

MHF[®] 4L Connector

Plug Parts No. 20565-001R-13, 20572-001R-08

Receptacle Parts No. 20579-001E, 20579-001E-01

Test Report

Product Specification no. PRS-1907

4	T21094	October 22, 2021	K. Ikeshita		M. Takemoto
3	T21050	July 2, 2021	N.Miyashiro	K.Ikeshita	M.Takemoto
2	T21028	April 20, 2021	N.Miyashiro	K.Ikeshita	M.Takemoto
1	T17123	August 1, 2017	M.Nomoto	S.Taguchi	K.Yotsutani
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Purpose

To evaluate the performance of MHF 4L Connector in accordance with PRS-1907.

2. Specimen

(1) MHF 4L PLUG (Part No. 20565-001R-13, 20572-001R-08)

(2) MHF 4L RECEPTACLE (Part No. 20579-001E-01)

*Part No. 20579-001E, 20579-001E-01 are different in the packing style only,
so we tested part No. 20579-001E-01 as representative.

3. Test Sequence

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

4. Result

See Table 2, Graph 1 to 20. For the details of the testing conditions and requirements, see PRS-1907.

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

5. Conclusion

All the specimens met the requirements of PRS-1907.

Table 1 Test Sequence and Sample Quantity

Test Item	Group															
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
Contact resistance						1,3		1,3	1,3	1,5	1,3	1,5	1,3	1,3		
Insulation resistance										2,6		2,6				
Dielectric withstanding voltage	1									3,7		3,7				
VSWR		1														
Mating force Un-mating force			1													
Cable retention force at 30 degree				1												
Cable retention force at 0 degree					1											
Durability						2										
Shearing strength							1									
Vibration								2								
Shock									2							
Thermal shock										4						
High temperature life											2					
Humidity (Steady State)												4				
Saltwater spray													2			
H ₂ S gas														2		
Solder ability															1	
Soldering heat resistance																1
Specimen quantity.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	12 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.	10 pcs.

※Numbers indicate test sequences

Table 2-1

Group	Test items		Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement	
	Measurements										
A	Dielectric withstanding voltage		Spec: No creeping discharge, flashover, no insulator breakdown shall occur.								
	20565-001R-13		-	10	-	No abnormality				Pass	
	20572-001R-08		-	10	-	No abnormality				Pass	
B	VSWR										
	Plug	20565-001R-13									
		0.1~3.0GHz		1.30 MAX.	10	-	1.112	1.14	1.08	0.015	Pass
		3.0~6.0GHz		1.45 MAX.		-	1.283	1.32	1.24	0.020	Pass
		6.0~9.0GHz		1.60 MAX.		-	1.404	1.44	1.33	0.033	Pass
	9.0~12.0GHz		1.90 MAX.	-		1.490	1.53	1.45	0.021	Pass	
		20572-001R-08									
		0.1~3.0GHz		1.30 MAX.	10	-	1.153	1.17	1.13	0.009	Pass
		3.0~6.0GHz		1.45 MAX.		-	1.326	1.38	1.30	0.020	Pass
		6.0~9.0GHz		1.60 MAX.		-	1.437	1.50	1.39	0.029	Pass
	9.0~12.0GHz		1.90 MAX.	-		1.529	1.62	1.47	0.039	Pass	
	Receptacle	0.1~3.0GHz		1.30 MAX.	10	-	1.103	1.12	1.08	0.016	Pass
		3.0~6.0GHz		1.40 MAX.		-	1.204	1.22	1.18	0.013	Pass
		6.0~9.0GHz		1.85 MAX.		-	1.502	1.55	1.44	0.040	Pass
		9.0~12.0GHz		1.85 MAX.		-	1.695	1.73	1.66	0.022	Pass
	C	Mating force 20565-001R-13									
Initial		30N MAX.	10	N	20.25	21.8	18.9	1.00	Pass		
After testing		30N MAX.			10.85	11.6	10.0	0.61	Pass		
20572-001R-08											
Initial		30N MAX.	10	N	20.11	21.7	18.3	1.20	Pass		
After testing		30N MAX.			10.79	11.6	10.0	0.57	Pass		
Unmating force 20565-001R-13											
Initial		20N MAX.,5N MIN.	10	N	12.90	14.7	11.0	0.98	Pass		
After testing		20N MAX.,3N MIN.			9.03	10.7	7.4	0.89	Pass		
20572-001R-08											
Initial		20N MAX.,5N MIN.	10	N	14.05	16.2	13.0	0.95	Pass		
After testing		20N MAX.,3N MIN.			10.06	11.3	9.0	0.84	Pass		
D	Cable retention force at 30 degree										
	20565-001R-13										
	Electrical discontinuity		Pass criteria: No electrical discontinuity grater than 1μs shall occur.								
			-	10	-	No discontinuity				Pass	
	Appearance		Spec: No abnormality adversely affecting the performance shall occur.								
	Initial		No abnormality	10	-	No abnormality				Pass	
	After testing		No abnormality			No abnormality				Pass	
	20572-001R-08										
	Electrical discontinuity		Pass criteria: No electrical discontinuity grater than 1μs shall occur.								
			-	10	-	No discontinuity				Pass	
	Appearance		Spec: No abnormality adversely affecting the performance shall occur.								
	Initial		No abnormality	10	-	No abnormality				Pass	
After testing		No abnormality	No abnormality				Pass				

Table 2-2

Group	Test items		Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement
	Measurements									
E	Cable retention force at 0 degree									
	20565-001R-13									
	Electrical discontinuity									
	Pass criteria: No electrical discontinuity greater than 1μs shall occur.									
		-	-	10	-	No discontinuity				Pass
	Appearance									
		Initial	No abnormality	10	-	No abnormality				Pass
		After testing	No abnormality			No abnormality				Pass
	20572-001R-08									
	Electrical discontinuity									
	Pass criteria: No electrical discontinuity greater than 1μs shall occur.									
		-	-	10	-	No discontinuity				Pass
Appearance										
Spec: No abnormality adversely affecting the performance shall occur.										
	Initial	No abnormality	10	-	No abnormality				Pass	
	After testing	No abnormality			No abnormality				Pass	
F	Durability									
	20565-001R-13									
	Contact resistance of main contact									
		Initial	20mΩ MAX.	10	mΩ	8.45	9.3	7.7	0.51	Pass
		After testing	-			9.07	9.8	8.2	0.55	-
		ΔR	Δ20mΩ MAX.			0.63	1.7	-0.2	0.63	Pass
	Contact resistance of Ground contact									
		Initial	20mΩ MAX.	10	mΩ	5.84	6.9	5.2	0.49	Pass
		After testing	-			6.62	7.2	6.2	0.36	-
		ΔR	Δ20mΩ MAX.			0.78	1.5	-0.2	0.51	Pass
	Appearance									
	Spec: No abnormality adversely affecting the performance shall occur.									
		Initial	No abnormality	10	-	No abnormality				Pass
		After testing	No abnormality			No abnormality				Pass
	20572-001R-08									
	Contact resistance of main contact									
		Initial	20mΩ MAX.	10	mΩ	8.58	9.8	7.5	0.78	Pass
		After testing	-			9.86	12.0	8.3	1.06	-
		ΔR	Δ20mΩ MAX.			1.28	3.1	-0.2	1.22	Pass
	Contact resistance of Ground contact									
		Initial	20mΩ MAX.	10	mΩ	5.45	5.9	4.2	0.52	Pass
		After testing	-			6.49	7.4	5.8	0.51	-
		ΔR	Δ20mΩ MAX.			1.04	2.1	0.2	0.58	Pass
	Appearance									
Spec: No abnormality adversely affecting the performance shall occur.										
	Initial	No abnormality	10	-	No abnormality				Pass	
	After testing	No abnormality			No abnormality				Pass	
G	Shearing strength									
		Direction①	20N MIN.	3	N	28.23	28.8	27.9	0.41	Pass
		Direction②		3	N	30.21	31.1	29.8	0.97	Pass
		Direction③		3	N	28.19	28.9	27.6	0.51	Pass
		Direction④		3	N	31.58	32.5	30.2	0.87	Pass

Table 2-3

Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement	
	Measurements									
H	Vibration									
	20565-001R-13									
	Contact resistance of main contact									
		Initial	20mΩ MAX.	10	mΩ	8.34	9.70	7.27	0.80	Pass
		After testing	-			8.77	9.53	7.43	0.55	-
		ΔR	Δ20mΩ MAX.			0.43	1.42	-0.61	0.61	Pass
	Contact resistance of Ground contact									
		Initial	20mΩ MAX.	10	mΩ	6.18	6.64	5.77	0.29	Pass
		After testing	-			6.43	6.96	5.53	0.44	-
		ΔR	Δ20mΩ MAX.			0.24	1.19	-0.67	0.57	Pass
	Electrical discontinuity									
		Spec: No electrical discontinuity greater than 1μs shall occur.								
		After testing	-	10	-	No abnormality			Pass	
	Appearance									
		Spec: No abnormality adversely affecting the performance shall occur.								
		Initial	No abnormality	10	-	No abnormality			Pass	
		After testing				No abnormality			Pass	
	20572-001R-08									
	Contact resistance of main contact									
		Initial	20mΩ MAX.	10	mΩ	9.76	11.12	8.02	1.02	Pass
		After testing	-			10.08	10.94	8.23	0.76	-
		ΔR	Δ20mΩ MAX.			0.32	1.60	-0.89	0.90	Pass
	Contact resistance of Ground contact									
		Initial	20mΩ MAX.	10	mΩ	5.19	6.16	4.69	0.45	Pass
	After testing	-	5.97			6.76	5.20	0.52	-	
	ΔR	Δ20mΩ MAX.	0.78			1.44	-0.34	0.48	Pass	
Electrical discontinuity										
	Spec: No electrical discontinuity greater than 1μs shall occur.									
	After testing	-	10	-	No abnormality			Pass		
Appearance										
	Spec: No abnormality adversely affecting the performance shall occur.									
	Initial	No abnormality	10	-	No abnormality			Pass		
	After testing				No abnormality			Pass		

Table 2-4

Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement
	Measurements								
J	Shock								
	20565-001R-13								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	7.87	8.7	7.1	0.61	Pass
	After testing	-			8.38	8.9	7.9	0.39	-
	ΔR	Δ20mΩ MAX.			0.51	0.9	-0.5	0.45	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.09	6.9	5.7	0.44	Pass
	After testing	-			6.64	6.9	6.5	0.17	-
	ΔR	Δ20mΩ MAX.			0.55	1.0	-0.1	0.40	Pass
	Electrical discontinuity								
	Spec: No electrical discontinuity greater than 1μs shall occur.								
	After testing	-	10	-	No abnormality			Pass	
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality			Pass	
	After testing				No abnormality			Pass	
	20572-001R-08								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	9.63	10.7	9.0	0.55	Pass
	After testing	-			10.10	10.7	9.3	0.54	-
	ΔR	Δ20mΩ MAX.			0.46	1.2	-0.1	0.41	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	5.98	7.0	5.2	0.47	Pass
	After testing	-			6.46	7.3	5.5	0.72	-
	ΔR	Δ20mΩ MAX.			0.48	2.1	-0.6	0.79	Pass
	Electrical discontinuity								
	Spec: No electrical discontinuity greater than 1μs shall occur.								
	After testing	-	10	-	No abnormality			Pass	
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality			Pass	
	After testing				No abnormality			Pass	

Table 2-5

Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement		
	Measurements										
K	Thermal shock										
	20565-001R-13										
	Contact resistance of main contact										
		Initial	20mΩ MAX.	10	mΩ	8.62	9.5	7.9	0.49	Pass	
		After testing	-			8.21	9.1	6.9	0.72	-	
		ΔR	Δ20mΩ MAX.			-0.41	0.4	-1.9	0.63	Pass	
	Contact resistance of Ground contact										
		Initial	20mΩ MAX.	10	mΩ	6.03	6.9	5.7	0.32	Pass	
		After testing	-			6.42	6.9	6.1	0.25	-	
		ΔR	Δ20mΩ MAX.			0.39	0.8	-0.2	0.31	Pass	
	Insulation residence										
		Initial	500MΩ MIN.	10	MΩ	10,000MΩ MIN.			Pass		
		After testing	100MΩ MIN.			10,000MΩ MIN.			Pass		
	Appearance										
		Spec: No abnormality adversely affecting the performance shall occur.									
		Initial	No abnormality	10	-	No abnormality			Pass		
		After testing				No abnormality			Pass		
	K	20572-001R-08									
		Contact resistance of main contact									
			Initial	20mΩ MAX.	10	mΩ	9.18	10.3	8.2	0.63	Pass
			After testing	-			9.25	10.7	7.8	0.94	-
			ΔR	Δ20mΩ MAX.			0.06	2.5	-1.9	1.19	Pass
		Contact resistance of Ground contact									
		Initial	20mΩ MAX.	10	mΩ	6.08	6.8	5.7	0.33	Pass	
		After testing	-			6.74	7.3	6.0	0.42	-	
		ΔR	Δ20mΩ MAX.			0.66	1.3	0.1	0.35	Pass	
Insulation residence											
		Initial	500MΩ MIN.	10	MΩ	10,000MΩ MIN.			Pass		
		After testing	100MΩ MIN.			10,000MΩ MIN.			Pass		
Appearance											
		Spec: No abnormality adversely affecting the performance shall occur.									
		Initial	No abnormality	10	-	No abnormality			Pass		
		After testing				No abnormality			Pass		

Table 2-6

Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement
	Measurements								
L	High temperature life								
	20565-001R-13								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	8.06	9.0	7.2	0.66	Pass
	After testing	-			8.38	9.1	6.7	0.76	-
	ΔR	Δ20mΩ MAX.			0.32	1.4	-1.1	0.86	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.59	7.7	5.3	0.59	Pass
	After testing	-			6.73	7.6	6.2	0.37	-
	ΔR	Δ20mΩ MAX.			0.14	1.3	-0.3	0.46	Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass
	20572-001R-08								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	9.35	11.4	8.4	0.89	Pass
	After testing	-			9.19	10.4	7.2	0.96	-
	ΔR	Δ20mΩ MAX.			-0.15	1.0	-2.3	1.07	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	5.83	6.7	5.4	0.37	Pass
	After testing	-			6.65	7.5	5.8	0.51	-
	ΔR	Δ20mΩ MAX.			0.83	1.7	0.2	0.53	Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass

Table 2-7

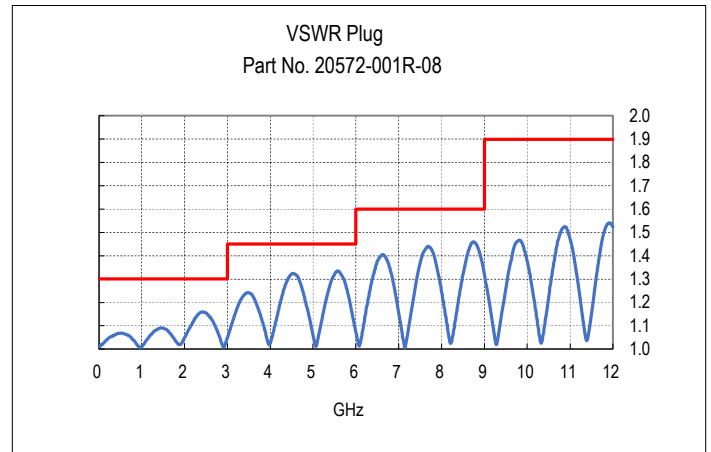
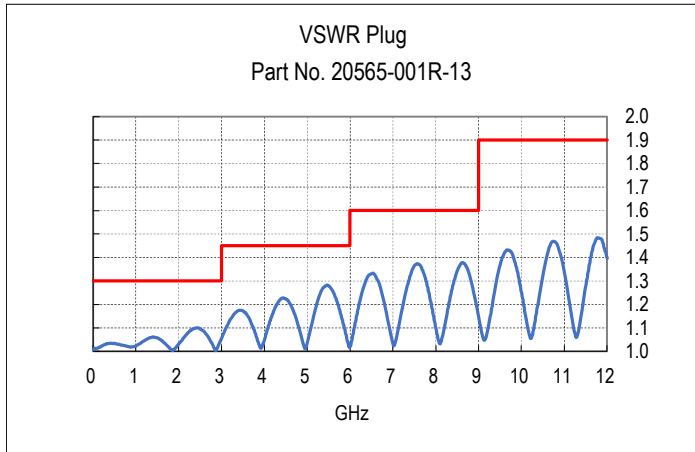
Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement
	Measurements								
M	Humidity (Steady State)								
	20565-001R-13								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	9.00	10.0	7.6	0.80	Pass
	After testing	-			8.54	10.0	7.1	0.98	-
	ΔR	Δ20mΩ MAX.			-0.46	1.4	-2.1	1.04	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.73	7.3	6.4	0.30	Pass
	After testing	-			5.79	6.3	5.1	0.42	-
	ΔR	Δ20mΩ MAX.			-0.93	-0.3	-1.8	0.48	Pass
	Insulation residence								
	Initial	500MΩ MIN.	10	MΩ	10,000MΩ MIN.				Pass
	After testing	100MΩ MIN.			10,000MΩ MIN.				Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass
	20572-001R-08								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	9.67	10.4	8.0	0.74	Pass
	After testing	-			9.58	11.1	8.6	0.96	-
	ΔR	Δ20mΩ MAX.			-0.10	0.9	-1.3	0.75	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.46	6.9	5.4	0.48	Pass
	After testing	-			4.79	6.6	3.7	0.89	-
	ΔR	Δ20mΩ MAX.			-1.68	-0.2	-3.1	0.88	Pass
	Insulation residence								
	Initial	500MΩ MIN.	10	MΩ	10,000MΩ MIN.				Pass
	After testing	100MΩ MIN.			10,000MΩ MIN.				Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass

Table 2-8

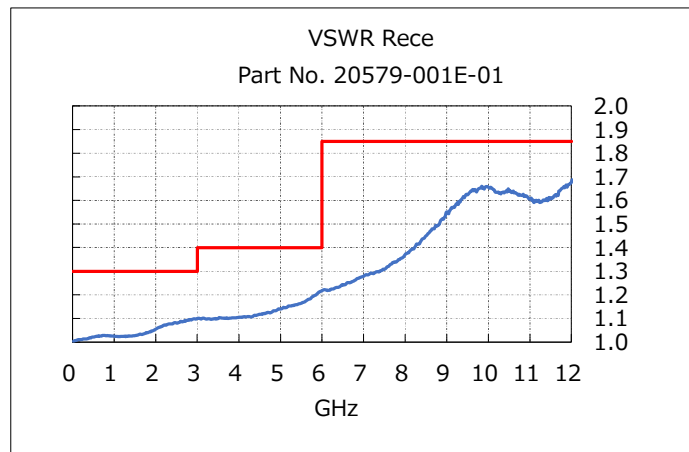
Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement
	Measurements								
N	Saltwater spray								
	20565-001R-13								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	7.64	8.0	7.3	0.25	Pass
	After testing	-			8.27	9.0	7.3	0.69	-
	ΔR	Δ20mΩ MAX.			0.63	1.4	-0.5	0.67	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.12	6.7	5.5	0.41	Pass
	After testing	-			6.47	7.0	5.2	0.47	-
	ΔR	Δ20mΩ MAX.			0.36	1.2	-0.6	0.62	Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass
	20572-001R-08								
	Contact resistance of main contact								
	Initial	20mΩ MAX.	10	mΩ	9.46	10.9	8.5	0.87	Pass
	After testing	-			9.86	10.9	8.6	0.88	-
	ΔR	Δ20mΩ MAX.			0.39	2.4	-0.6	1.07	Pass
	Contact resistance of Ground contact								
	Initial	20mΩ MAX.	10	mΩ	6.14	7.0	5.7	0.40	Pass
	After testing	-			6.85	7.4	6.2	0.42	-
	ΔR	Δ20mΩ MAX.			0.71	1.5	-0.7	0.65	Pass
	Appearance								
	Spec: No abnormality adversely affecting the performance shall occur.								
	Initial	No abnormality	10	-	No abnormality				Pass
	After testing				No abnormality				Pass

Table 2-9

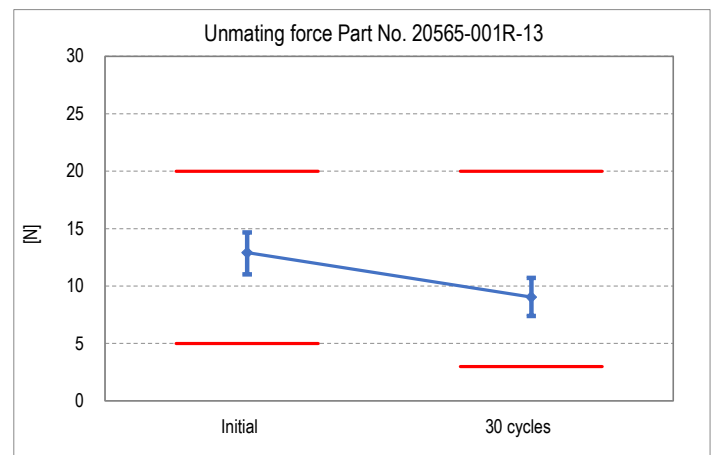
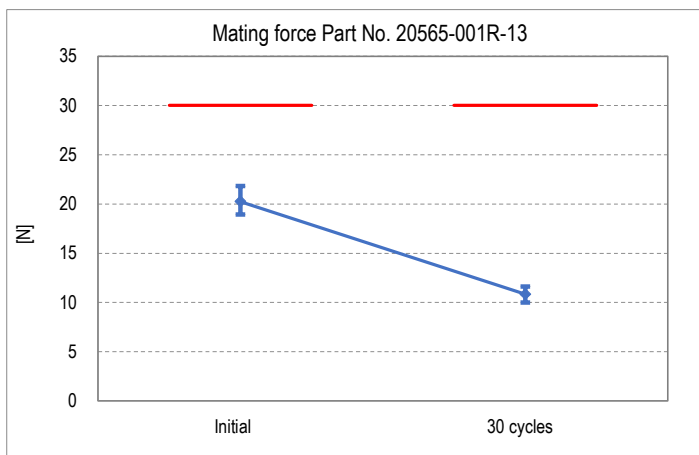
Group	Test items	Specification	n	Unit	AVE.	MAX.	MIN.	S	Judgement		
	Measurements										
P	H2S gas										
	20565-001R-13										
	Contact resistance of main contact										
		Initial	20mΩ MAX.	10	mΩ	8.09	9.7	6.7	0.97	Pass	
		After testing	-			8.52	9.6	7.5	0.77	-	
		ΔR	Δ20mΩ MAX.			0.43	1.4	-0.7	0.66	Pass	
	Contact resistance of Ground contact										
		Initial	20mΩ MAX.	10	mΩ	6.15	7.0	5.5	0.39	Pass	
		After testing	-			6.52	7.6	5.5	0.73	-	
		ΔR	Δ20mΩ MAX.			0.37	2.0	-0.9	0.95	Pass	
	Appearance										
		Spec: No abnormality adversely affecting the performance shall occur.									
		Initial	No abnormality	10	-	No abnormality			Pass		
		After testing				No abnormality			Pass		
		20572-001R-08									
		Contact resistance of main contact									
			Initial	20mΩ MAX.	10	mΩ	9.34	10.0	8.3	0.62	Pass
			After testing	-			9.11	10.2	8.1	0.63	-
			ΔR	Δ20mΩ MAX.			-0.23	1.1	-1.8	0.88	Pass
		Contact resistance of Ground contact									
			Initial	20mΩ MAX.	10	mΩ	5.68	6.3	5.2	0.36	Pass
			After testing	-			5.78	6.4	5.4	0.26	-
			ΔR	Δ20mΩ MAX.			0.10	0.8	-0.6	0.46	Pass
		Appearance									
		Spec: No abnormality adversely affecting the performance shall occur.									
		Initial	No abnormality	10	-	No abnormality			Pass		
		After testing				No abnormality			Pass		
Q		Solder ability									
			Spec: More than 95% of the dipped surface shall be evenly wet.								
		After testing	-	10	-	No abnormality			Pass		
R		Reflow soldering heat resistance									
		Appearance									
			Spec: No abnormality adversely affecting the performance shall occur.								
		After testing	-	10	-	No abnormality			Pass		



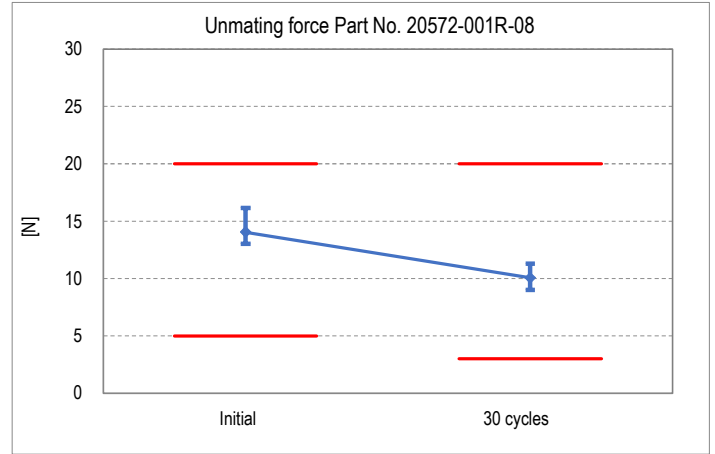
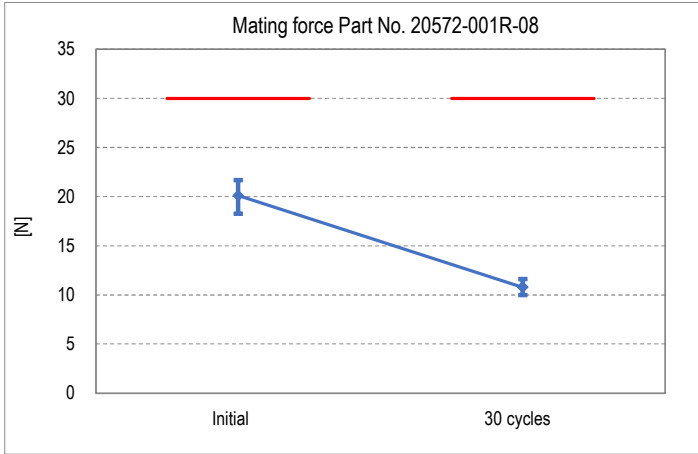
Graph 1



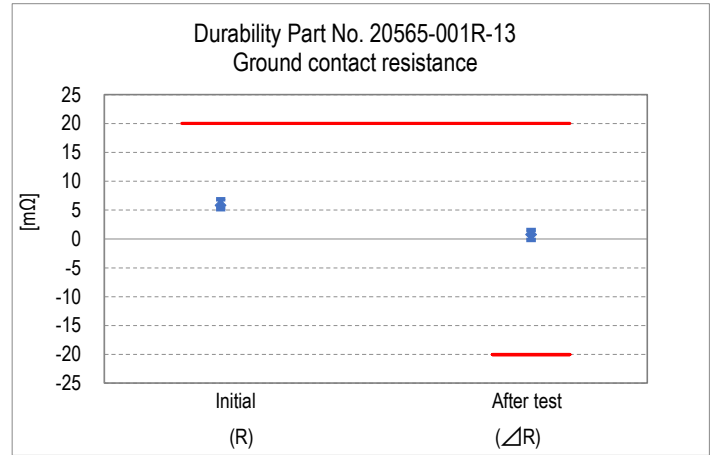
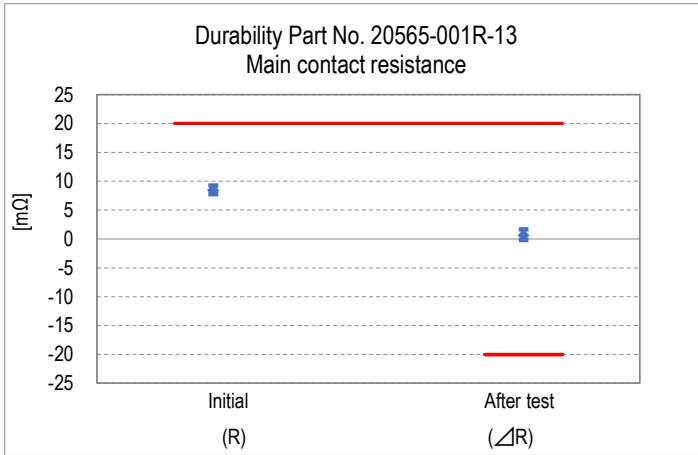
Graph 2



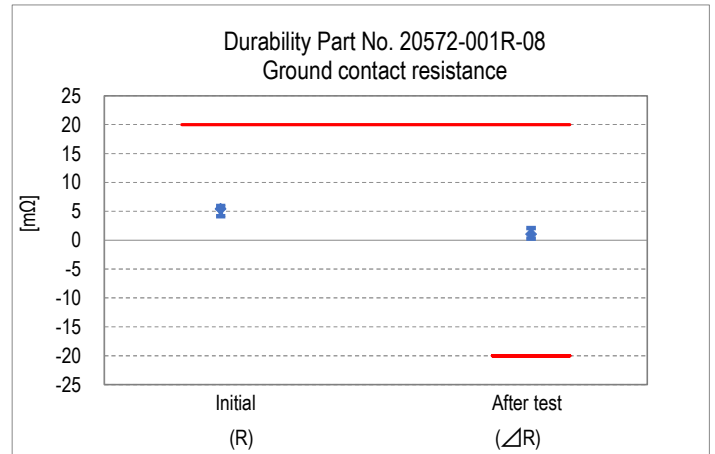
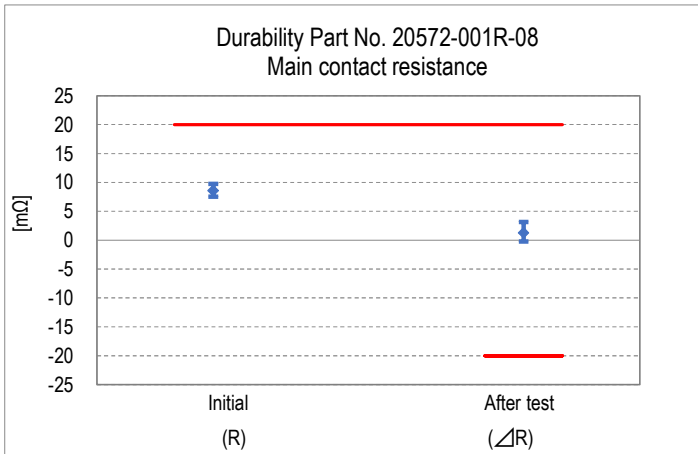
Graph 3



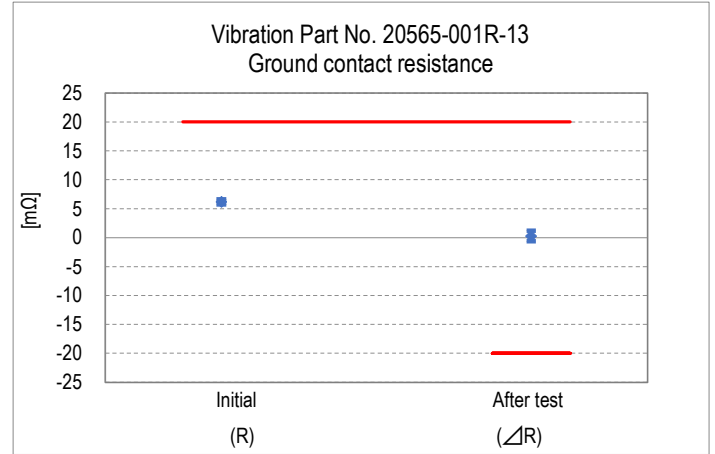
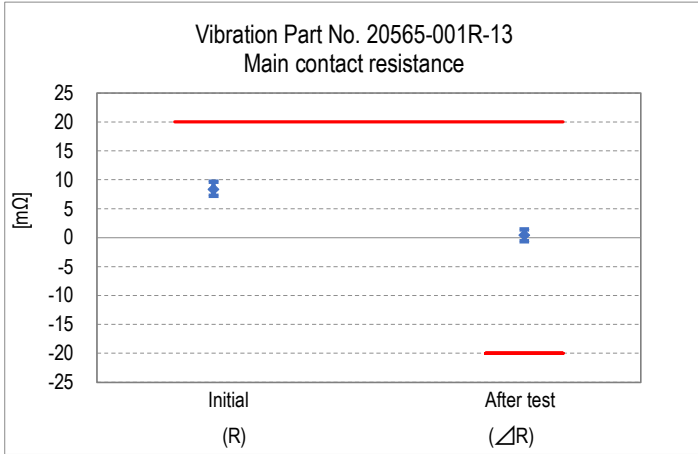
Graph 4



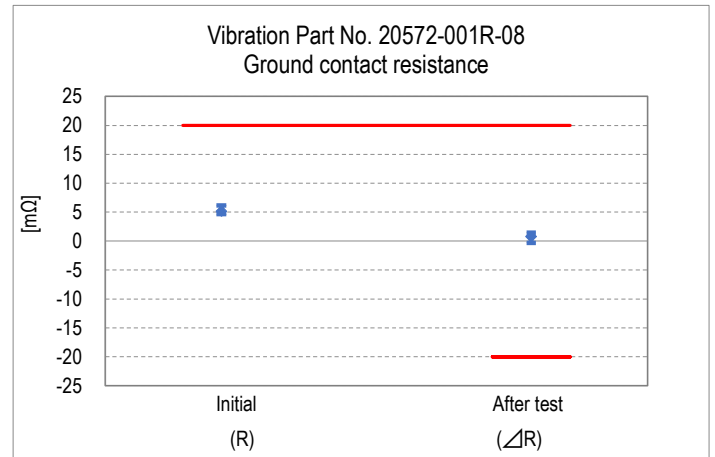
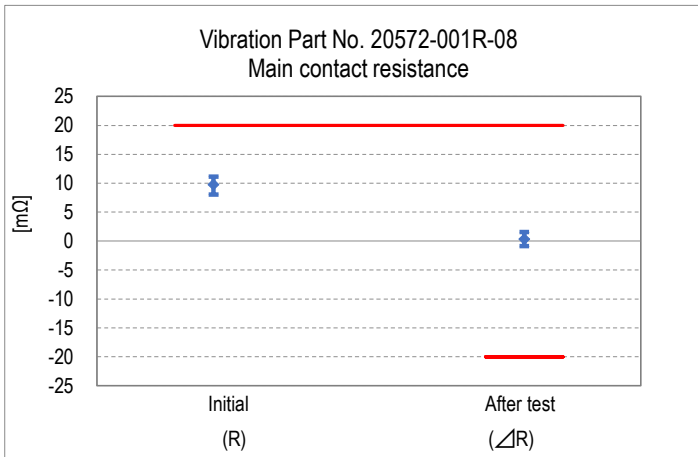
Graph 5



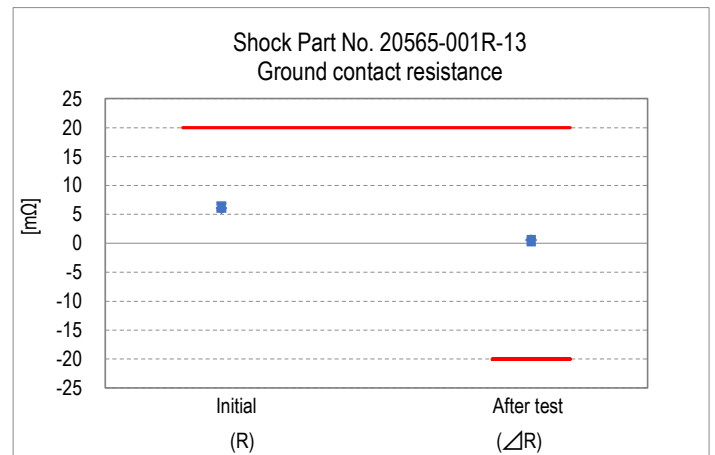
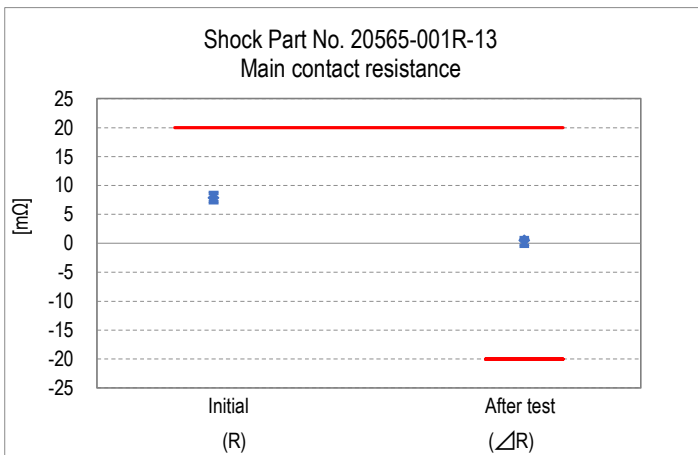
Graph 6



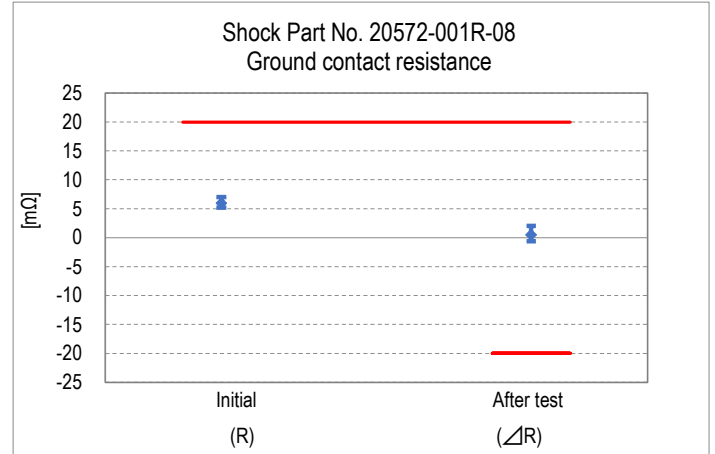
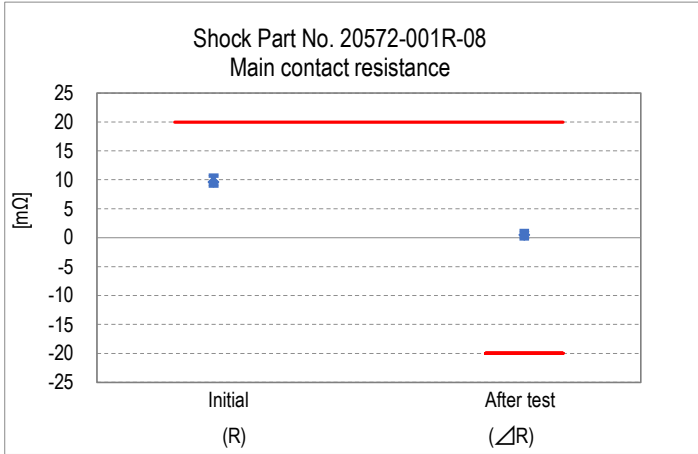
Graph 7



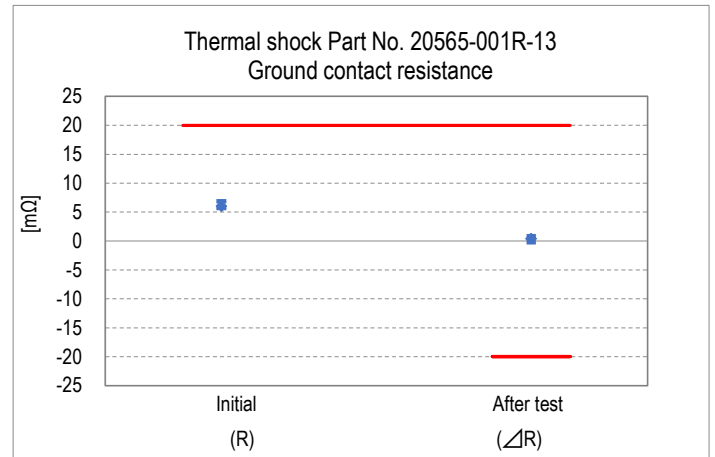
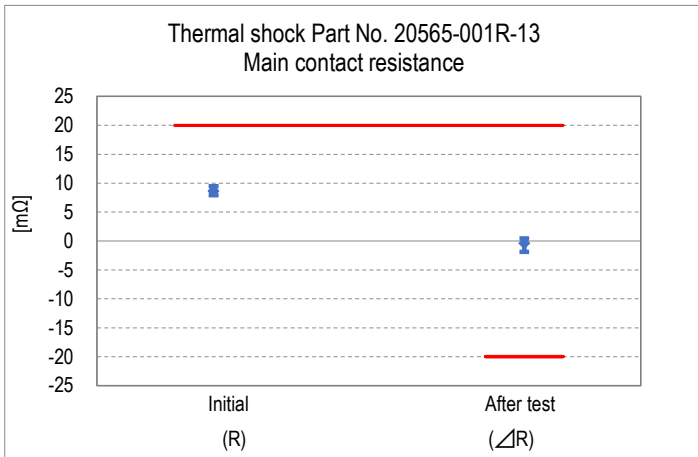
Graph 8



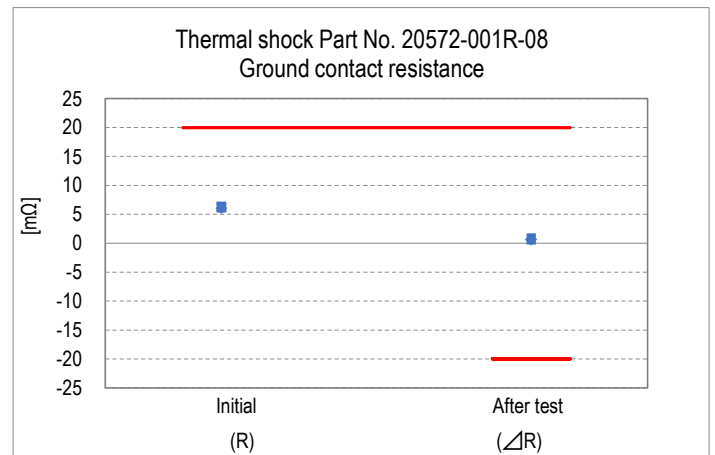
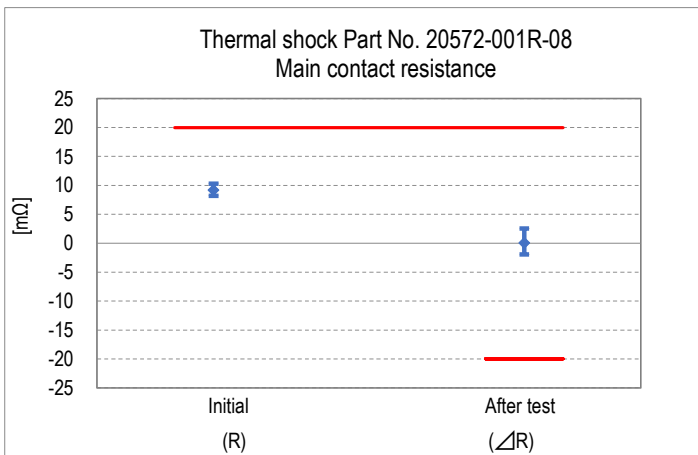
Graph 9



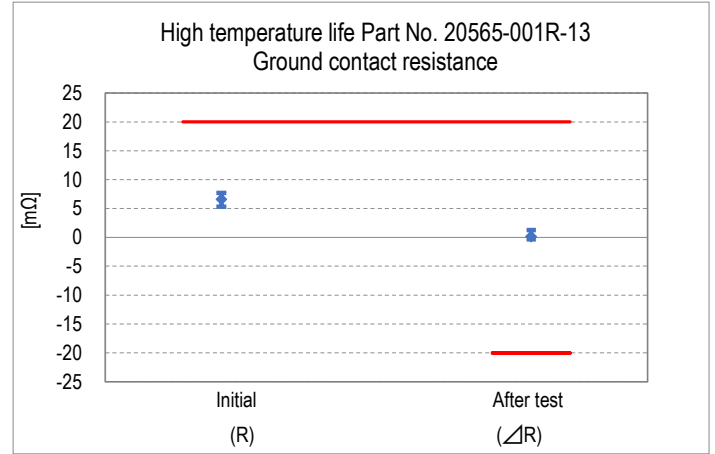
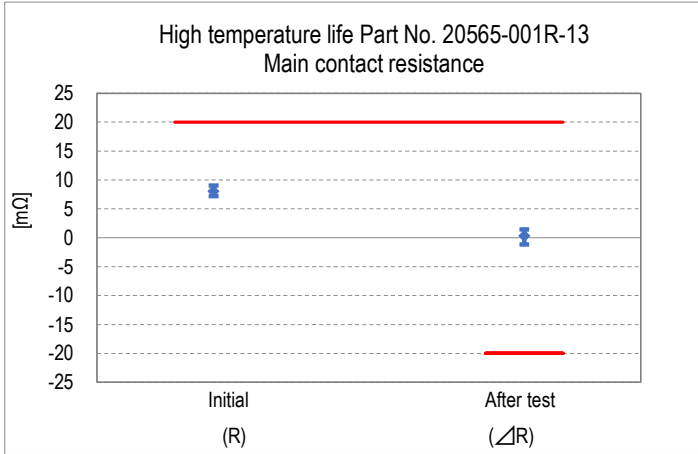
Graph 10



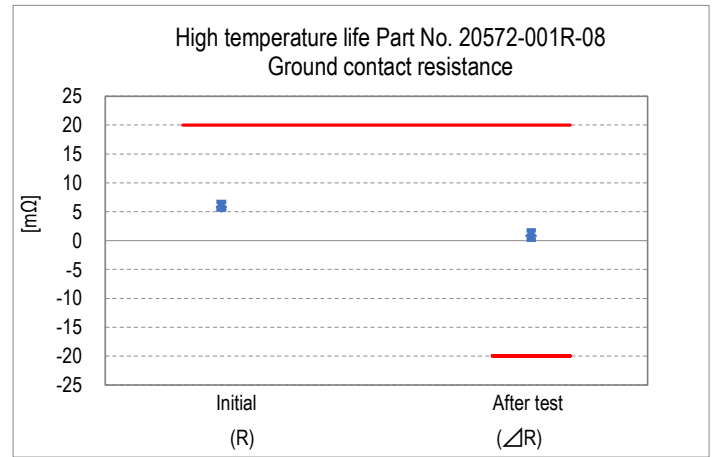
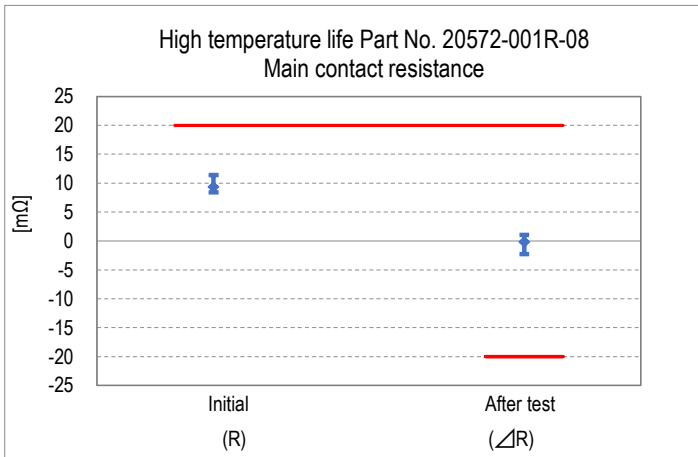
Graph 11



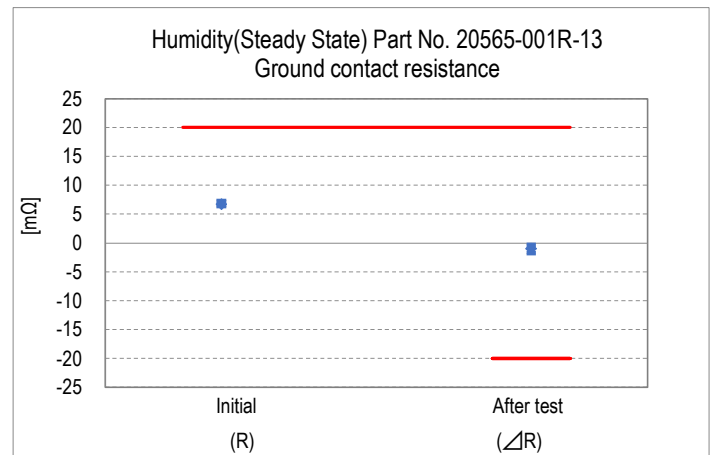
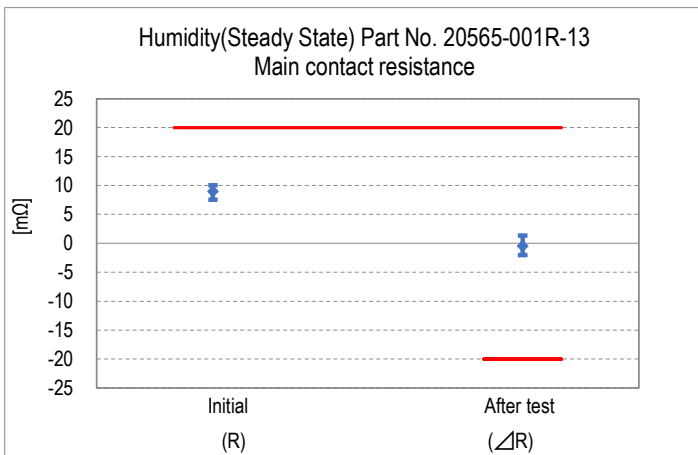
Graph 12



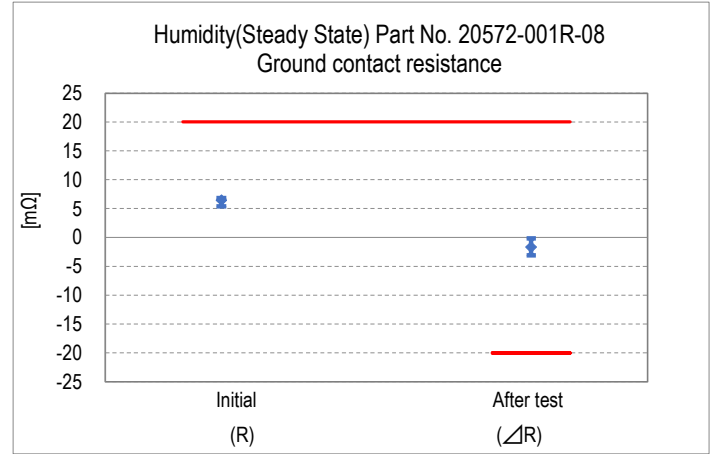
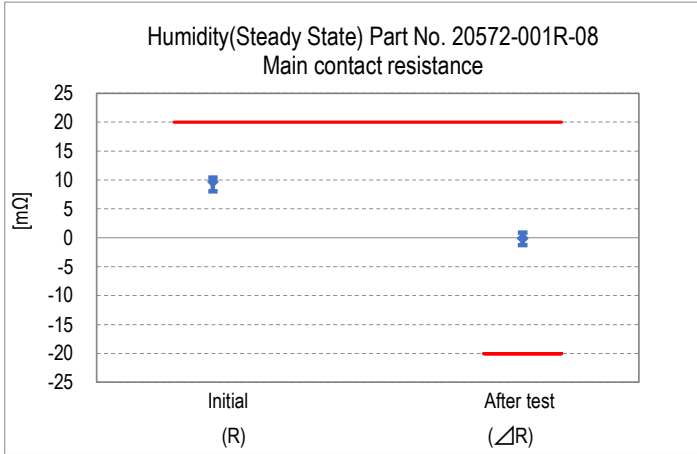
Graph 13



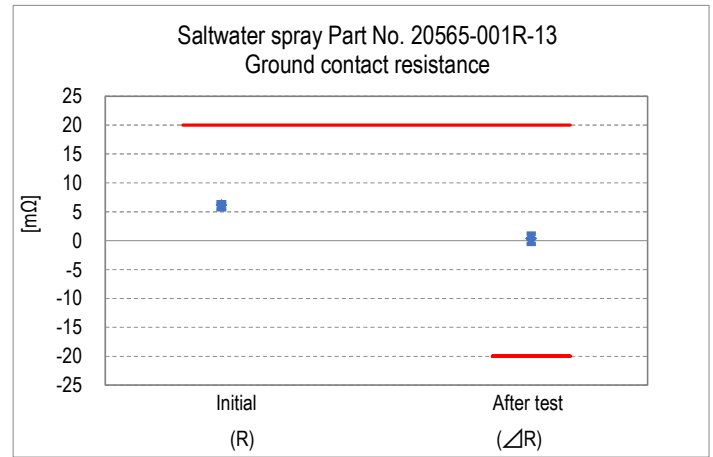
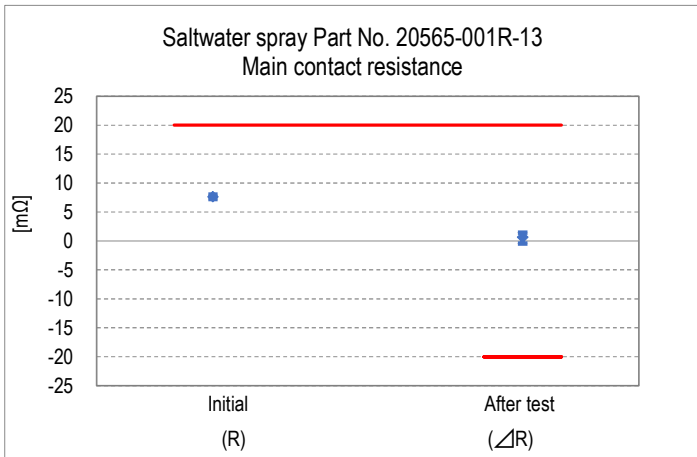
Graph 14



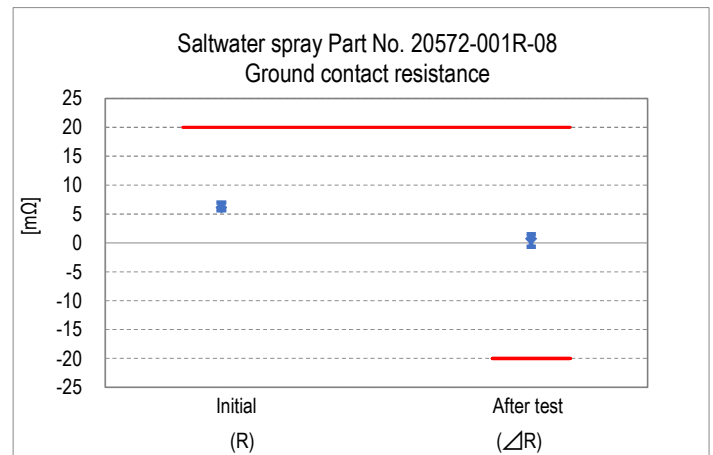
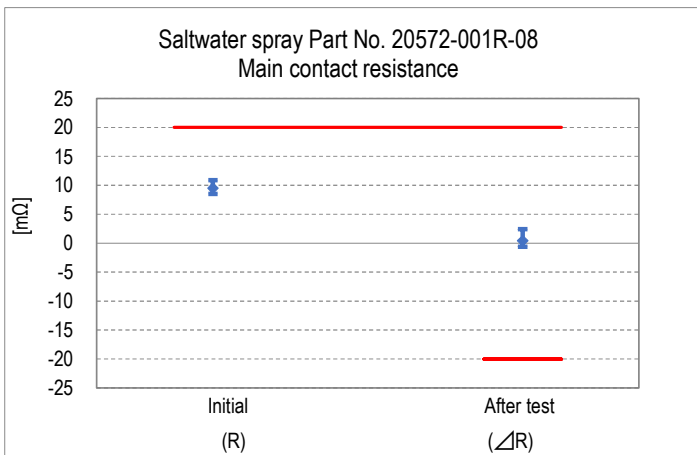
Graph 15



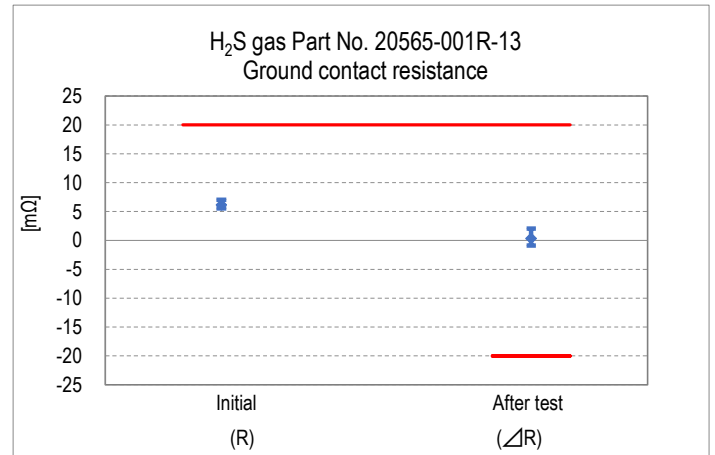
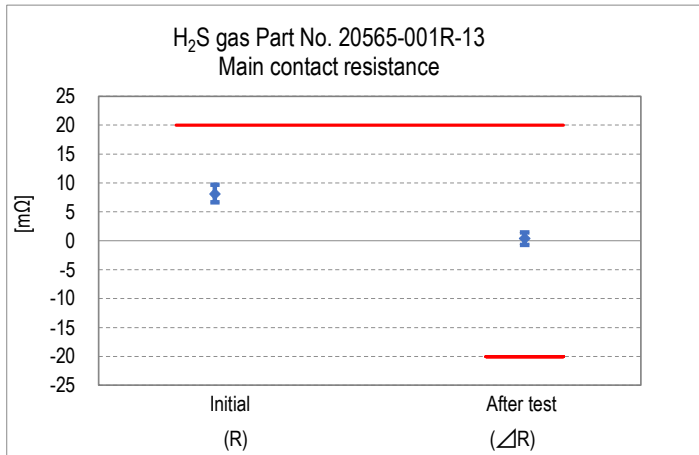
Graph 16



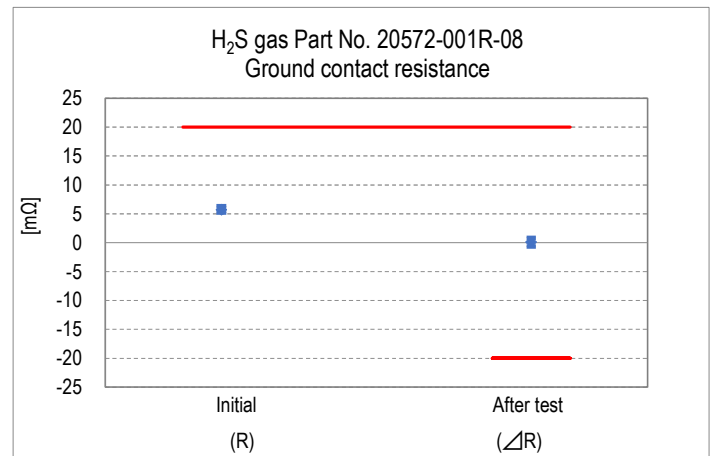
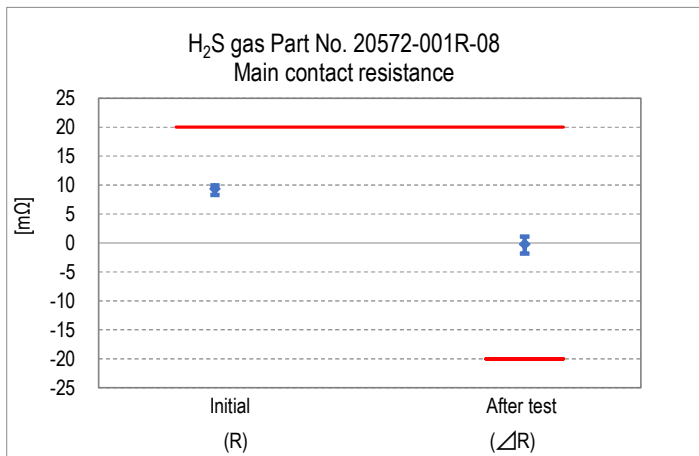
Graph 17



Graph 18



Graph 19



Graph 20