MINIFLEX® 4-ST

Part No. 20588-0**E-01#

Test Report

Product Specification no. PRS-1863

Rev.	ECN	Date	Prepared by	Checked by	Approved by
7	T23031	June 5, 2023	M. Muro	-	H. Ikari
6	T21146	November 8, 2021	M. Muro	-	H. Ikari
5	T19131	October 2, 2019	S. Shigekoshi	M. Muro	H. Ikari
4	T17044	March 3, 2017	Y. Sasa	-	H. Ikari

1. Purpose

To evaluate the performance of MINIFLEX 4-ST Connector in accordance PRS-1863.

2. Specimen

(1)Connector：MINIFLEX 4-ST Connector ・・・ P/N 20588-0**E-01#

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

Thickness Lead：t=0.12±0.03 (Actual measurement：0.116～0.117mm)

3. Test Sequence

All the evaluation was performed in accordance with Table. 1 Test Sequence.

4. Result

See Table 2-1～2-4. Graph 1～14. For the details of testing conditions and requirements, see PRS-1863.

5. Conclusion

All the specimen met the requirements of PRS-1863.

Table 1. 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 Retention Force			1													
LOCK 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_2S)											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 AVE.(X)	MAX.	MIN.	s	X±3s	Judge
A Group Durability	Contact Resistance (mΩ)	Initial		60mΩMAX.	10	100	27.044	30.52	23.74	1.656	32.012	○
		After 20th		ΔR=40mΩ MAX.			0.950	3.58	-1.52	1.001	3.953	○
	Act Locking Force (N)	4P	Initial	1.8N MAX. (0.3N/Pos. ×(4P+2))	10	10	0.641	0.79	0.55	0.132	1.037	○
			20th cycles				0.576	0.68	0.50	0.091	0.849	○
		6P	Initial	2.4N MAX. (0.3N/Pos. ×(6P+2))			0.835	0.88	0.81	0.037	0.946	○
			20th cycles				0.708	0.75	0.66	0.045	0.843	○
		8P	Initial	3.0N MAX (0.3N/Pos. ×(8P+2))			1.044	1.15	0.96	0.072	1.260	○
			20th cycles				0.925	1.07	0.84	0.068	1.129	○
		10P	Initial	3.6N MAX. (0.3N/Pos. ×(10P+2))			1.156	1.27	0.97	0.123	1.525	○
			20th cycles				0.987	1.07	0.86	0.088	1.251	○
		12P	Initial	4.2N MAX. (0.3N/Pos. ×(12P+2))			1.545	1.58	1.14	0.024	1.617	○
			20th cycles				1.230	1.28	1.19	0.035	1.335	○
	Act Un-locking Force (N)	4P	Initial	0.06N MIN. (0.01N/Pos. ×(4P+2))	10	10	0.247	0.26	0.22	0.026	0.169	○
			20th cycles				0.235	0.27	0.21	0.029	0.148	○
		6P	Initial	0.08N MIN. (0.01N/Pos. ×(6P+2))			0.376	0.41	0.35	0.033	0.277	○
			20th cycles				0.367	0.40	0.34	0.034	0.265	○
		8P	Initial	0.10N MIN. (0.01N/Pos. ×(8P+2))			0.538	0.60	0.46	0.046	0.400	○
			20th cycles				0.528	0.59	0.46	0.044	0.396	○
		10P	Initial	0.12N MIN. (0.01N/Pos. ×(10P+2))			0.673	0.73	0.61	0.054	0.511	○
			20th cycles				0.718	0.75	0.67	0.033	0.619	○
		12P	Initial	0.14N MIN. (0.01N/Pos. ×(12P+2))			0.739	0.78	0.69	0.032	0.643	○
			20th cycles				0.721	0.75	0.67	0.034	0.619	○
B Group FPC Retention Force	4P	Initial		2.50N MIN. (0.06N/Pos. ×4P+2.26N)	10	10	4.804	5.03	4.47	0.293	3.925	○
		After 20th					4.749	4.94	4.61	0.172	4.233	○
	6P	Initial		2.62N MIN. (0.06N/Pos. ×6P+2.26N)			5.183	5.40	5.02	0.196	4.595	○
		After 20th					4.969	5.19	4.77	0.212	4.333	○
	8P	Initial		2.74N MIN. (0.06N/Pos. ×8P+2.26N)			5.680	6.02	5.33	0.215	5.035	○
		After 20th					5.307	5.68	4.88	0.251	4.554	○
	10P	Initial		2.86N MIN. (0.06N/Pos. ×10P+2.26N)			5.891	6.06	5.79	0.145	5.456	○
		After 20th					5.394	5.42	5.38	0.025	5.319	○
	12P	Initial		2.98N MIN. (0.06N/Pos. ×12P+2.26N)			6.611	6.95	6.42	0.222	5.945	○
		After 20th					5.949	6.26	5.77	0.194	5.367	○

Table 2-2. Test result

Test Item	Measurement		Spec.	Set	N	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
C Group Retention Force	C/T		0.25N MIN.	10	100	0.947	1.15	0.76	0.128	0.563	○
	LOCK		0.25N MIN.	10	20	0.646	0.65	0.64	0.009	0.619	○
D Group Vibration Shock	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	26.729	29.61	22.57	1.783	32.078	○
		After Vibration	ΔR=40mΩ MAX.			0.917	4.03	-2.94	1.530	5.507	○
		After Shock				0.136	2.63	-2.52	1.170	3.646	○
	Discontinuity	During Vibration	1μsec. MAX.	10	10	No Discontinuity					○
		During 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)	Initial	60mΩ MAX.	10	100	26.479	31.56	20.82	2.466	33.877	○
		After Test	ΔR=40mΩ MAX.			-0.362	3.87	-3.53	1.842	5.164	○
	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)	Initial	60mΩ MAX.	10	100	27.044	30.52	23.74	1.656	32.012	○
		After Test	ΔR=40mΩ MAX.			1.074	4.38	-2.36	1.459	5.451	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○
G Group High Temp. Life	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	28.128	32.12	22.95	1.837	33.639	○
		After Test	ΔR=40mΩ MAX.			1.595	4.95	0.00	1.863	7.184	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○

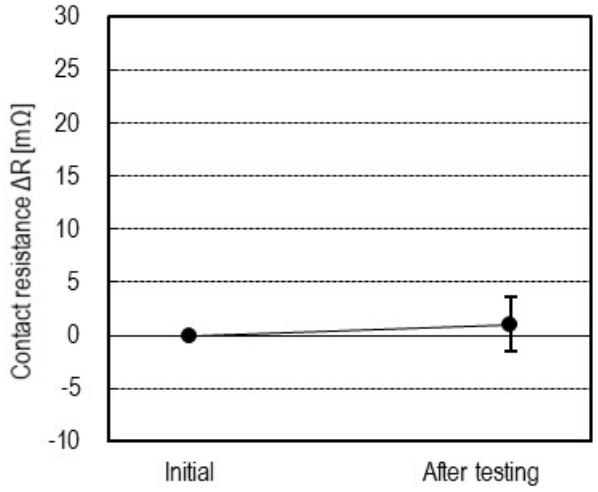
Table 2-3. Test result

Test Item	Measurement		Spec.	Set	N	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
H Group High Temp. & High Hum. energizing	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	28.741	33.24	23.59	2.203	35.350	○
		After Test	ΔR=40mΩ MAX.			0.481	3.39	-1.48	1.057	3.652	○
	D.W.Voltage	Initial	No Abnormality	10	50	No Abnormality					○
		After Test				No Abnormality					○
	Insulation Resistance (MΩ)	Initial	100MΩ MIN	10	50	MIN. 50×10^5MΩ					○
		After Test				MIN. 2.5×10^4MΩ					○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○
J Group High Temp. & High Hum. Life	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	28.104	33.19	22.34	2.754	36.366	○
		After Test	ΔR=40mΩ MAX.			1.936	5.00	-0.87	1.419	6.193	○
	D.W.Voltage	Initial	No Abnormality	10	50	No Abnormality					○
		After Test				No Abnormality					○
	Insulation Resistance (MΩ)	Initial	100MΩ MIN	10	50	MIN. 100×10^5MΩ					○
		After Test				MIN. 4.0×10^5MΩ					○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○
K Group Cold Temp. Life	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	28.080	32.96	21.60	2.045	34.215	○
		After Test	ΔR=40mΩ MAX.			-1.088	0.00	-4.08	1.313	2.851	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○
L Group Gas (H_2S)	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	27.009	30.32	23.92	1.760	32.289	○
		After Test	ΔR=40mΩ MAX.			-0.211	3.94	-2.98	1.734	4.991	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○
M Group Gas (SO_2)	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	26.294	29.61	22.06	1.514	30.836	○
		After Test	ΔR=40mΩ MAX.			1.661	4.16	-1.53	1.328	5.645	○
	Appearance	After Test	No abnormality adversely affecting the performance shall occur	10	10	No Abnormality					○

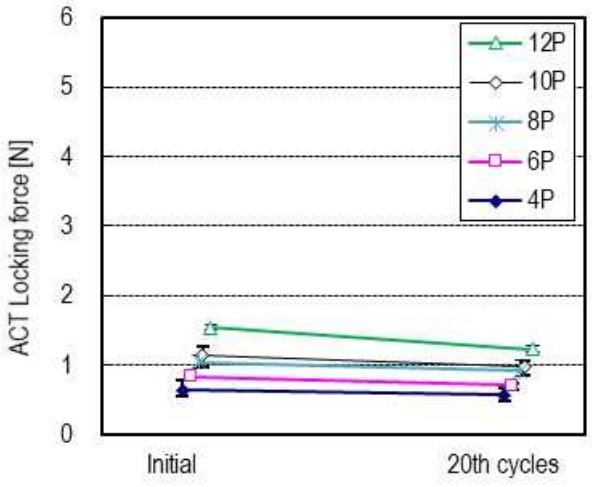
Table 2-4. Test result

Test Item	Measurement		Spec.	Set	N	Data					Judge
						AVE.(X)	MAX.	MIN.	s	X±3s	
N Group Salt Water Spray	Contact Resistance (mΩ)	Initial	60mΩ MAX.	10	100	27.452	32.97	23.04	2.494	34.934	○
		After Test	ΔR=40mΩ MAX.			0.807	3.07	-2.56	1.237	4.518	○
	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	10	10	MAX. 0sec.					○
		LOCK		10	10	MAX. 0sec.					○
	Appearance	C/T	Wetness 95% MIN.	10	10	95%MIN.was wet.					○
		LOCK		10	10	95%MIN.was wet.					
Q Group Soldering Heat Resistance	Reflow twice		No Abnormality	10	10	No Abnormality					○
	Soldering iron										
R Group Temp. rising	0.4A/Contact 4.0A/Connector		ΔT=30K MAX.	10	10	23.2K MAX. no problem.					○

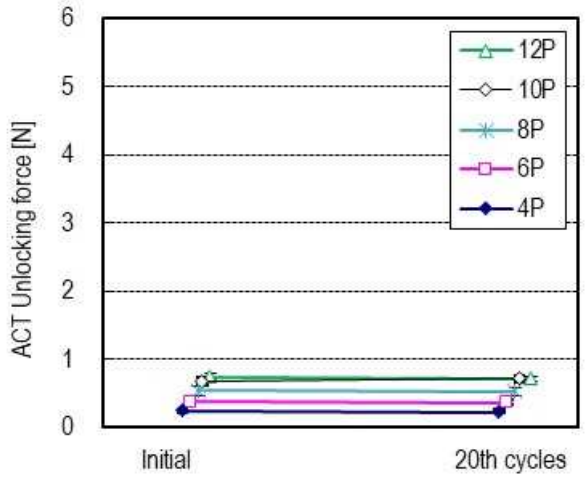
* To evaluate about Temp. Rising Test with FPC made by Taiyo Industrial Co.,Ltd (Thickness Lead : t=0.12mm, Length : L=40mm). It is a result of when applied ratings current (0.4A/Contact) between the neighboring contacts for 10pos. (With the whole connector 4.0A).



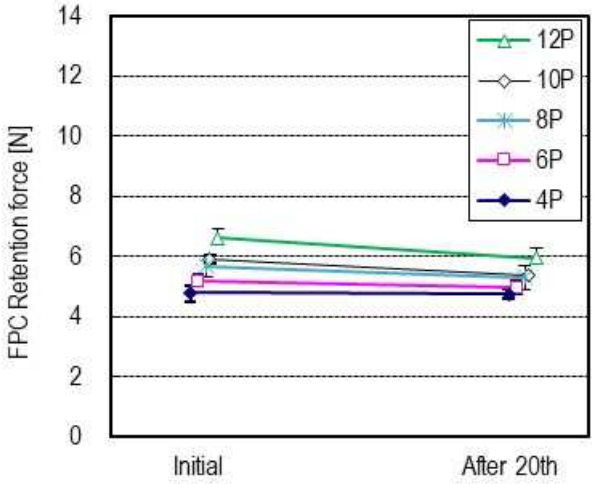
Graph 1. A change of Contact Resistance
A group : Durability



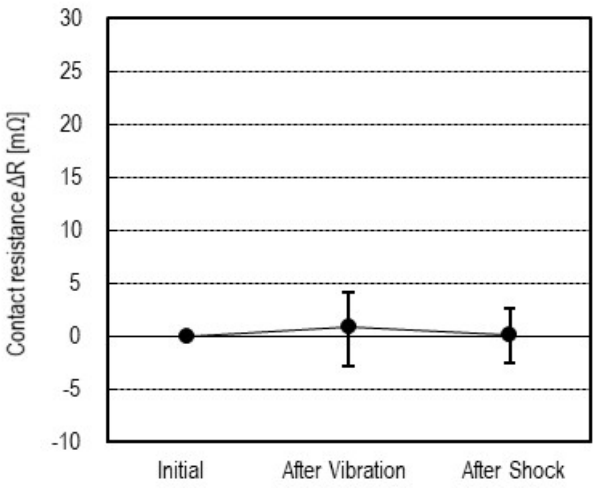
Graph 2. A change of Locking Force
A group : Durability



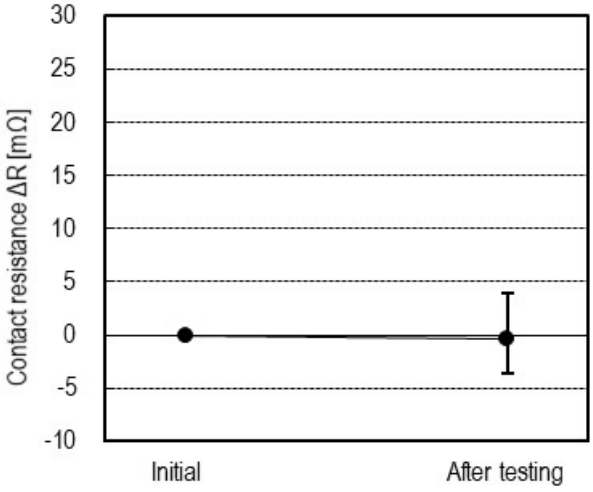
Graph 3. A change of Un-locking Force
A group : Durability



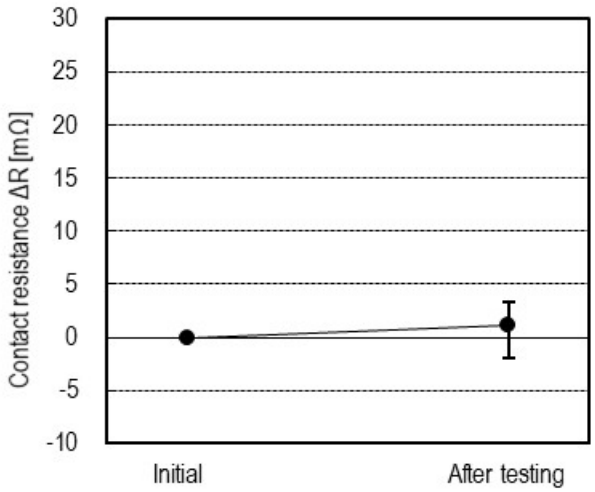
Graph 4. A change of FPC Retention Force
B group : FPC Retention Force



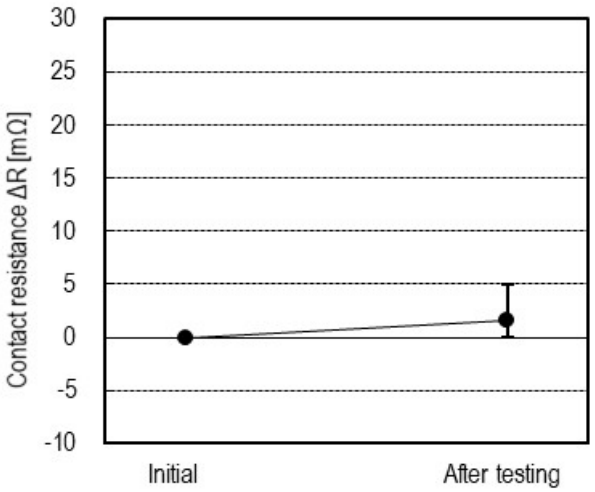
Graph 5. A change of Contact Resistance
D group : Vibration / Shock



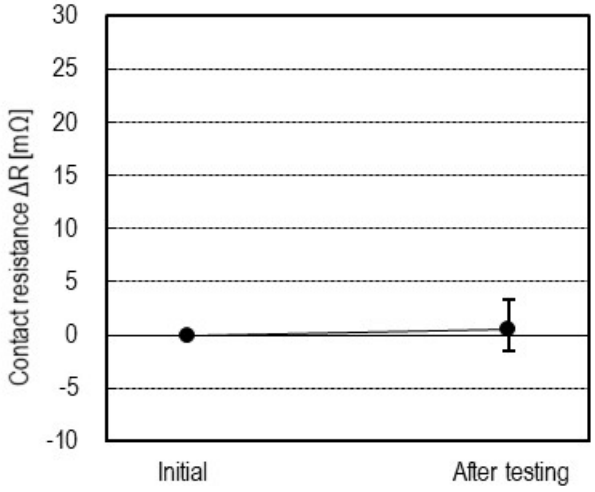
Graph 6. A change of Contact Resistance
E group : Fretting Corrosion



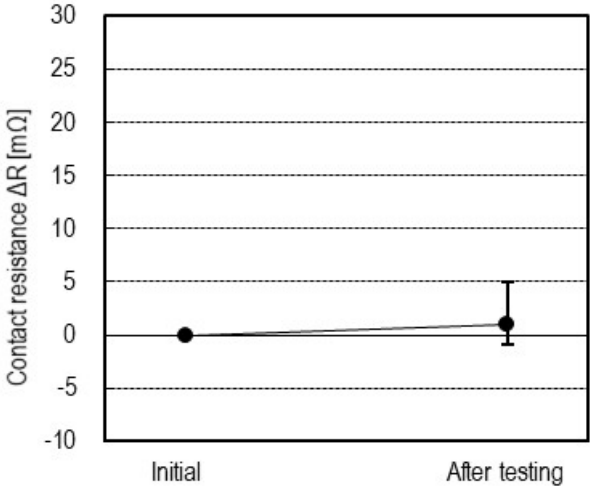
Graph 7. A change of Contact Resistance
F group : Thermal Shock



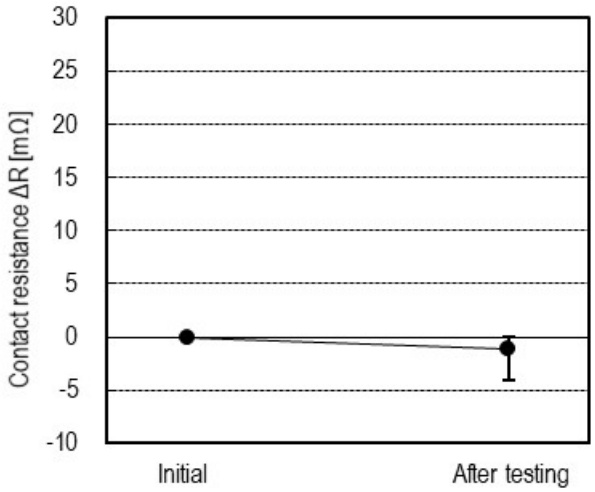
Graph 8. A change of Contact Resistance
G group : High Temp. Life



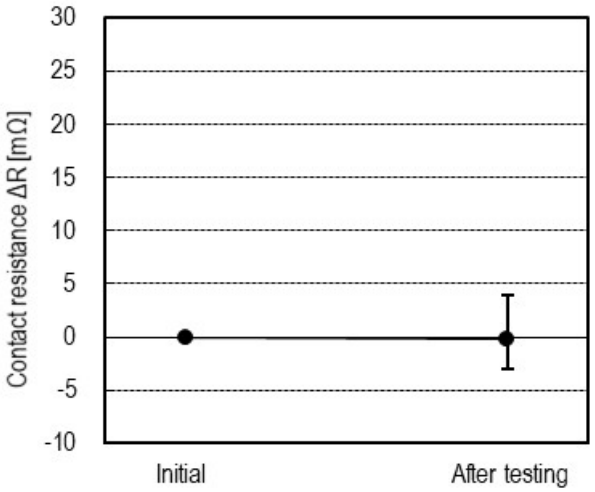
Graph 9. A change of Contact Resistance
H group : High Temp. & High Hum. Energizing



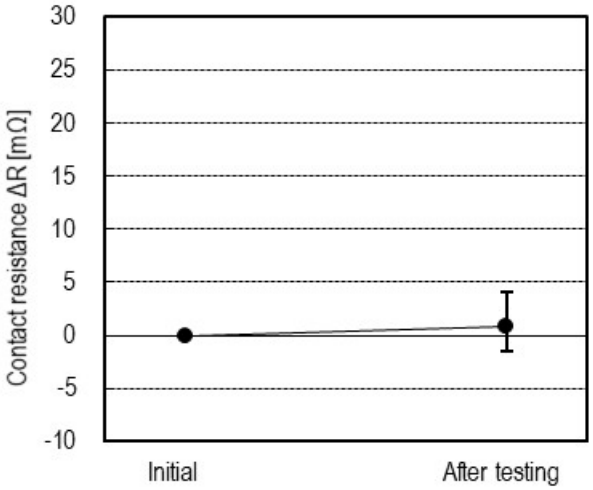
Graph 10. A change of Contact Resistance
J group : High Temp. & High Hum. Life



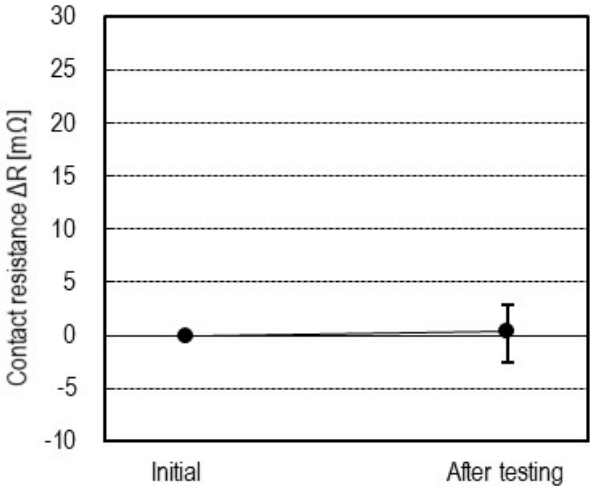
Graph 11. A change of Contact Resistance
K group : Cold Temp. Life



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