501-61095

Validation Test Report

LOW PROFILE POWER 2P CONNECTOR

June 10, 2014.

Tested & Reported By	Reviewed By	Approved By	Test Date	From May 14, 2014 To June 05, 2014
			Classification	Unrestricted

TE Korea Engineering Validation and Reliability Test Center

TE CONNECTIVITY RELIABILITY TEST REPORT

Test Name : Validation for LOW PROFILE POWER 2P CONNECTOR.

1. Introduction

1-1 Purpose

Testing was performed on the LOW PROFILE POWER 2P CONNECTOR to determine if it conformance to the requirements of Product Specification 108-61208, Rev.A

1-2 Scope

This report covers the electrical, mechanical, environmental performance requirements of the LOW PROFILE POWER 2P CONNECTOR.
The testing was performed between May 14, 2014 and June 05, 2014.

1-3 Test Samples

The test samples were randomly selected from normal current production lots.

P/N	Description
2108744-1	LOW PROFILE POWER 2P HDR ASSY
2108742-1	LOW PROFILE POWER 2P PLUG
2108743-1	LOW PROFILE POWER 2P TPA
1744201-1	CONTACT, LANCELESS, STD ECONOMY POWER II
1744144-1	CONTACT, LANCELESS, STD ECONOMY POWER II

1-4 Conclusion

The LOW PROFILE POWER 2P CONNECTOR meets the electrical, mechanical and environmental performance requirements of Product Specification 108-61208, Rev.A

1-5 Attachment

1) Test Sequence
2) Requirements and Test Procedure
3) Test Result
4) Photograph of Test

1) Test Sequence

Test Examination	Test Sequence(a)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Examination of Product	1,3	1,4	1,3	1	1,3	1,4	1,7	1,7	1,5	1,4	1,4	1,4	1,4	1,5	1,3	1,3	1,3
Termination Resistance (Low Level)							2,4 ,6	2,6	2,4	2,5	2,5	2,5	2,5	2,4			
Dielectric withstanding voltage						3											
Insulation Resistance						2											
Temperature Rising					2												
Vibration(Low Frequency)							5										
Physical Shock							3										
Connector Mating Force								3									
Connector Unmating Force								4									
Connector Locking Strength			2														
Contact Insertion Force				2													
Contact Retention Force						5											
Contact Mating Force		2															
Contact Unmating Force		3															
Crimp Tensile Strength	2																
Durability (Repeated Mate/Unmating)								5									
Post Retention Force																2	
Solderability															2		
Humidity-Temperature																	
Resistance to Soldering Heat																	2
Thermal Shock									3								
Salt Spray										3							
H_2S Gas													3				
Temperature Life (Heat Aging)											3						
Resistance to Cold												3					
Resistance to Ammonia														3			

Test Examination	Test Sequence(a)																
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Examination of Product	1,4																
Termination Resistance (Low Level)	2,5																
Dielectric withstanding voltage	7																
Insulation Resistance	6																
Temperature Rising																	
Vibration(Low Frequency)																	
Physical Shock																	
Connector Mating Force																	
Connector Unmating Force																	
Connector Locking Strength																	
Contact Insertion Force																	
Contact Retention Force																	
Contact Mating Force																	
Contact Unmating Force																	
Crimp Tensile Strength	3																
Durability (Repeated Mate/Unmating)																	
Post Retention Force																	
Solderability																	
Humidity-Temperature	3																
Resistance to Soldering Heat																	
Thermal Shock																	
Salt Spray																	
H_2S Gas																	
Temperature Life (Heat Aging)																	
Resistance to Cold																	
Resistance to Ammonia																	

2) Requirements and Test Procedure

Para.	Test Items	Requirements	Procedures
3.5.1	Examination of Product	Meets requirements of product drawing and AMP Specification 114-13265	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
	Electrical Requirements		
3.5.2	Termination Resistance (Low Level)	10 mΩ Max. (Initial) 20 mΩ Max. (Final)	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. See Figure 4.
3.5.3	Dielectric withstanding Voltage	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 1500 volts AC at sea level. Test between adjacent contacts. Leakage current at 5.0 milliamps.
3.5.4	Insulation Resistance	1000 MΩ Min. (Initial) 500 MΩ Min. (Final)	EIA-364-21. 500 volts DC, 2 minute hold. Test between adjacent contacts.
	Mechanical Requirements		
3.5.6	Crimp Tensile Strength	Wire Size AWG: Crimp Tensile N(kgf) Min. #22: 44.5 (4.5) #20: 62.3(6.3) #18: 75.6(7.7) #16: 100(10.2)	EIA-364-8. Determine crimp tensile at a rate of 25.4 mm per minute.
3.5.7	Post Retention Force	29.4N (3.0 kgf) Min.	Measure post retention force. Operation Speed: 100mm/min
3.5.8	Contact Retention Force	1. with TPA : 29.4N(5.0kgf)Min. 2. without TPA : 29.4N(3.0kgf)Min.	EIA-364-29B Apply axial load at a rate of 4.4 N per second and hold for 6 seconds.

Para.	Test Items	Requirements	Procedures
3.5.9.	Contact Insertion Force	6.9N (700g) Max. per contact	EIA-364-5. Measure force necessary to insert a contact into the housing at a maximum rate of 12.7mm [0.5 in.] per minute.
3.5.10	Connector Mating Force	19.6 N [2.0 Kgf] Max.	EIA-364-13. Measure force necessary to mate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
3.5.11	Connector Unmating Force	3.92 N [0.4Kgf] Min.	EIA-364-13. Measure force necessary to unmate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
3.5.12	Durability (Repeated Mate/ Unmating)	20 mΩ Max. (Final)	No. of Cycles : 50 cycles. AMP Spec. 109-5213
3.5.13	Vibration (Low Frequency)	No Electrical Discontinuity greater than 1 μ sec. shall occur.	EIA-364-28, Test Condition VII, Condition Letter D. Subject mated specimens to 3.10 G's
		20 mΩ Max. (Final)	rms between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
3.5.14	Physical Shock	No electrical discontinuity greater than 1 μ sec. Shall occur. Final 20 mΩ Max.	EIA-364-27, Condition H. Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
3.5.15	Solderability	Wet Solder Coverage: 95% Min.	Solder Temperature: 230 ± 5℃ Immersion Duration: 3±0.5 seconds Flux: Alpha100 AMP Spec. 109-5203
3.5.16	Connector Locking Strength	2 Pos : 49 N (5.0kgf)Min.	EIA-364-98. Measure connector locking strength at a maximum rate of 12.7mm [0.5 in.] per minute.

3.5.17	Contact Mating Force	9.8 N (1 .0kgf)Max.	EIA-364-13. Measure force necessary to mate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
3.5.18	Contact Unmating Force	Initial 1.96N (0.2Kgf) Min. After 50 Cycle 0.9 N (0.09 Kgf) Min.	EIA-364-13. Measure force necessary to unmate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
3.5.19	Resistance to Cold	20 mΩ Max. (Final)	Mated connector - 30±3℃, 96 hours AMP Spec. 109-5108-3
3.5.20	Thermal Shock	20 mΩ Max. (Final)	EIA-364-32, Test Condition VII. Subject specimens to 10 cycles between – 25° C and 105°C with 30 minute dwells at temperature extremes.
3.5.21	Humidity-Temperature	Insulation resistance (Final) 500 MΩ Min. Termination resistance 20 mΩ Max. (Final) Dielectric withstanding Voltage: No creeping discharge nor flashover shall occur.	EIA-364-31, Method III. Subject specimens to 10 cycles (10 days) between 25° and 65° C at 80 to 100% RH.

Para.	Test Items	Requirements	Procedures
3.5.22	Salt Spray	20 mΩ Max. (Final)	EIA-364-26. Subject mated specimens to 5% salt concentration for 48 hours.
3.5.23	Resistance to Soldering Heat	No physical damage shall occur.	Test connector on PCB. Solder Temperature: 260±5℃ Immersion Duration: 5±0.5 sec. AMP Spec. 109-5204 Condition A
3.5.24	H_2S	20 mΩ Max. (Final)	Mated connector H_2S Gas: 3±1ppm, 40±2℃, 96hours
3.5.25	Temperature Life (Heat Aging)	20 mΩ Max. (Final)	EIA-364-17, Method A, Test Condition 4, Test Time Condition C. Subject mated specimens to 105° C for 500 hours.
3.5.28	Resistance to Ammonia	20 mΩ Max. (Final)	Subject mated specimens to 3% ammonia solution for 7 hours

3) Test Result

- Test Group 1

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result									Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Crimp Tensile Strength	Initial	Rec	10.2 kgf Min.	kgf	#16	16.83	13.11	15.73	18.12	15.24	13.11	18.12	15.81	OK
				7.7 kgf Min.		#18	10.85	12.32	12.00	12.73	11.89	10.85	12.73	11.96	OK
				6.3 kgf Min.		#20	9.46	8.95	9.77	10.11	9.65	8.95	10.11	9.59	OK
				4.5 kgf Min.		#22	5.83	5.85	6.18	6.70	6.42	5.83	6.70	6.20	OK

- Test Group 2

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result									Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Contact Mating Force	Initial	1 kgf Max.		kgf	-	0.55	0.57	0.57	0.56	0.56	0.55	0.57	0.56	OK
3	Contact Un-Mating Force	Initial	1st	0.2 kgf Min.			0.55	0.58	0.55	0.54	0.57	0.54	0.58	0.56	OK
			50th	0.1 kgf Min.			0.48	0.45	0.48	0.49	0.46	0.45	0.49	0.47	OK

- *Test Group 3*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Connector Locking Strength	Initial	5 kgf Min.	kgf	-	10.93	10.96	11.26	10.99	11.21	10.93	11.26	11.07	OK

- *Test Group 4*

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result								Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP		-	-	OK	OK	OK	OK	OK	-	-	-	OK
2	Contact Insertion Force	Initial	Rec	0.7 kgf Max.	kgf	-	0.62	0.52	0.54	0.58	0.55	0.52	0.62	0.56	OK

- Test Group 5

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Temperature Rising	Initial	Δ 30 ℃ Max. AWG16 : 12A AWG18 : 11A AWG20 : 10A AWG22 : 9A	℃	#16	20.1	23.3	22.1	21.0	22.7	20.1	23.3	21.8	OK
					#18	20.6	24.0	23.6	23.0	25.6	20.6	25.6	23.4	OK
					#20	25.7	21.0	23.9	21.4	23.8	21.0	25.7	23.2	OK
					#22	22.0	24.9	20.4	21.9	22.2	20.4	24.9	22.3	OK

- Test Group 6

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result									Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Insulation Resistance	Initial	1000MΩ Min.		GΩ	-	11.70	9.67	10.10	10.30	11.40	9.67	11.70	10.63	OK
3	Dielectric withstanding Voltage		One minute hold with no breakdown or flashover. Current Leakage : 5mA Max.		μA	-	29	26	25	24	25	24	29	26	OK
4	Contact Retention Force		With TPA	5 kgf Min.	kgf	-	10.03	10.69	10.52	10.79	9.98	9.98	10.79	10.40	OK
			Without TPA	3 kgf Min.			5.20	5.08	5.07	5.18	5.11	5.07	5.20	5.13	OK

- Test Group 7

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.61	1.75	1.54	1.60	1.57	1.66	1.75	1.61	OK
		After Physical Shock	20 mΩ Max.			1.69	1.75	1.62	1.71	1.68	1.62	1.75	1.69	OK
		After Vibration				1.76	1.74	1.69	1.81	1.78	1.69	1.81	1.76	OK
3	physical shock	Initial	No electrical discontinuity greater than 1μ sec. Shall occur.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
4	Vibration (Low Frequency)	Initial	No electrical discontinuity greater than 1μ sec. Shall occur.	-	-	OK	OK	OK	OK	OK	-	-	-	OK

- *Test Group 8*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.64	1.72	1.63	1.65	1.66	1.63	1.72	1.66	OK
		After Durability	20 mΩ Max.			2.35	2.07	2.19	2.24	2.21	2.07	2.35	2.21	OK
3	Connector Mating Force	Initial	2 kgf Max.	kgf	-	1.44	1.27	1.32	1.47	1.34	1.27	1.47	1.37	OK
4	Connector Un-Mating Force	Initial	0.4 kgf Min.			0.98	1.05	1.01	0.97	0.98	0.97	1.05	1.00	OK

- *Test Group 9*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.50	1.69	1.54	1.69	1.61	1.50	1.69	1.61	OK
		After Thermal Shock	20 mΩ Max.			1.60	1.73	1.62	1.72	1.65	1.60	1.73	1.66	OK

- *Test Group 10*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.55	1.59	1.50	1.56	1.52	1.50	1.59	1.54	OK
		After Salt Spray	20 mΩ Max.			1.62	1.61	1.60	1.77	1.57	1.57	1.77	1.63	OK

- *Test Group 11*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.60	1.62	1.60	1.50	1.61	1.50	1.62	1.59	OK
		After Temperature Life	20 mΩ Max.			1.73	1.77	1.75	1.78	1.81	1.73	1.81	1.77	OK

- *Test Group 12*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.66	1.64	1.57	1.56	1.58	1.56	1.66	1.60	OK
		After Cold	20 mΩ Max.			1.69	1.70	1.72	1.68	1.65	1.65	1.72	1.69	OK

- *Test Group 13*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.51	1.55	1.54	1.52	1.54	1.51	1.55	1.53	OK
		After H2S	20 mΩ Max.			1.66	1.64	1.70	1.68	1.64	1.64	1.70	1.66	OK

- *Test Group 14*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.54	1.57	1.50	1.52	1.56	1.50	1.57	1.54	OK
		After Ammonia	20 mΩ Max.			1.68	1.72	1.69	1.64	1.74	1.64	1.74	1.69	OK

- *Test Group 15*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Solderability	Initial	Wet Solder Coverage: 95%	-	-	OK	OK	OK	OK	OK	-	-	-	OK

- *Test Group 16*

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	Meets requirements of product drawing and AMP	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Post Retention Force	Initial	2 kgf Min.	kgf	-	4.99	5.39	5.42	4.93	5.22	4.93	5.42	5.19	OK

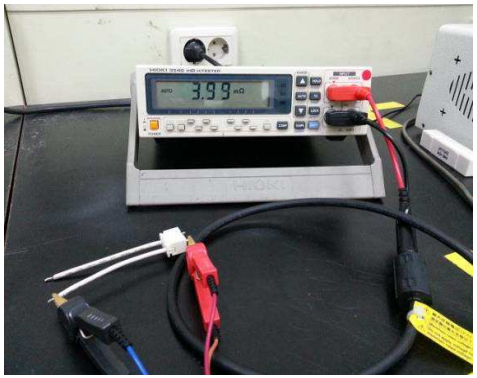
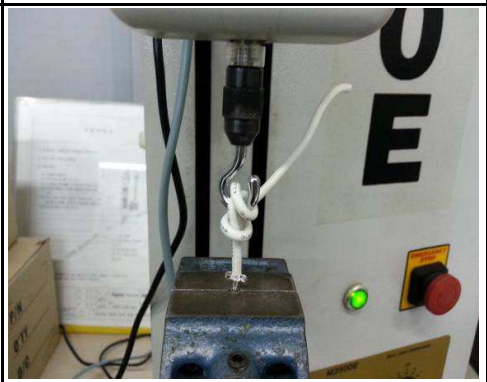
- *Test Group 17*

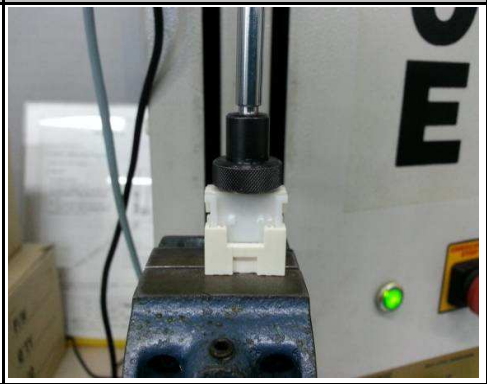
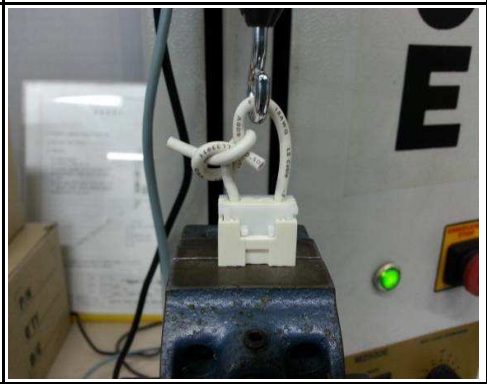
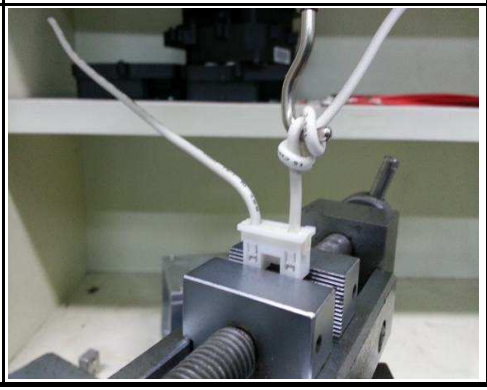
NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Resistance to Soldering Heat	Initial	No physical damage shall occur.	-	-	OK	OK	OK	OK	OK	-	-	-	OK

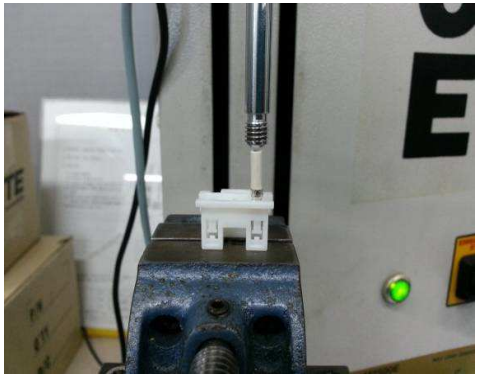
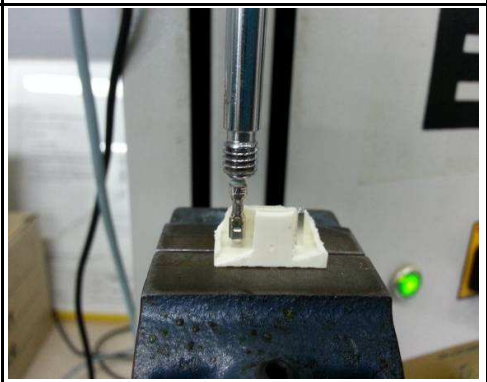
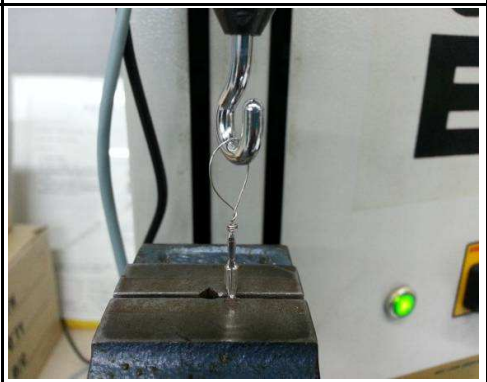
- Test Group 18

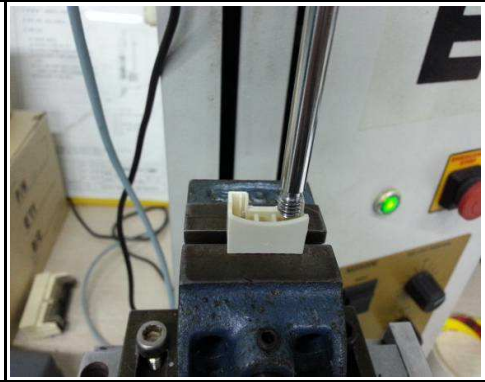
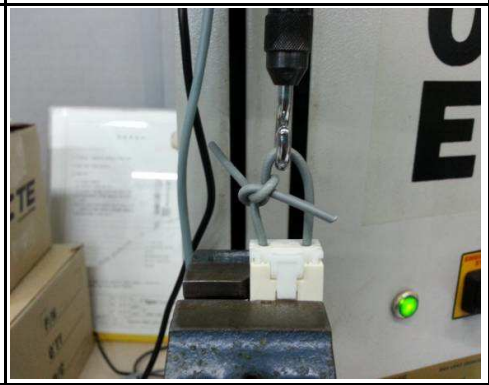
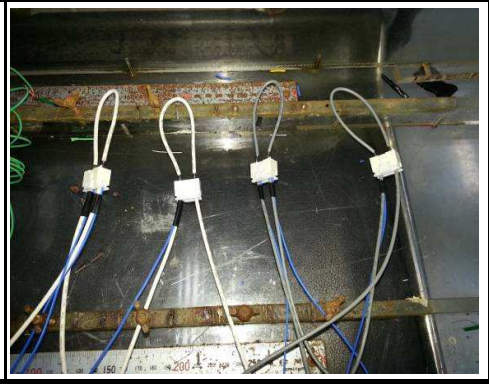
NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	1.59	1.60	1.58	1.54	1.55	1.54	1.60	1.57	OK
		After Humidity-temperature	20 mΩ Max.			1.64	1.71	1.73	1.77	1.69	1.64	1.77	1.71	OK
3	Insulation Resistance	After Humidity-temperature	500MΩ Min.	GΩ	-	8.99	8.88	8.12	8.68	8.97	8.12	8.99	8.73	OK
4	Dielectric withstanding Voltage		No creeping discharge nor flashover shall occur Current Leakage : 5mA Max.	μA	-	22	25	27	26	24	22	27	25	OK

4) Photograph of Test

NO.	Test Items	Photograph	Remark
1	Termination Resistance (Low Level)		-
2	Insulation Resistance / Dielectric Withstanding Voltage		-
3	Crimp Tensile Strength		-

NO.	Test Items	Photograph	Remark
4	Connector Mating Force		-
5	Connector Unmating Force		-
6	Contact Retention Force		-

NO.	Test Items	Photograph	Remark
7	Contact Insertion Force		-
8	Contact Mating Force		-
9	Contact Unamting Force		-

NO.	Test Items	Photograph	Remark
10	Post Retention Force		-
11	Connector Locking Strength		-
12	Temperature Rising		-

NO.	Test Items	Photograph	Remark
13	Salt Spray		-
14	Thermal Shock		-
15	Temperature Life		-

NO.	Test Items	Photograph	Remark
16	Resistance to Cold		-
17	Vibration/Physical Shock		-
18	Humidity Temperature		-