

# MINIFLEX® 5-BF III

Part No. 20593-0\*\*E-01#

## Test Report

Product Specification no. PRS-1937

9	T22029	February 1, 2022	M.Muro	-	H.Ikari
8	T19132	October 2, 2019	S.Shigekoshi	M.Muro	H.Ikari
7	T17175	November 9, 2017	H.Aoki	M.Ishimaru	H.Ikari
6	T17163	October 3, 2017	K.Hashimoto	M.Ishimaru	H.Ikari
Rev.	ECN	Date	Prepared by	Checked by	Approved by

## 1. Purpose

To evaluate the performance of MINIFLEX 5-BF III Connector in accordance with PRS-1937.

## 2. Specimen

(1) Connector : MINIFLEX 5-BF III Conn. . . . P/N : 20593-0\*\*E-01#

(2) FPC : Made by Taiyo Industrial Co., Ltd.

Thickness Lead :  $t=0.3\pm 0.05$  (Actual measurement : 0.29~0.30mm)

## 3. Test Sequence

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

## 4. Result

See Table 2-1 to 2-6, Graph. 1 to 17. For the details of the testing conditions and requirements, see PRS-1937.

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

## 5. Conclusion

All the specimens met the requirements of PRS-1937.

Table 1 Test Sequence and Sample Quantity

Test Item	Group												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Contact Resistance		2,6		1,3,5	1,5	1,3	1,3	1,5	1,3	1,3	1,3		2
Insulation Resistance								2,6					
D. W. Voltage								3,7					
Temperature rising	1												
Actuator Locking Force		1,5											
Actuator Unlocking Force		3,7											
FFC Retention Force			1,3										
Durability		4	2										
Contact Retention Force					2,6								
Hold Down Retention Force					3,7								
Vibration				2									
Shock				4									
High Temperature Life					4								
Cold Temperature Life						2							
Humidity (Steady State)							2						
Humidity (Cycling)								4					
Thermal Shock									2				
Gas (H <sub>2</sub> S + SO <sub>2</sub> )										2			
Salt Water Spray											2		
Solder ability												1	
Soldering Heat Resistance													1

※Numbers indicate sequence in which tests are performed.

Table 2-1 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX	MIN.	s	X±3s		
A group Temperature rising	0.4A / Contact (Total 13.0A)		ΔT=30K MAX.	5	5	11.4K MAX					Pass	
B group Durability  Actuator Operating Force	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	22.717	24.83	19.85	1.166	26.215	Pass
			After Testing	70mΩ MAX.			23.357	24.56	21.08	0.785	25.712	Pass
		※B	Initial	50mΩ MAX.			19.208	21.32	16.52	1.158	22.682	Pass
			After Testing	70mΩ MAX.			19.640	20.84	17.56	0.773	21.959	Pass
	Actuator Locking Force (N)	8P	Initial	4.0N MAX.	5	5	1.240	1.37	1.02	0.164	1.732	Pass
			After 20th				0.958	1.23	0.79	0.165	1.453	Pass
		10P	Initial	5.0N MAX.	5	5	1.548	1.63	1.42	0.082	1.794	Pass
			After 20th				1.244	1.34	1.14	0.078	1.478	Pass
		12P	Initial	6.0N MAX.	5	5	1.816	2.08	1.64	0.171	2.329	Pass
			After 20th				1.496	1.71	1.31	0.172	2.012	Pass
		14P	Initial	7.00N MAX.	5	5	2.092	2.36	1.82	0.192	2.668	Pass
			After 20th				1.694	1.83	1.39	0.179	2.231	Pass
		18P	Initial	9.0N MAX.	5	5	2.732	3.19	2.23	0.442	4.058	Pass
			After 20th				2.256	2.73	1.88	0.326	3.234	Pass
		20P	Initial	10.0N MAX.	5	5	3.040	3.35	2.81	0.270	3.850	Pass
			After 20th				2.406	3.03	2.00	0.409	3.633	Pass
		22P	Initial	11.0N MAX.	5	5	3.428	3.67	3.04	0.262	4.214	Pass
			After 20th				2.694	3.04	2.48	0.210	3.324	Pass
		24P	Initial	12.0N MAX.	5	5	3.544	3.81	3.41	0.176	4.072	Pass
			After 20th				2.812	3.21	2.64	0.230	3.502	Pass
30P	Initial	15.0N MAX.	5	5	4.526	4.80	4.16	0.251	5.279	Pass		
	After 20th				3.528	3.67	3.38	0.111	3.861	Pass		
34P	Initial	17.0N MAX.	5	5	4.750	5.01	4.54	0.239	5.467	Pass		
	After 20th				3.737	4.03	3.51	0.266	4.535	Pass		
36P	Initial	18.0N MAX.	5	5	5.623	5.73	5.52	0.105	5.938	Pass		
	After 20th				4.343	4.48	4.16	0.165	4.838	Pass		
38P	Initial	19.0N MAX.	5	5	5.690	5.99	5.41	0.278	6.524	Pass		
	After 20th				4.414	4.57	4.06	0.203	5.023	Pass		
40P	Initial	20.0N MAX.	5	5	6.184	6.73	5.84	0.479	7.621	Pass		
	After 20th				5.067	5.14	4.98	0.079	5.304	Pass		
45P	Initial	22.5N MAX.	5	5	6.718	7.22	6.41	0.301	7.621	Pass		
	After 20th				5.466	5.77	5.01	0.290	6.336	Pass		
50P	Initial	25.0N MAX.	5	5	7.125	7.38	6.70	0.371	8.238	Pass		
	After 20th				5.554	6.53	4.88	0.862	8.140	Pass		
60P	Initial	30.0N MAX.	5	5	8.546	9.12	8.15	0.509	10.073	Pass		
	After 20th				6.709	7.03	6.53	0.275	7.534	Pass		

※T : Top Contact    ※B : Bottom Contact

Table 2-2 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX	MIN.	s	X±3s	
B group Durability Actuator Operating Force	8P	Initial	0.8N MIN.	5	5	2.056	2.31	1.84	0.180	1.516	Pass
		After 20th				1.576	1.86	1.39	0.186	1.018	Pass
	10P	Initial	1.0N MIN.	5	5	3.842	4.07	3.58	0.185	3.287	Pass
		After 20th				2.124	2.48	1.86	0.236	1.416	Pass
	12P	Initial	1.2N MIN.	5	5	3.056	3.39	2.88	0.195	2.471	Pass
		After 20th				2.318	2.65	2.06	0.221	1.655	Pass
	14P	Initial	1.4N MIN.	5	5	3.614	3.77	3.34	0.170	3.104	Pass
		After 20th				2.768	3.06	2.64	0.171	2.255	Pass
	18P	Initial	1.8N MIN.	5	5	4.686	4.94	4.46	0.180	4.146	Pass
		After 20th				3.536	3.79	3.38	0.194	2.954	Pass
	20P	Initial	2.0N MIN.	5	5	5.148	5.29	4.96	0.131	4.755	Pass
		After 20th				3.714	3.87	3.49	0.140	3.294	Pass
	22P	Initial	2.2N MIN.	5	5	6.168	6.33	5.92	0.166	5.670	Pass
		After 20th				4.496	4.59	4.36	0.092	4.220	Pass
	24P	Initial	2.4N MIN.	5	5	6.534	6.83	6.32	0.241	5.811	Pass
		After 20th				4.790	5.07	4.62	0.185	4.235	Pass
	30P	Initial	3.0N MIN.	5	5	7.970	8.13	7.70	0.163	7.481	Pass
		After 20th				5.848	5.99	5.62	0.144	5.416	Pass
	34P	Initial	3.4N MIN.	5	5	8.157	8.42	7.84	0.294	7.275	Pass
		After 20th				6.230	6.39	6.12	0.142	5.804	Pass
	36P	Initial	3.6N MIN.	5	5	8.715	9.06	8.34	0.361	7.632	Pass
		After 20th				6.583	6.67	6.51	0.084	6.331	Pass
	38P	Initial	3.8N MIN.	5	5	9.448	9.75	9.06	0.267	8.647	Pass
		After 20th				6.942	7.10	6.64	0.200	6.342	Pass
40P	Initial	4.0N MIN.	5	5	9.623	9.66	9.58	0.042	9.497	Pass	
	After 20th				7.448	7.52	7.37	0.074	7.226	Pass	
45P	Initial	4.5N MIN.	5	5	10.882	11.51	10.21	0.545	9.247	Pass	
	After 20th				8.834	9.18	8.26	0.432	7.538	Pass	
50P	Initial	5.0N MIN.	5	5	12.333	12.51	12.16	0.174	11.811	Pass	
	After 20th				9.643	9.91	9.19	0.398	8.449	Pass	
60P	Initial	6.0N MIN.	5	5	14.095	14.28	13.75	0.297	13.204	Pass	
	After 20th				11.840	12.19	11.65	0.306	10.922	Pass	

Table 2-3 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge
						AVE.(X)	MAX	MIN.	s	X±3s	
C group Durability FPC/FFC Retention Force	8P	Initial	1.44N MIN.	10	10	5.576	5.97	5.35	0.234	4.874	Pass
		After 20th				5.060	5.27	4.61	0.274	4.238	Pass
	10P	Initial	1.80N MIN.	10	10	6.834	7.12	6.45	0.285	5.979	Pass
		After 20th				6.140	6.46	5.74	0.295	5.255	Pass
	12P	Initial	2.16N MIN.	10	10	8.512	8.99	8.20	0.323	7.543	Pass
		After 20th				7.468	7.96	6.81	0.452	6.112	Pass
	14P	Initial	2.52N MIN.	10	10	9.746	10.01	9.59	0.176	9.218	Pass
		After 20th				8.702	9.14	8.14	0.449	7.355	Pass
	18P	Initial	3.24N MIN.	10	10	12.676	12.95	12.52	0.191	12.103	Pass
		After 20th				11.390	11.60	11.05	0.204	10.778	Pass
	20P	Initial	3.60N MIN.	10	10	13.962	14.32	13.58	0.273	13.143	Pass
		After 20th				12.530	12.90	11.99	0.353	11.471	Pass
	22P	Initial	3.96N MIN.	10	10	15.732	17.63	14.75	1.136	12.324	Pass
		After 20th				14.400	15.92	13.49	1.042	11.274	Pass
	24P	Initial	4.32N MIN.	10	10	17.124	17.84	15.96	0.672	15.108	Pass
		After 20th				15.566	16.52	14.05	0.760	13.286	Pass
	30P	Initial	5.40N MIN.	10	10	21.878	22.43	20.73	0.697	19.787	Pass
		After 20th				20.218	20.90	19.02	0.714	18.076	Pass
	34P	Initial	6.12N MIN.	10	10	24.691	25.19	24.35	0.442	23.365	Pass
		After 20th				22.166	22.70	21.35	0.716	20.018	Pass
36P	Initial	6.48N MIN.	10	10	26.269	26.73	25.91	0.419	25.012	Pass	
	After 20th				23.443	23.78	22.78	0.574	21.721	Pass	
38P	Initial	6.84N MIN.	10	10	26.330	26.55	25.90	0.262	25.544	Pass	
	After 20th				23.476	23.77	22.78	0.398	22.282	Pass	
40P	Initial	7.20N MIN.	10	10	29.287	29.91	28.72	0.597	27.496	Pass	
	After 20th				26.366	26.54	26.22	0.163	25.877	Pass	
45P	Initial	8.10N MIN.	10	10	32.774	34.57	31.63	1.443	28.445	Pass	
	After 20th				30.344	31.20	29.61	0.654	28.382	Pass	
50P	Initial	9.0N MIN.	10	10	32.481	33.36	31.21	1.128	29.097	Pass	
	After 20th				27.668	28.67	26.74	0.965	24.773	Pass	
60P	Initial	10.8N MIN.	10	10	41.400	42.09	40.80	0.650	39.450	Pass	
	After 20th				35.233	36.28	33.35	1.632	30.337	Pass	

Table 2-4 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX	MIN.	s	X±3s		
D group Vibration Shock	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	20	24.002	26.11	20.60	1.174	27.524	Pass
			After Vibration	70mΩ MAX.			22.976	25.26	19.92	1.096	26.264	Pass
			After Shock				22.785	25.92	18.97	1.482	27.231	Pass
		※B	Initial	50mΩ MAX.			19.995	22.10	17.09	1.162	23.481	Pass
			After Vibration	70mΩ MAX.			18.982	21.17	16.12	1.089	22.249	Pass
			After Shock				18.906	22.02	16.00	1.446	23.244	Pass
	Discontinuity	※T	During Vibration	1.0μsec. MAX.	5	5	No discontinuity					Pass
			During Shock				No Discontinuity					Pass
		※B	During Vibration				No discontinuity					Pass
			During Shock				No Discontinuity					Pass
	Appearance		After Vibration	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass
			After Shock				No abnormality					Pass
E group High Temperature Life	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	22.334	25.97	18.89	1.732	27.530	Pass
			After 1000 hours	70mΩ MAX.			22.829	25.79	19.38	1.571	27.542	Pass
		※B	Initial	50mΩ MAX.			18.805	22.44	15.49	1.728	23.989	Pass
			After 1000 hours	70mΩ MAX.			19.206	22.16	15.84	1.568	23.910	Pass
	Contact Retention Force (N)		Initial	0.5N MIN.	-	15	0.785	0.89	0.72	0.060	0.605	Pass
			After 1000 hours				0.825	0.95	0.73	0.068	0.621	Pass
	Hold Down Retention Force (N)		Initial	1.0N MIN.	-	15	2.391	2.70	2.11	0.193	1.812	Pass
			After 1000 hours				2.445	2.60	2.21	0.127	2.064	Pass
	Appearance		After 500 hours	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass
			After 1000 hours				No abnormality					Pass

※T : Top Contact    ※B : Bottom Contact

Table 2-5 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX	MIN.	s	X±3s		
F group Low Temperature Life	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	22.507	25.58	19.93	1.143	25.936	Pass
			After Testing	70mΩ MAX.			23.223	27.22	20.00	1.473	27.642	Pass
		※B	Initial	50mΩ MAX.			18.797	21.86	16.45	1.132	22.193	Pass
			After Testing	70mΩ MAX.			19.663	23.56	16.44	1.471	24.076	Pass
	Appearance	After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	
	G group Humidity (Steady State)	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	21.530	24.07	18.47	1.153	24.989
			After Testing	70mΩ MAX.	22.313			26.01	19.97	1.315	26.258	Pass
※B			Initial	50mΩ MAX.	18.066			20.60	15.55	1.141	21.489	Pass
			After Testing	70mΩ MAX.	18.646			22.21	16.30	1.307	22.567	Pass
Appearance		After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	
H group Humidity (Cycling)		Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	10	400	23.134	26.19	20.50	1.222	26.800
			After Testing	70mΩ MAX.	22.654			24.53	20.49	0.912	25.390	Pass
	※B		Initial	50mΩ MAX.	18.797			21.45	16.16	1.215	22.442	Pass
			After Testing	70mΩ MAX.	19.439			21.11	17.27	0.909	22.166	Pass
	Insulation Resistance (MΩ)	Initial	100MΩ MIN.	10	200	4.6×10 <sup>4</sup> MΩ MIN.					Pass	
		After Testing				2.8×10 <sup>4</sup> MΩ MIN.					Pass	
	D.W.Voltage	Initial	No abnormalities such as creeping discharge, flashover, insulator breakdown occur	10	200	No abnormality					Pass	
		After Testing				No abnormality					Pass	
	Appearance	After Testing	No abnormality adversely affecting the performance shall occur	10	10	No abnormality					Pass	

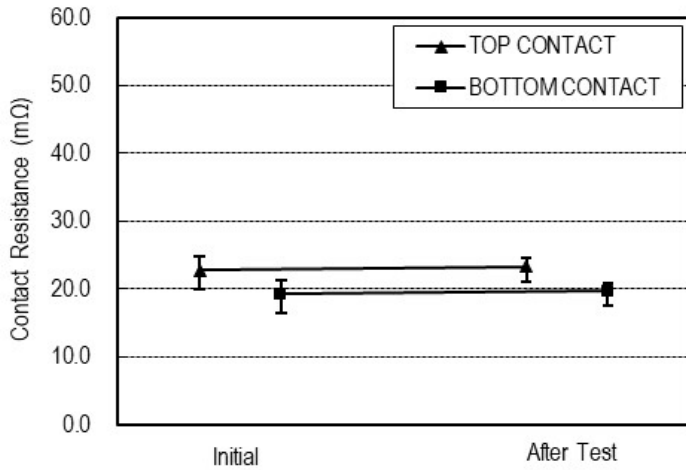
※T : Top Contact    ※B : Bottom Contact



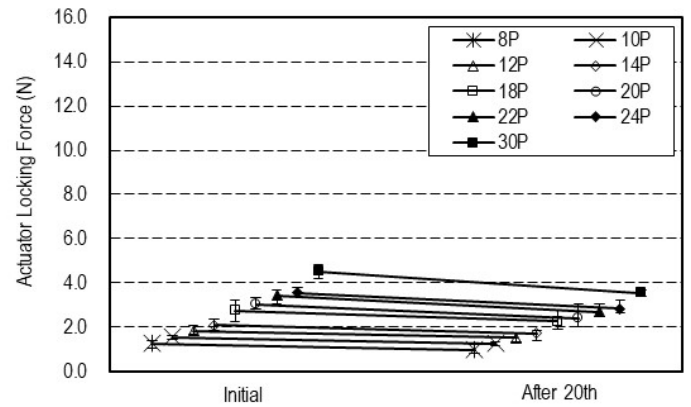
Table 2-6 Test Result

Test Item	Measurement		Spec.	Set	n	Data					Judge	
						AVE.(X)	MAX	MIN.	s	X±3s		
I group Thermal Shock	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	23.209	25.27	21.05	1.124	26.581	Pass
			After Testing	70mΩ MAX.			21.832	25.28	19.56	1.202	25.438	Pass
		※B	Initial	50mΩ MAX.			19.475	21.63	17.35	1.125	22.850	Pass
			After Testing	70mΩ MAX.			18.714	21.96	16.33	1.199	22.311	Pass
	Appearance	After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	
	J group Gas (H <sub>2</sub> S + SO <sub>2</sub> )	Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	24.331	26.63	21.01	1.191	27.904
			After Testing	70mΩ MAX.	23.359			26.10	20.41	1.123	26.728	Pass
※B			Initial	50mΩ MAX.	19.811			22.08	16.48	1.209	23.438	Pass
			After Testing	70mΩ MAX.	19.008			21.74	16.17	1.131	22.401	Pass
Appearance		After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	
K group Salt Water Spray		Contact Resistance (mΩ)	※T	Initial	50mΩ MAX.	5	200	24.043	26.26	20.73	1.261	27.826
			After Testing	70mΩ MAX.	23.186			25.45	20.41	1.429	27.473	Pass
	※B		Initial	50mΩ MAX.	19.361			21.57	16.34	1.255	23.126	Pass
			After Testing	70mΩ MAX.	19.944			22.09	17.17	1.419	24.201	Pass
	Appearance	After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	
	L group Solderability	Zerox Time		3sec. MAX	10	10	0.12 sec. MAX					Pass
Appearance		Wetness 95% MIN.	No abnormality					Pass				
M group Soldering Heat Resistance	Contact Resistance (mΩ)	※T	After Testing	70mΩ MAX.	5	200	27.158	31.59	24.57	1.968	33.062	Pass
		※B	After Testing	70mΩ MAX.			22.303	25.77	20.02	1.586	27.061	Pass
	Appearance	After Testing	No abnormality adversely affecting the performance shall occur	5	5	No abnormality					Pass	

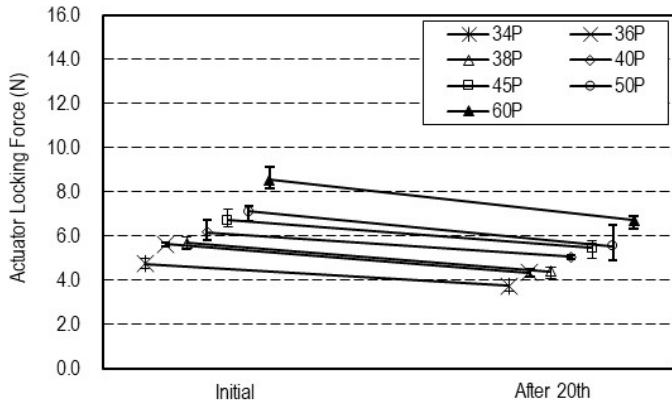
※T : Top Contact    ※B : Bottom Contact



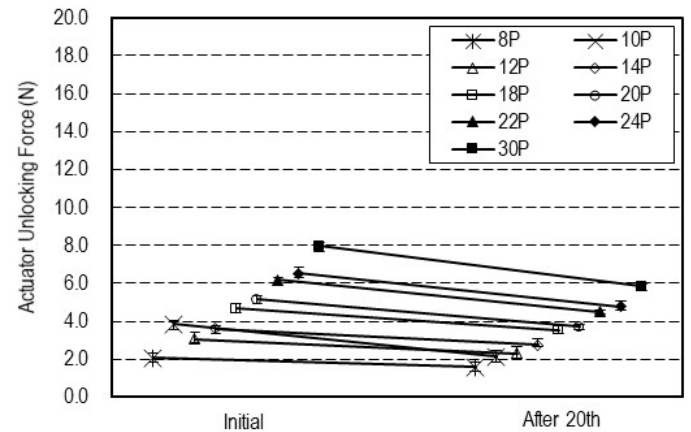
Graph. 1 A change of Contact Resistance  
A group : Durability



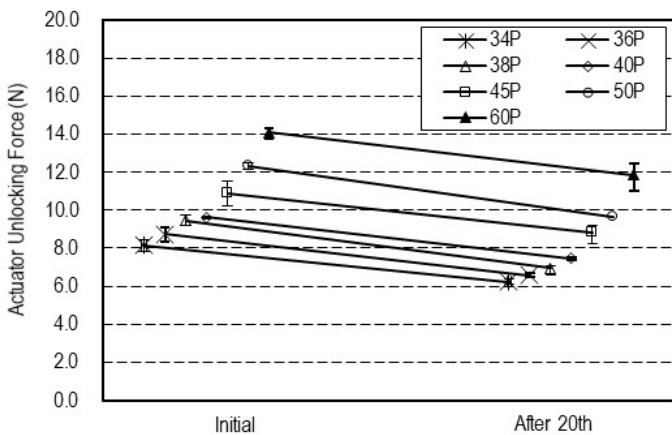
Graph. 2 A change of Actuator Locking Force (8P~30P)  
B group : Durability



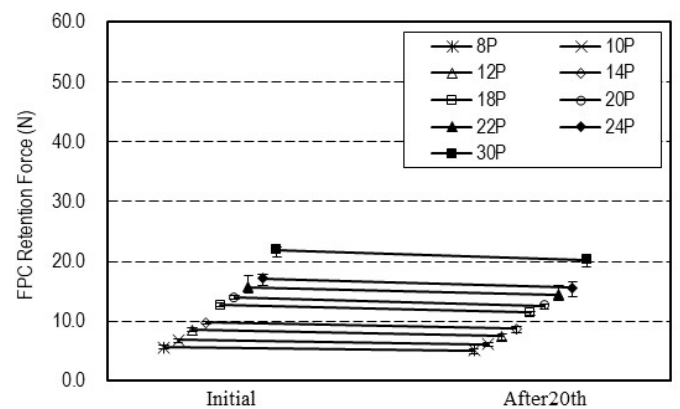
Graph. 3 A change of Actuator Locking Force (34P~60P)  
B group : Durability



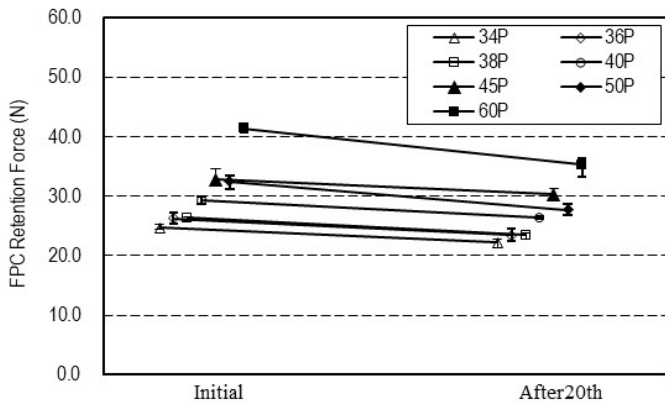
Graph. 4 A change of Actuator Unlocking Force (8P~30P)  
B group : Durability



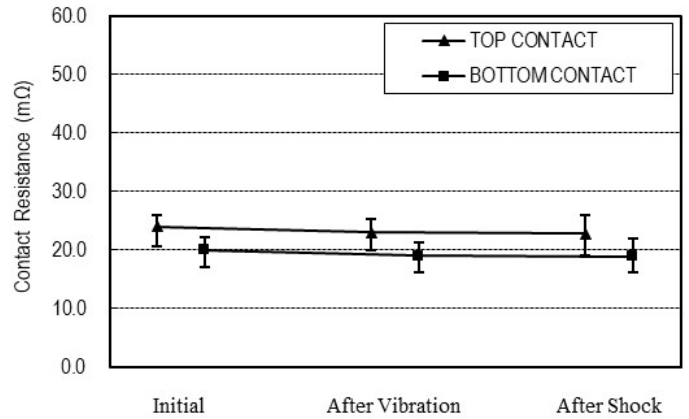
Graph. 5 A change of Actuator Unlocking Force (34P~60P)  
B group : Durability



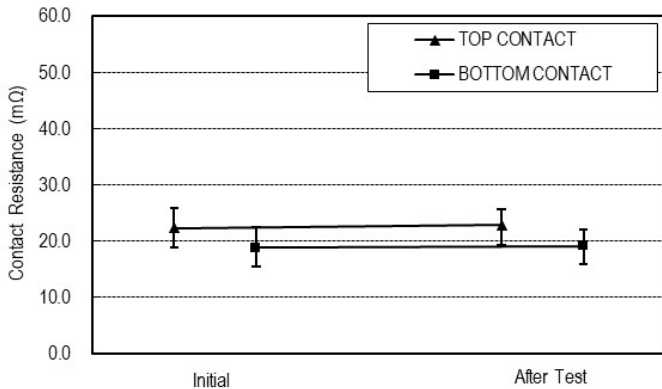
Graph. 6 A change of FPC Retention Force (8P~30P)  
C group : FPC Retention Force



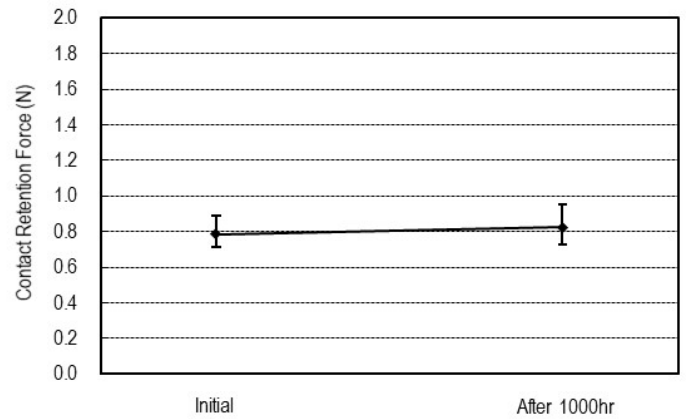
Graph. 7 A change of FPC Retention Force (34P~60P)  
C group : FPC Retention Force



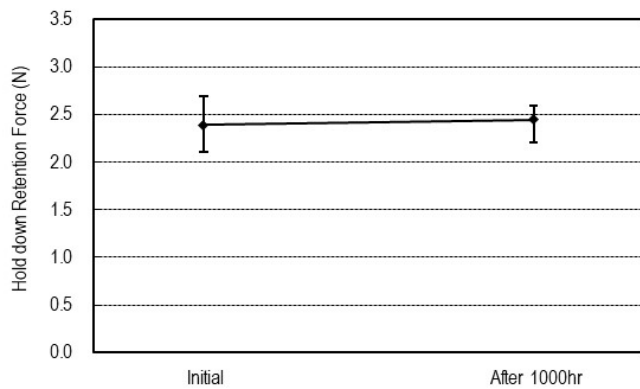
Graph. 8 A change of Contact Resistance  
D group : Vibration / Shock



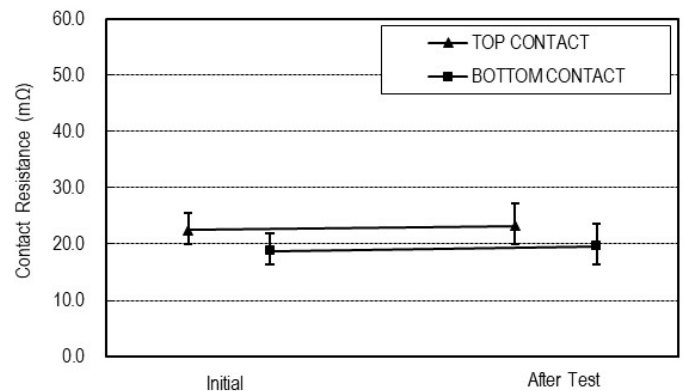
Graph. 9 A change of Contact Resistance  
E group : High Temperature Life



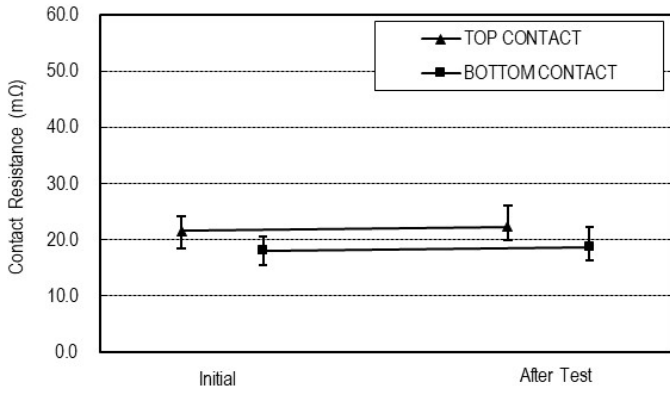
Graph. 10 A change of Contact Retention Force  
E group : High Temperature Life



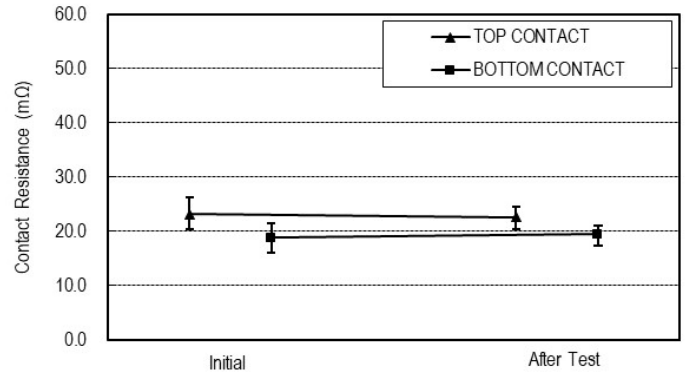
Graph. 11 A change of H/D Retention Force  
E group : High Temperature Life



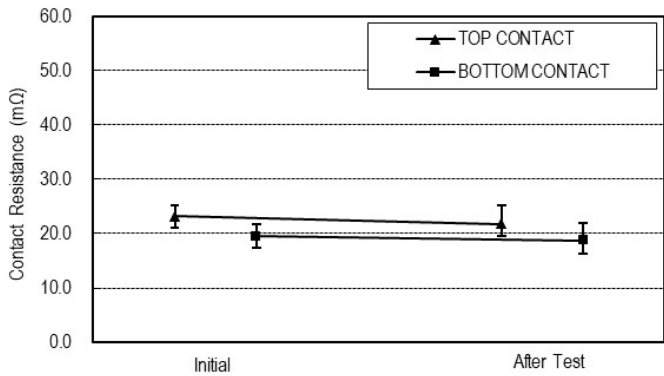
Graph. 12 A change of Contact Resistance  
F group : Low Temperature Life



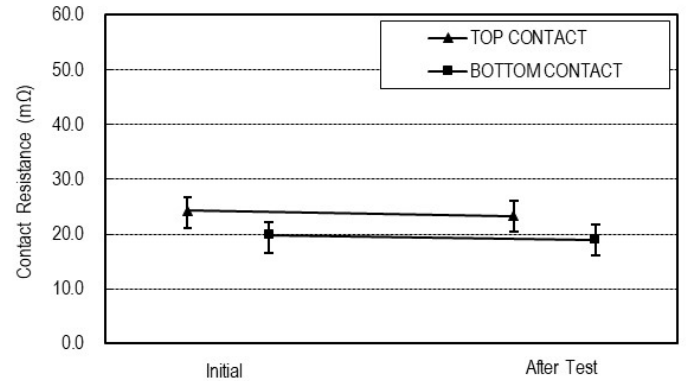
Graph. 13 A change of Contact Resistance  
G group : Humidity(Steady State)



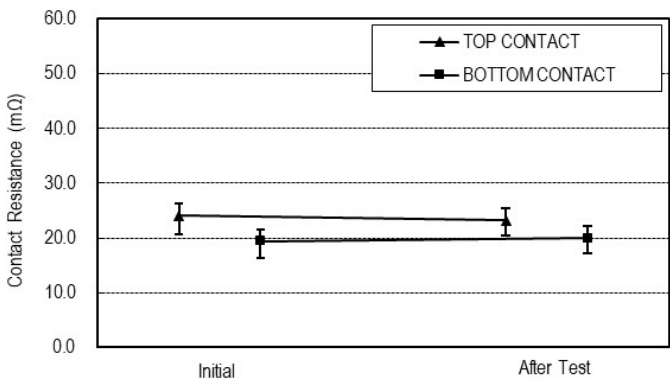
Graph. 14 A change of Contact Resistance  
H group : Humidity(Cycling)



Graph. 15 A change of Contact Resistance  
I group : Thermal Shock



Graph. 16 A change of Contact Resistance  
J group : Gas(H<sub>2</sub>S+SO<sub>2</sub>)



Graph. 17 A change of Contact Resistance  
K group : Salt Water Spray