1. INTRODUCTION

1.1 Purpose

Testing was performed on TE Connectivity Dual-Pole 500A Rack Bus Bar Power Connector to determine its conformance to the requirement of Product Specification.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of Dual-Pole 500A Rack Bus Bar Power Connector. Qualification Test was performed at the China Engineering Center Testing Laboratory between 28 Jun. 2017 and 23 Nov. 2017.

1.3 Conclusion

TE Connectivity Dual-Pole 500A Rack Bus Bar Power Connector conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-128050.

1.4 Test Specimens

The specimens were representative of normal production lots, Specimens identified with the following part numbers were used for test.

TE Part Number	Description
2204866-*	Dual-Pole 500A Rack Bus Bar Power Connector
Test Bus Bar I	6mm Laminated Mating Bus Bar, semi-bright silver plating
Test Bus Bar II	3mm Screw-Mounting Bus Bar Board, matte tin plating
Test Hardware	Test Hardware shown as drawing.

Figure 1

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 Product Qualification and Requalification Test Sequence

Test or Examination	Test Group					
	1	2	3	4	5	6
	Test Sequence					
Initial examination of product	1	1	1	1	1	
Low level contact resistance	2,5,7	4,7,9,13	3,5,7,9	2,7(a),11	2,4	
Contact resistance at rated current				5,9		
Insulation resistance		2,10				
Withstanding voltage		3,11				
Temperature rise vs. Current				4,8		
Vibration			8			
Mechanical shock			6			
Durability	3(b)	5	4(b)	3(b)		
Mating force			2			
Unmating force			10			
Thermal shock		6				
Humidity-temperature cycling		8				
Temperature life	4					
Salt Spray Test					3	
Mixed flowing gas				6(c)		
Reseating	6	12		10		
Final examination of product	8	14	11	12	5	

NOTE

(a) LLCR shall be measured according to MFG test sequence.
(b) Durability (preconditioning)
(c) MFG test. ½ samples mated 168hours(7 dayes); ½ samples unmated 168 hours(7days).

2. SUMMARY OF TESTING

2.1 Initial Examination of Product – All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate Conformance (C of C) was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Low Lever Contact Resistance - All Test Group

Contact resistance measurements for Dual-Pole 500A Rack Bus Bar Power Connector meet product specification.

Power contact: 0.5 milliohms maximum (initial and final state)
Sensor Pin: 5.0 milliohms maximum (initial and final state)

Power contact Test Record.

Test Group	Test Condition	LLCR Spec. (mΩ)	LLCR Test Record Min. (mΩ)	LLCR Test Record Max. (mΩ)	LLCR Test Record Ave. (mΩ)
1	Initial State	0.5	0.049	0.067	0.061
1	After Temperature Life	0.5	0.061	0.073	0.069
2	Initial State	0.5	0.056	0.066	0.063
2	After Durability	0.5	0.028	0.062	0.053
2	After Durability/Thermal Shock	0.5	0.063	0.082	0.074
2	After Durability/Thermal Shock/Humidity-Temperature Cycling	0.5	0.062	0.091	0.079
3	Initial State	0.5	0.069	0.079	0.074
3	After Mechanical Shock	0.5	0.063	0.073	0.068
3	After Mechanical Shock/Vibration	0.5	0.087	0.164	0.135
4	Initial State	0.5	0.065	0.078	0.071
4	After Mixed Flowing Gas Test	0.5	0.060	0.072	0.066
5	Initial State	0.5	0.057	0.063	0.06
5	After Salt Spray Test	0.5	0.059	0.067	0.064

Sensor Pin Test Record.

Test Group	Test Condition	LLCR Spec. (mΩ)	LLCR Test Record Min. (mΩ)	LLCR Test Record Max. (mΩ)	LLCR Test Record Ave. (mΩ)
All	Initial State	5.0	0.97	1.74	1.34
All	Final State	5.0	1.29	2.63	1.73

2.3 Contact Resistance at Rated Current- Test Group 4

Contact resistance measurements for Dual-Pole 500A Rack Bus Bar Power Connector meet product specification.

Power contact: 0.5 milliohms maximum (initial and final state)
Sensor Pin: 5.0 milliohms maximum (initial and final state)

2.4 Insulation Resistance – Test Group 2

All insulation resistance measurements were greater than 1000 megohms.

2.5 Withstanding Voltage – Test Group 2

No dielectric breakdown or flashover occurred

26 Temperature Rise vs. Current – Test Group 4

Rated current energized at 250A per contact, 500A totally, and 30°C max. temperature rise. Detail refer to the plot of T-rise on appendix-1.

2.7 Vibration Test – Test Group 3

No discontinuities were detected during vibration testing. Flowing vibration test. No cracks, breaks, or loose parts on the specimens were visible.

2.8 Mechanical Shock – Test Group 3

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9 Durability – Test Group1, 2, 3, 4

No evidence of physical damage was visible as the result of mating and unmating the specimens 50 cycles.

2.10 Mating Force – Test Group 3

All mating force measurements were less than 100N per connector for Dual-Pole 500A Rack Bus Bar Power Connector. Test Record 84N mating force.

2.11 Un-mating Force – Test Group 3

All un-mating force measurements were greater than 20 N per connector for Dual-Pole 500A Rack Bus Bar Power Connector. Test Record 41N mating force.

2.12 Thermal Shock – Test Group 2

No evidence of physical damage was visible as the result of thermal shock testing

2.13 Humidity/temperature cycling – Test Group 2

No evidence of physical damage was visible as the result of humidity/temperature cycling.

2.14 Temperature life – Test Group 1

No evidence of physical damage was visible as the result of temperature life testing.

2.15 Mixed Flowing Gas Test – Test Group 4

No evidence of physical damage was visible as the result of exposure to the pollutants of mixed flowing gas

2.15 Salt Spray Test – Test Group 5

No evidence of physical damage was visible as the result of exposure to the pollutants of salt spray test.

2.19 Final Examination of Product – All Test Groups

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

3 TEST METHODS

3.1 Initial Examination of Product

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

3.2 Low Level Contact Resistance

Low level contact resistance measurements were made with four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage, in accordance with EIA-364-27

3.3 Contact Resistance at Rated Current

Specimens were subjected to contact resistance testing in accordance with product Specification 108-128050. And EIA –364-06. Specimens were energized at rated current and resistance measurements were recorded.

3.3 Insulation Resistance

Insulation resistance was measured between adjacent power contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured, in accordance with EIA–364-21C

3.4 Withstanding Voltage

A test potential of 2500 volts DC was applied between the adjacent power contacts of mated specimens. This potential was applied for 1 minute and then returned to zero. In accordance with EIA–364-20B Condition I

3.5 Temperature Rise vs. Current

Stabilize at a single current level until 3 readings at 5 minute intervals are within 1^{0}C. Test with single energized contact and with all adjacent power contacts energized. Test Condition: EIA-364-70, Method 1.

3.6 Random Vibration

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hz. The spectrum remained flat at 0.05 G2/Hz from 20Hz to upper bound frequency of 500Hz. The root-mean square amplitude of excitation was 4.90 GRMS. The specimens were subjected to this test time of 45 minutes per specimen. Specimens were monitored for discontinuities of microsecond or greater using an energizing current of 100 milliamperes. In accordance with EIA–364-28D Condition Ⅶ.

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 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 one microsecond or greater using a current of 100 milliamperes DC. In accordance with EIA–364-27B Method A.

3.8 Durability

Specimens were mated and unmated 50 cycles at a maximum rate of 500 cycles per hour. In accordance with EIA–364-09.

3.9 Mating force

The force required to mate individual specimens was measured using a tensile/compression device with the floating fixture and a rate of travel of 12.7 mm per minute, in accordance with EIA–364-13B.

3.10 Un-mating force

The force required to mate individual specimens was measured using a tensile/compression device with the floating fixture and a rate of travel of 12.7 mm per minute in accordance with EIA–364-13B.

3.11 Thermal Shock

Mated specimens were subjected to 36 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40° and 105°C. The transition between temperatures was less than 1 minute in accordance with EIA–364-32C.

3.12 Humidity-temperature Cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C at 80 to 100 %RH, in accordance with EIA–364-31B Method III.

3.13 Temperature Life

Mated specimens were exposed to a temperature of 105°C for 504 hours (21 days) in accordance with EIA–364-17B Method A.

3.14 Mixed Flowing Gas Test

Specimens were exposed for 14 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30±1°C and a relative humidity of 70 ±2% with the pollutants of Cl2 at 10 ±3 ppb, NO2 at 200±50 ppb, H2S at 10±5 ppb and SO2 at 100±20 ppb, in accordance with EIA-364-65, class IIA. ½ subject samples mated for 336 hours (14days); ½ subject samples unmated 168 hours (7days), and then mated for final 168 hours (7days).

3.15 Salt Spray Test

Mated specimens were exposed for 48 hours to a 5% solution salt spray, at 35 +1/-2°C, in accordance with EIA–364-26.

3.16 Final Examination of Product

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

APPENDIX-1
CURRENT VS TEMPERATURE RISE CURVE.

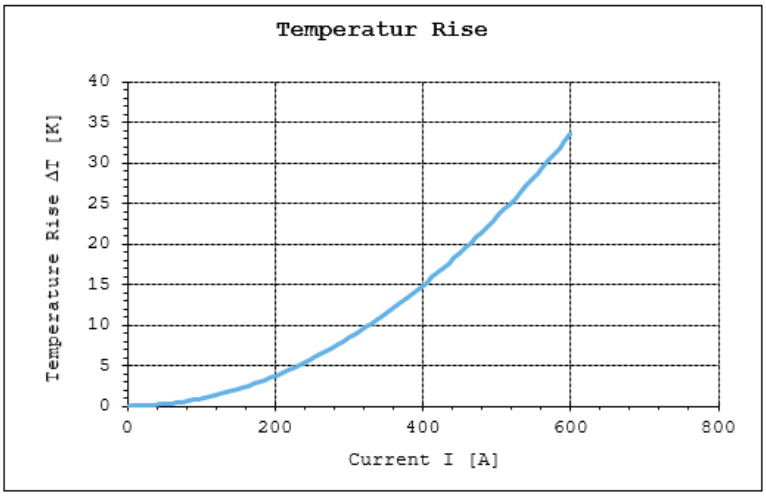

Figure. Current vs Temperature Rise Curve of Dual-Pole 500A Rack Bus Bar Power Connector

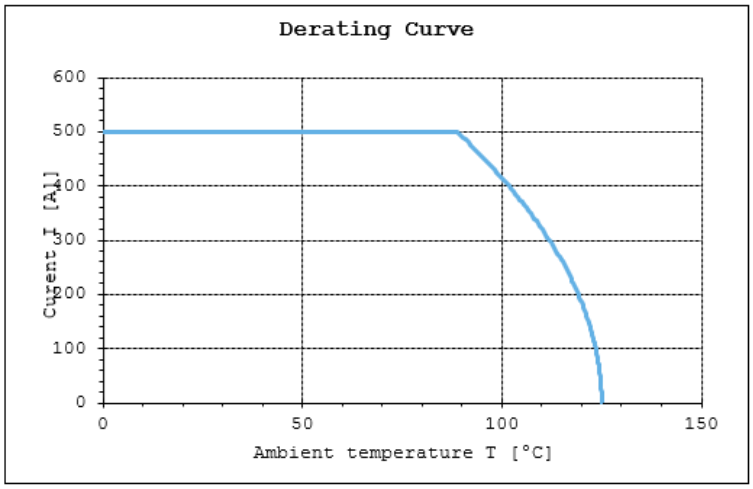

Figure. Derating Curve of Dual-Pole 500A Rack Bus Bar Power Connector