Medusa Power Cable Verification Test Specification

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Medusa Power cable to determine its conformance to the requirements of Product Specification 108-152000 and customer special request during their audit in TE.

1.2. Scope

This report covers the electrical, mechanical of Medusa Power cable. Testing was performed at the TE Connectivity Shanghai Testing Laboratory between 26 Sep 2014 and 06 Nov 2014.

1.3. Conclusion

The Medusa Power cable conformed to the electrical, mechanical performance requirements of Product Specification 108-152000 Revision 05.

1.4. Test Specimens

Medusa cable assembly PN: 2820303-2.
Include CCJ silver plating conn. Part Number: 2204040-1.
MBXLE gold plating conn, Part Number: 1-1892903-2.
8AWG Red wire PN: 1760457-5,8AWG black wire: 1760457-4.

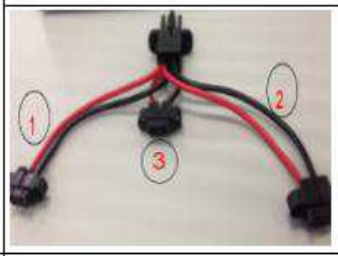
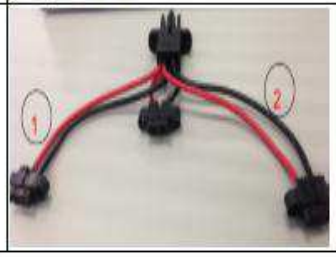
1.5. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 25±10°C
- Relative Humidity: 50±25% RH

| Indicates Change

1.6. Qualification Test Sequence:

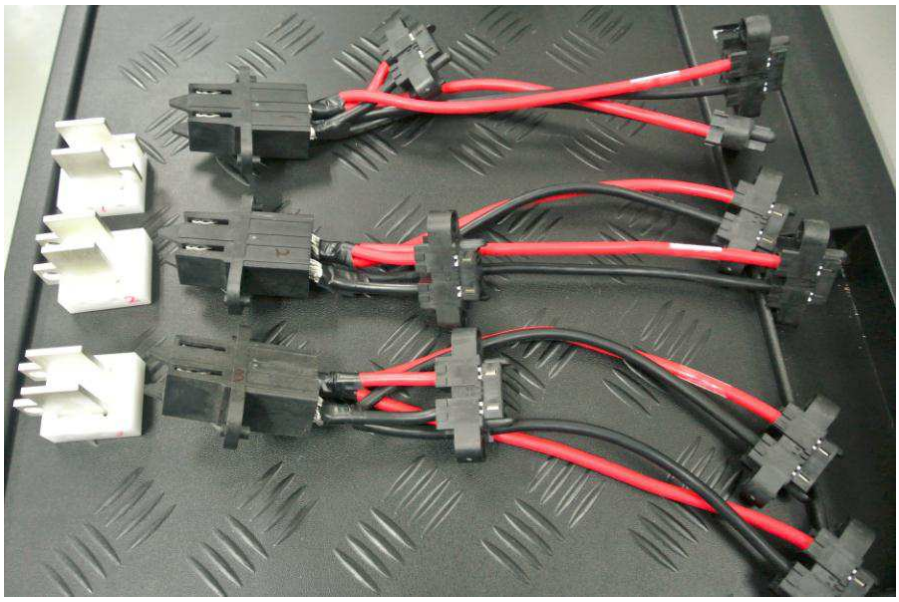
NO.	Test Item	(a) Test sequence Merge Group 3&4	Test samples qty and required	
1	Examination of Product	1,9	3pcs	
2	Temperature rise vs current & Contact Resistance	3	2pcs (all 3 Multibeams connected--six cables) 20A increments with contact resistance measured at each increment along with temperature.	1pcs (2 Multibeams connected-four cables) 20A increments with contact resistance measured at each increment along with temperature
				
3	Mating force &un-mating	2, 7	3pcs	
4	Durability (every 10cycles need measure contact resistance)	4(b)	3pcs 50 cycles, measuring contact resistance after every 10 cycles. (10, 20, 30, 40, 50)	
5	Vibration, random.	5	3pcs	
6	Mechanical shock.	6	3pcs	
7	Contact retention, straight pull.	8	3pcs Pull the contacts out of the bus bar clip housing one at a time and record the force profile	

Note: **(a) Numbers indicate sequence in which tests are performed.**
(b) Measure contact resistance after every 10 cycles up to 50.

2. SUMMARY OF TESTING

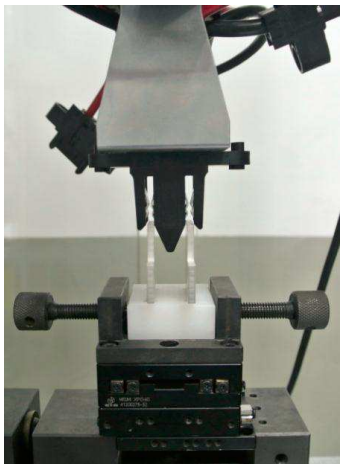
2.1. Initial Examination of Product - All Test Groups

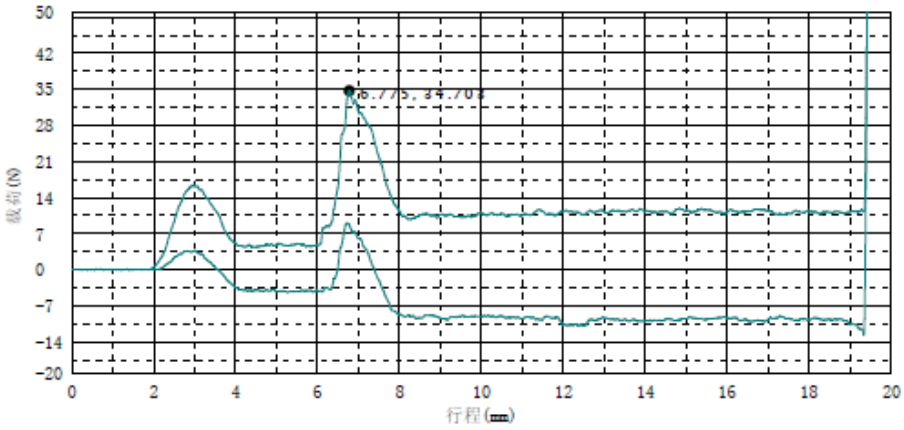
Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.



2.2. Mating and un-mating force.

a) Test pictures.





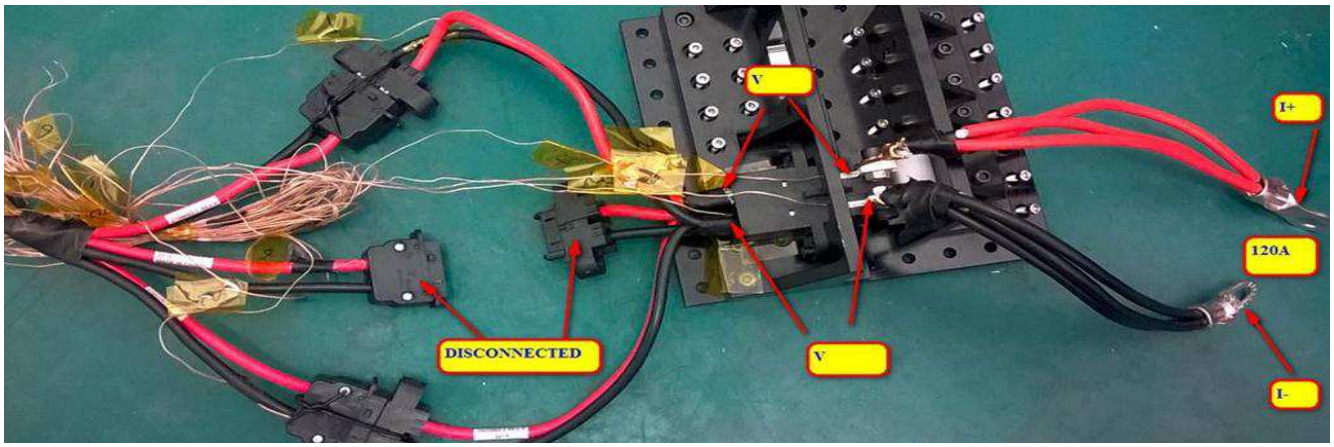
b) Test result.

Meet specification Mating force: 50N maximum. Un-mating force: 2.5 N minimum.

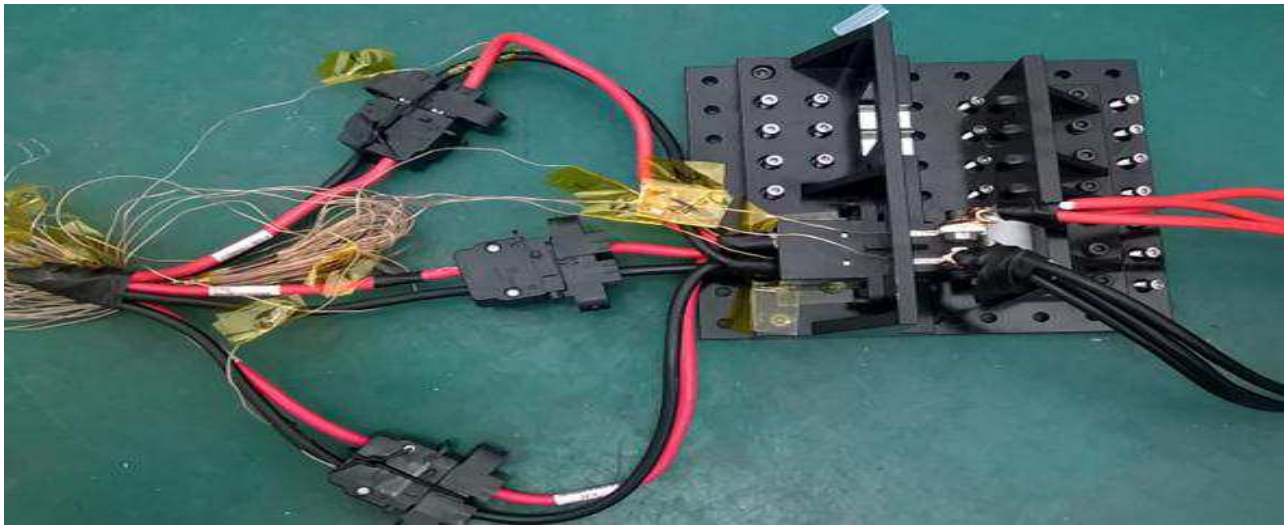
Unit: N	Mating Force	Un-mating Force
Sample 1#	38.81	11.83
Sample 2#	34.70	12.63
Sample 3#	39.81	16.20
Max	39.81	16.20
Min	34.70	11.83
Ave	37.77	13.55

2.3. Contact Resistance.

a) Test pictures.
Customer special requested to connect four cables, the connecting as below:



Six cables connected as below:



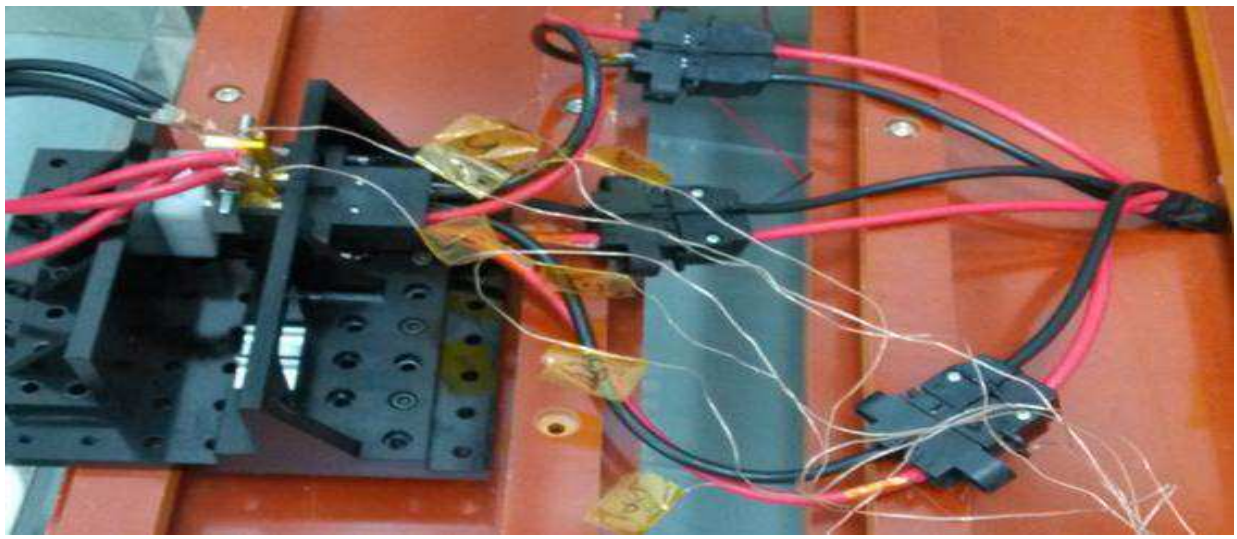
b) Test results.
Meet specification 0.5mΩ maximum.

Unit: mohm	Sample 1#		
Pin	100A current Six Cables	120A current Six Cables	120A current Four Cables
Busbar 1-Red	0.082	0.086	0.087
Busbar 2-Black	0.086	0.087	0.092

Unit: mohm Pin	Sample 2# Six Cables	Sample 3# Six Cables	Sample 2# Six Cables	Sample 3# Six Cables	Sample 2# Six Cables	Sample 3# Six Cables
	20A current		40A current		60A current	
Busbar1-Red	0.077	0.074	0.074	0.071	0.072	0.073
Busbar2-Black	0.064	0.077	0.065	0.074	0.067	0.074
Max	0.077		0.074		0.074	
Min	0.064		0.065		0.067	
Ave	0.073		0.071		0.072	
	80A current		100A current		120A current	
Busbar1-Red	0.070	0.074	0.070	0.078	0.071	0.075
Busbar2-Black	0.065	0.074	0.065	0.078	0.067	0.079
Max	0.074		0.078		0.079	
Min	0.065		0.065		0.067	
Ave	0.071		0.073		0.073	

2.4. Temperature rise vs current.

a) Test pictures.
The temperature detected points as below.



b) Test results: meet specification 30°C maximum temperature rise at 120A current in each point.
Notes: TC 1~TC7 means the location show in test picture.
Customer special requested to connect only four cables to check the T-rise sample 1.

Unit: °C.

120A current	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	Max	Min	Ave
Sample 1 Six cables	19.15	19.05	19.75	19.35	11.95	21.25	10.85	21.25	10.85	17.34
Sample 1 Four cables	21.40	22.00	23.95	23.75	28.65	8.65	28.55	28.65	8.65	22.42
Sample 1 Four cables After 50cycles durability	20.05	20.75	22.85	22.55	26.75	7.85	27.05	27.05	7.85	21.12

Current	#	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	Max	Min	Ave
20A current	Sample 2 six cables	0.75	0.75	1.8	0.65	0.55	0.35	1.7	1.8	0.35	0.94
	Sample 3 six cables	0.5	0.5	0.45	0.45	0.55	1.3	1.35	1.35	0.45	0.73
40A current	Sample 2 six cables	2.65	2.55	2.75	2.55	1.85	1.5	2.8	2.8	1.5	2.38
	Sample 3 six cables	1.15	2.35	2.2	2.4	2.65	1.55	1.9	2.65	1.15	2.03
60A current	Sample 2 six cables	5.75	5.65	5.9	5.45	3.9	3.15	6.05	6.05	3.15	5.12
	Sample 3 six cables	4.65	4.95	4.65	5.05	5.4	3.15	4.0	5.4	3.15	4.55
80A current	Sample 2 six cables	10.4	9.95	10.65	10.05	7.2	5.25	11.0	11.0	5.25	9.21
	Sample 3 six cables	8.65	9.3	8.7	9.35	10.0	5.6	7.45	10.0	5.6	8.44
100A current	Sample 2 six cables	15.75	15.1	16.15	15.2	10.7	8.2	16.7	16.7	8.2	13.97
	Sample 3 six cables	13.1	14.2	13.25	14.15	15.2	8.2	11.3	15.2	8.2	12.77
120A current	Sample 2 six cables	22.0	20.85	22.55	21.3	14.8	11.15	23.35	23.35	11.15	19.43
	Sample 3 six cables	18.2	20.0	18.65	19.9	21.3	11.5	15.75	21.3	11.5	17.9

2.5. Durability 50 cycles.

In order to shorten the testing time during customer audit, performed 50 cycles durability by manual, only check the Contact Resistance after 50 cycles, sample2&3 check Contact Resistance after every 10 cycles.

No physical damage occurred as a result of mating and un-mating the specimens 50 cycles.

2.6. Contact resistance after durability.

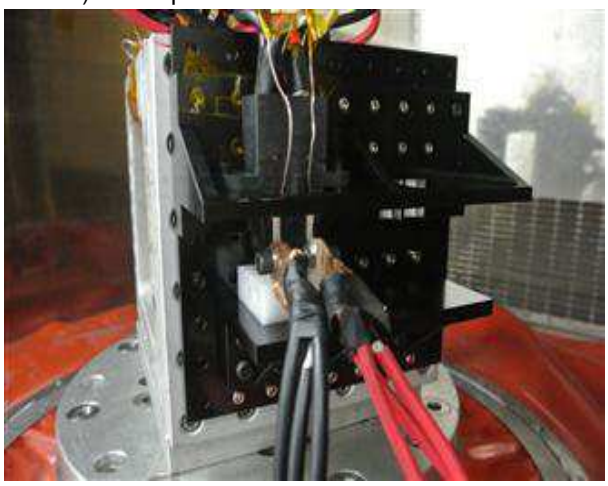
a) Test picture same as above 2.3 tested.
b) Test results: Meet specification 0.5mΩ maximum.

Unit (mohm) / Pin	**Sample 1 Four Cables** after 50cycles durability
Busbar1-Red	0.088
Busbar2-Black	0.097
Max	0.097
Min	0.088
Ave	0.093

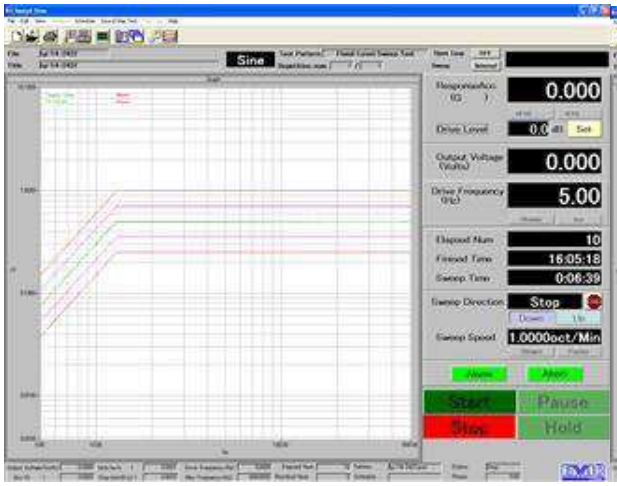
Pin	Sample 2 Six Cables	Sample 3 Six Cables	Sample 2 Six Cables	Sample 3 Six Cables	Sample 2 Six Cables	Sample 3 Six Cables	Sample 2 Six Cables	Sample 3 Six Cables	Sample 2 Six Cables	Sample 3 Six Cables
	after 10cycles durability		after 20cycles durability		after 30cycles durability		after 40cycles durability		after 50cycles durability	
Busbar1-Red	0.065	0.069	0.069	0.08	0.068	0.075	0.067	0.069	0.068	0.071
Busbar2-Black	0.066	0.07	0.066	0.071	0.067	0.07	0.067	0.072	0.068	0.072
Max	0.07		0.08		0.075		0.072		0.072	
Min	0.065		0.066		0.067		0.067		0.068	
Ave	0.068		0.072		0.070		0.069		0.070	

2.7. Vibration test.

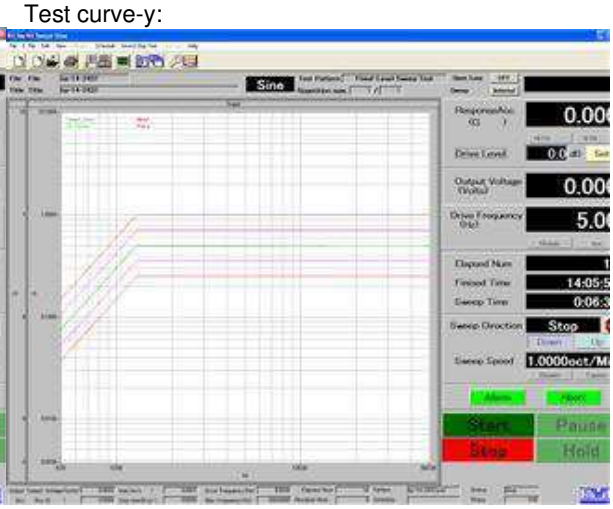
a) Test pictures.



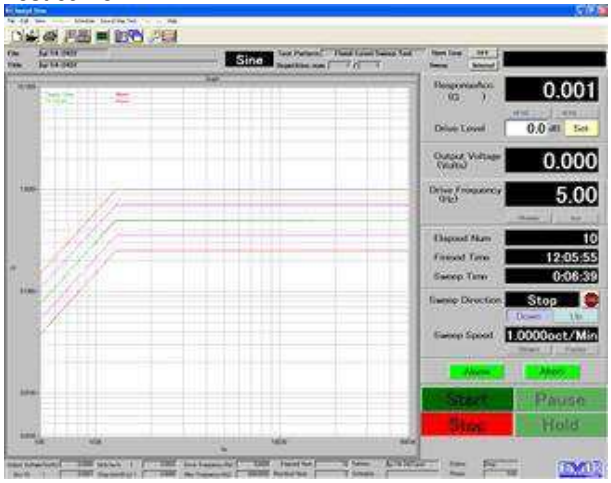
Test curve-x:



Test curve-y:



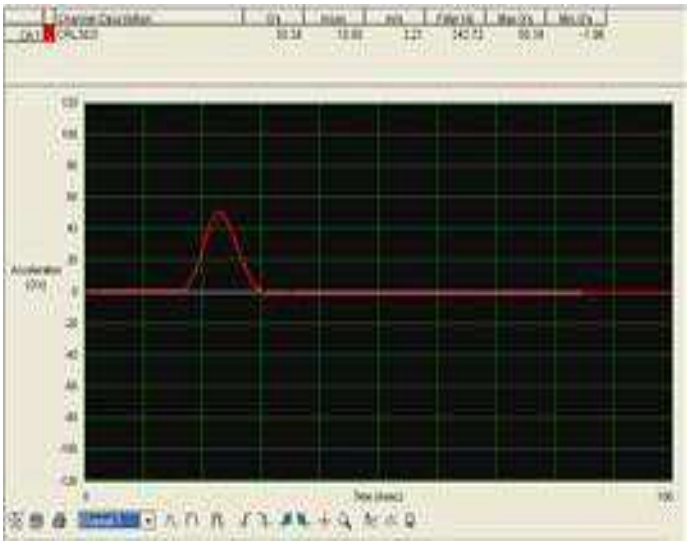
Test curve-z.



b) Test result.
Meet specification, no discontinuities of 1 microsecond or longer duration occurred. Under Condition (Frequency range: 0.5g, 1.5mm amplitude, 5-500 Hz, 10 sweeps @ 1 octave/minute in all orthogonal axes).

2.8. Mechanical shock.

a) Test pictures.

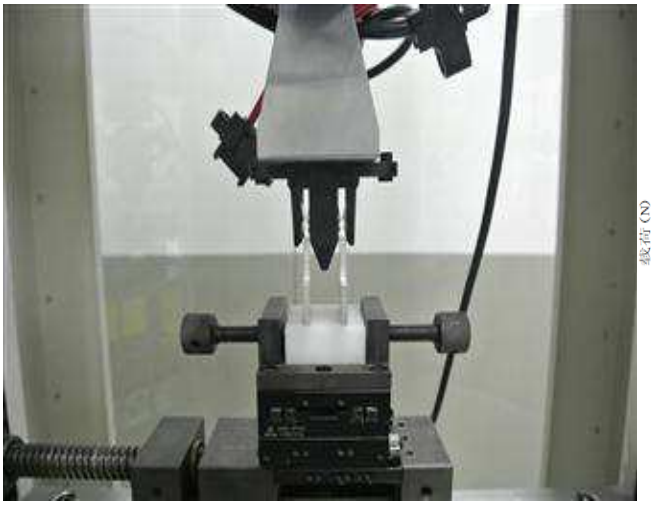


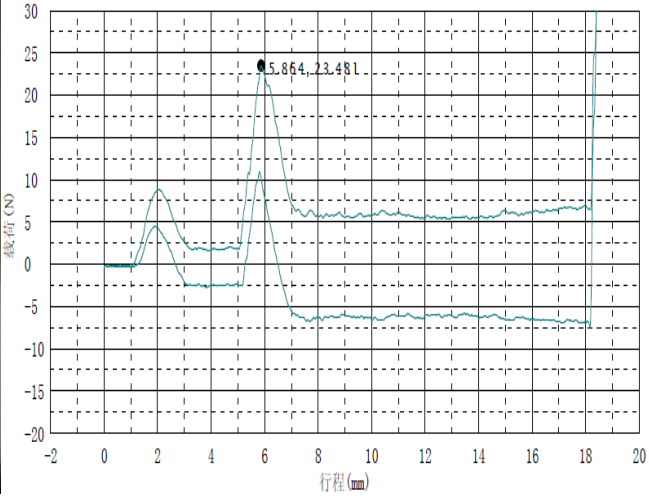
b) Test results.

Meet specification, no discontinuities of 1 microsecond or longer duration occurred. Under Condition A (50g, 11ms, Half sine).

2.9. Mating force &un-mating (Final).

a) Test pictures.





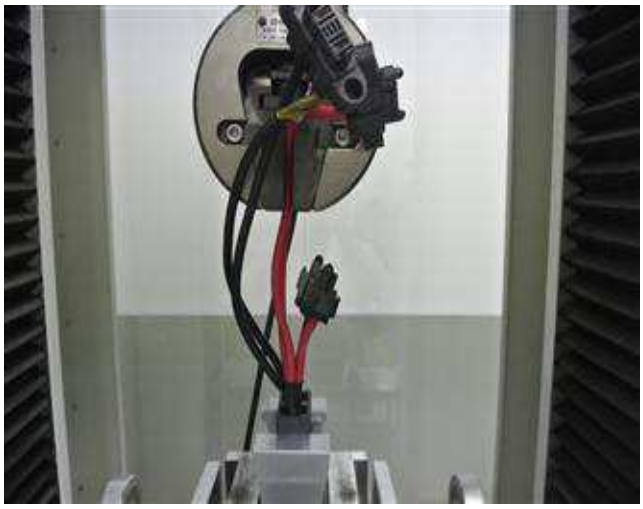
b) Test results.

Meet specification Mating force: 50N maximum. Un-mating force: 2.5 N minimum

Unit: N	Mating Force	Un-mating Force
Sample 1#	30.77	11.88
Sample 2#	23.48	7.52
Sample 3#	24.96	7.65
Max	30.77	11.88
Min	23.48	7.52
Ave	26.4	9.0

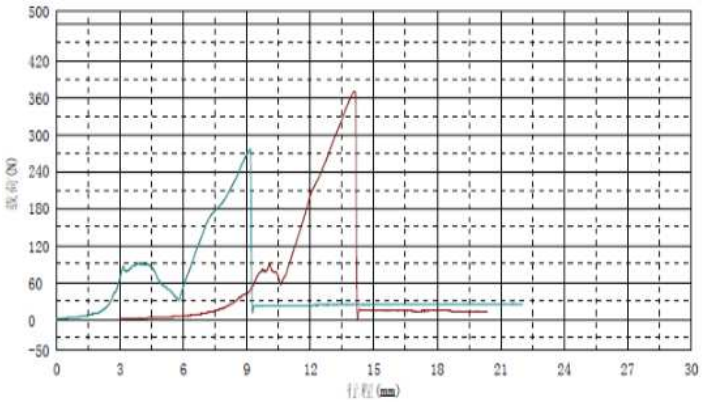
2.10. Contact retention, straight pull to failure.

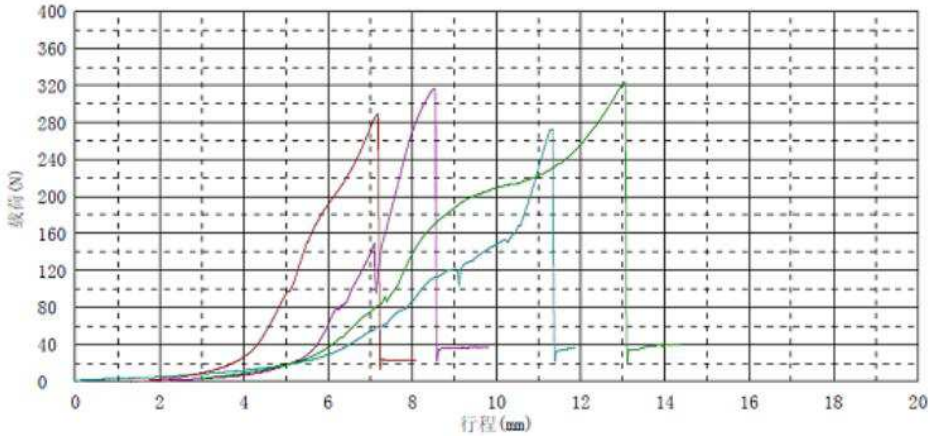
a) Test pictures.



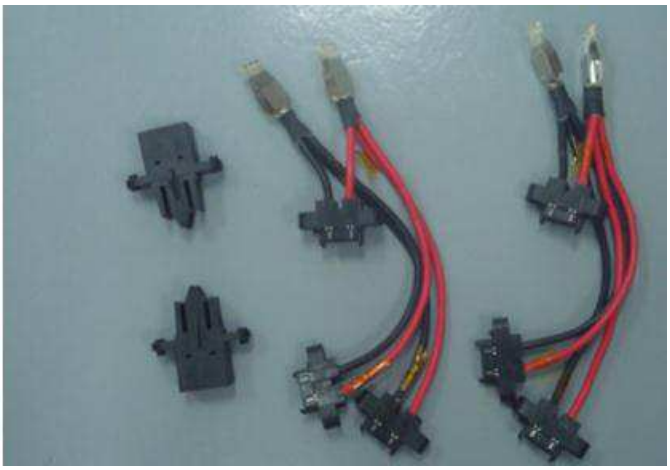
b) Test results: meet specification 136 N (30 lbf) minimum.

Unit:(N)		
Sample	Red	Black
Sample 1	276.50	370.90
Sample 2	273.09	289.15
Sample 3	317.15	323.81
Max.	317.15	370.90
Min.	273.09	289.15





2.11. Final Examination of Product



3. TEST METHODS.

3.1. Initial Examination of Product.

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Mating force &un-mating (initial and final).

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.3. Contact Resistance.

Resistance should be measured after the clip has reached thermal equilibrium, after carrying Rated load at 25°C ambient temperature.

3.4. Temperature rise vs current

Temperature rise were established for specimens with a single circuit energized, current up to 120A. Test the temperature every 20A increments. The temperature is measures after the stabilization period. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C. The specimens were placed in the stable air environment of a temperature rise enclosure. In accordance with EIA-364-70C.

3.5. Durability

Specimens were mated and unmated 50 cycles by maunal. And Measure contact resistance after every 10 cycles up to 50 cycles.

3.6. Vibration

Mated specimens were subjected to a random vibration test, per test condition 0.5g, 1.5mm amplitude, 5-500 Hz, 10 sweeps @ 1 octave/minute in all orthogonal axes. This was performed for 66 minutes in each of 3 mutually perpendicular planes for a total vibration time of 198 minutes. Specimens were monitored for discontinuities of 1 microsecond.

3.7. Mechanical shock.

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond.

3.8. Contact Retention, Straight Pull to failure.

Pull the contacts out of the bus bar clip housing one at a time and record the force profile, pull test speed: 12.7mm/min.

3.9. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.