Test	Δ R=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	Δ R=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	Δ R=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	Δ R=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 Solderability		Zerox Time (sec.)	C/T	3sec. MAX	5	5	MAX. 0.1sec.					○
	LOCK		5		5	MAX. 0.1sec.					○	
	Appearance	C/T	Wetness : 95% MIN.	5	5	95%MIN.was wet.					○	
		LOCK		5	5	95%MIN.was wet.					○	
Q Group Soldering Heat Resistance	Reflow twice		No Abnormality	5	5	No Abnormality					○	
	Soldering iron											
R Group Temp. rising	0.3A/Contact		Δ T=30K MAX.	5	5	No Problem. MAX.ΔT=10.6K					○	

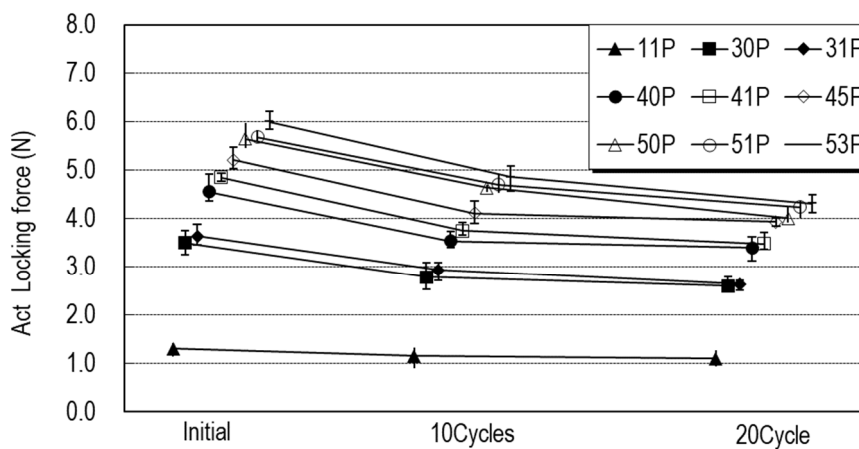
※U : Upper Contact    L : Lower Contact



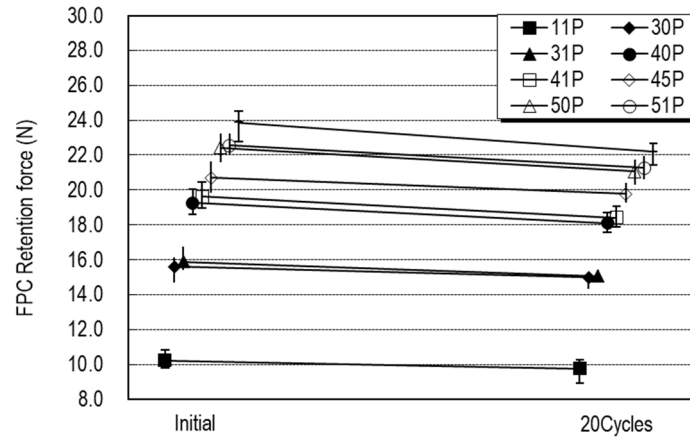
Graph.1 A change of contact resistance  
A group : Durability



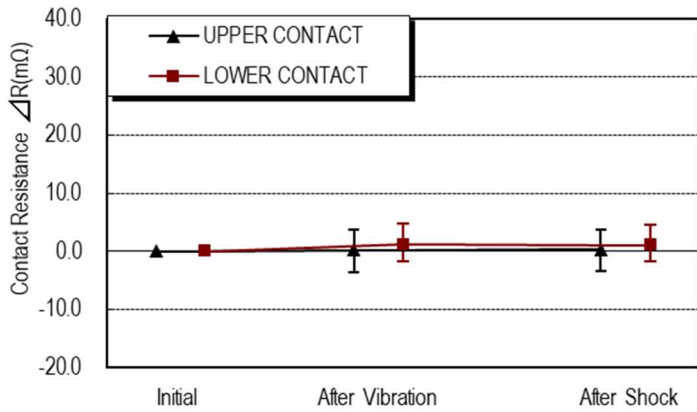
Graph.2 Act A change of Un-locking force  
A group : Durability



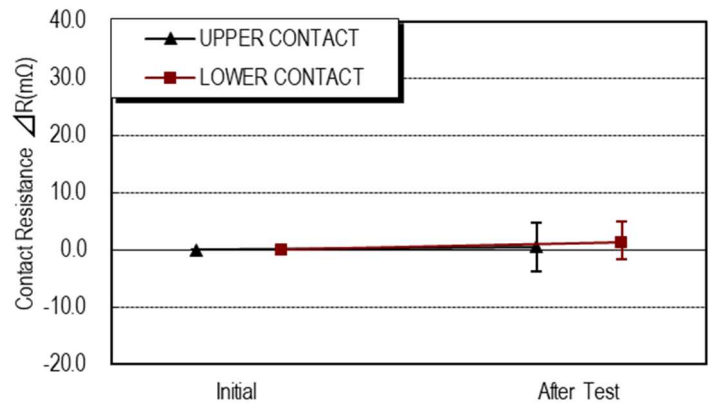
Graph.3 A change of Act Locking force  
A group : Durability



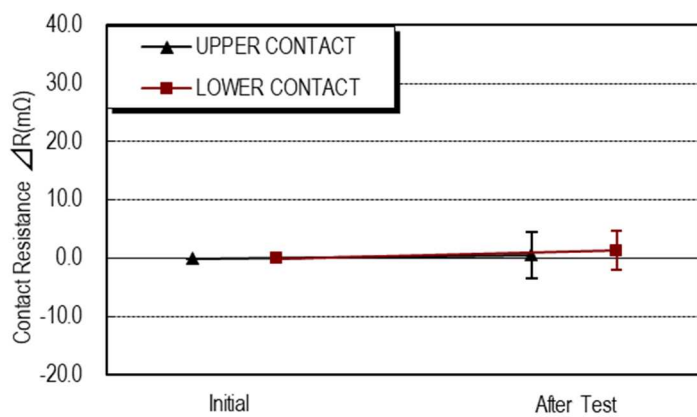
Graph.4 A change of FPC Retention Force  
B group : FPC Retention Force



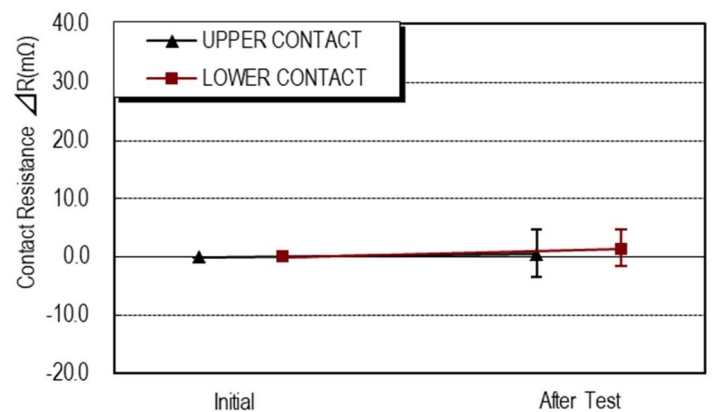
Graph.5 A change of contact resistance  
D group : Vibration / Shock



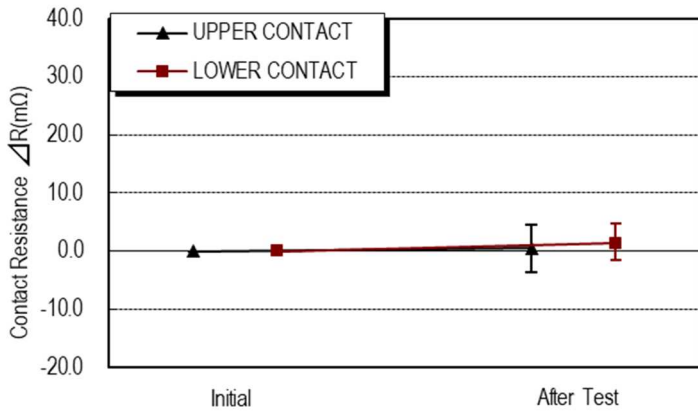
Graph.6 A change of contact resistance  
E group : Fretting Corrosion



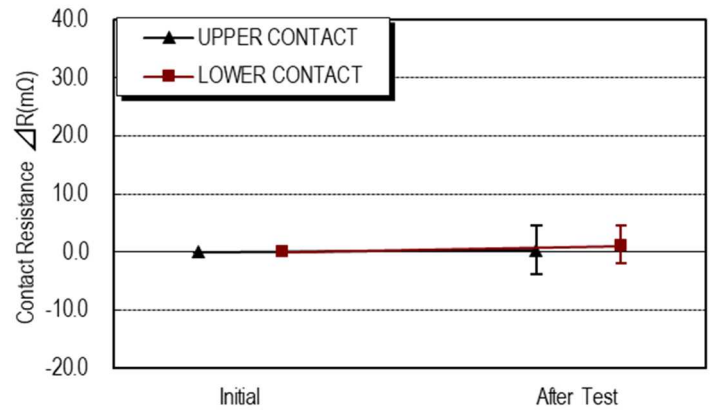
Graph.7 A change of contact resistance  
F group : Thermal Shock



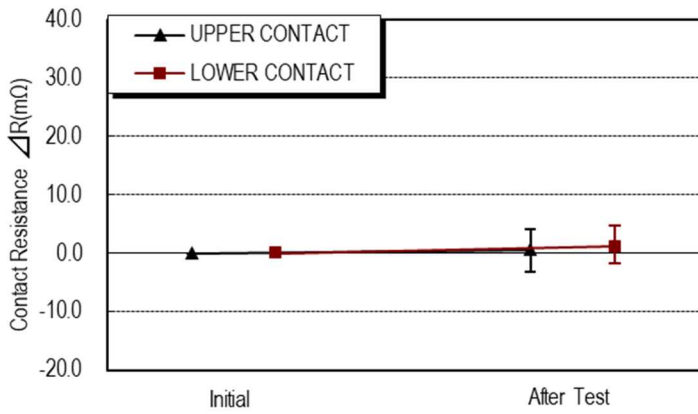
Graph.8 A change of contact resistance  
G group : High Temp. Life



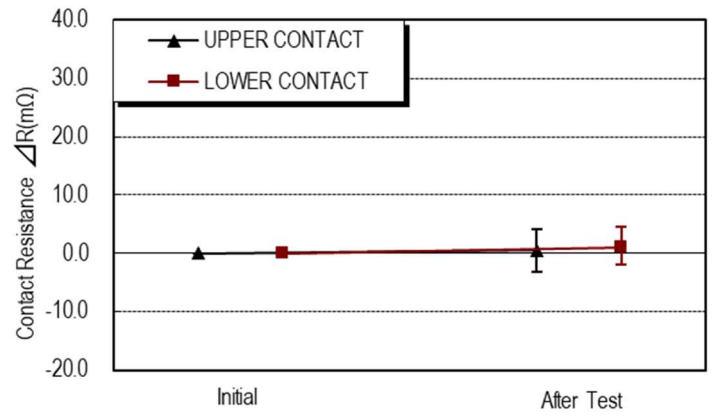
Graph.9 A change of contact resistance  
H group : High Temp. & High Hum. energizing



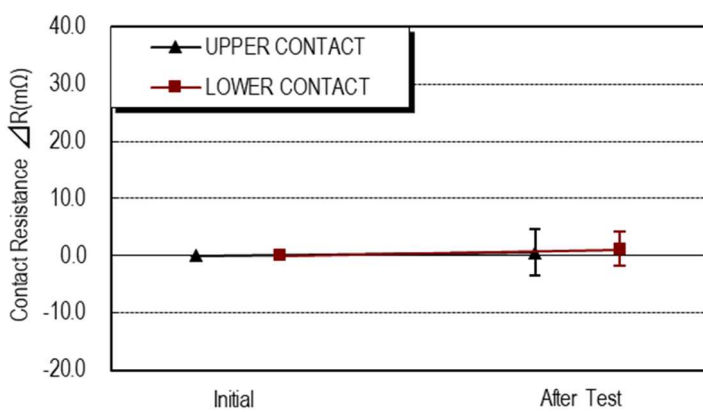
Graph.10 A change of contact resistance  
J group : High Temp. & High Hum. Life



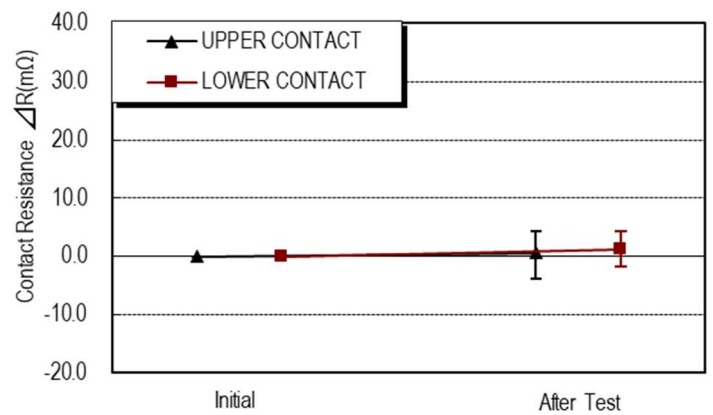
Graph.11 A change of contact resistance  
K group : Cold Temp. Life



Graph.12 A change of contact resistance  
L group : Gas( H<sub>2</sub>S )



Graph.13 A change of contact resistance  
M group : Gas( SO<sub>2</sub> )



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