

AMP Multifitting MkII connectors, 10 and 16A Tab versions

1. Introduction

1.1 Purpose

This is a product qualification test. The purpose of this test is to evaluate the performance of AMP Multifitting MkII connectors, 10 and 16A Tab versions. Testing was performed on below products to determine its compliance with the requirements of 108-18652 Rev.C3.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the AMP Multifitting MkII connectors, 10 and 16A Tab versions, with resin acc. to UL94-V0 + GWIT & GWFI acc. to IEC 60335-1 and silver plated terminals. TG 4-4 is performed in third lab per aligned with requestor. TG 4-4 was performed at Shanghai Motor Vehicle Inspection Certification & Tech Innovation Center Co., LTD between 2023-04-26 and 2023-04-27. Others were performed at TE Connectivity Shanghai Electrical Test Laboratory (Building ID 554) between 2023-04-03 and 2023-05-31. The associated test number is TP-22-01546.

1.3 Conclusion

Based on the test results, all samples meet the requirement according to customer requirement. The testing results are only responsible for the specimens tested.

1.4 Test Specimens

Product Description

AMP Multifitting MkII connectors, 10 and 16A Tab versions, with resin acc. to UL94-V0 + GWIT & GWFI acc. to IEC 60335-1 and silver plated terminals.

Specimens received on 2023-03-30 with the following part numbers were used for test:

Test Group	Part No.	Part Rev.	Description	Qty (pcs)	Comments
1	2407711-4	1	Multifitting Mk2 assy 4P,10A silver	1	without cover and without wire
	2407711-4	1	Multifitting Mk2 assy 4P,10A silver	1	with cover and without wire
	2407717-4	1	Multifitting Mk2 assy 4P,16A	1	without cover and without wire
	2407717-4	1	Multifitting Mk2 assy 4P,16A	1	with cover and without wire
	2-1971896-4	D	4P, RAST 5 Tab Header, THV	4	
2	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	1	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	1	terminated onto 1,50mm ² wires
	2-1971896-4	D	4P, RAST 5 Tab Header, THV	2	
3	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	3	(rated 10A) terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	3	(rated 16A) terminated onto 1,50mm ² wires
	2-1971896-4	D	4P, RAST 5 Tab Header, THV	6	
4	2407711-1	1	Multifitting Mk2 assy 1P,10Asilver	1	terminated onto 0,35mm ² wires
	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	1	terminated onto 0,35mm ² wires
	2407717-1	1	Multifitting Mk2 assy 1P,16A	1	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	1	terminated onto 1,00mm ² wires
	2-1971896-4	D	4P, RAST 5 Tab Header, THV	4	
5	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	3	terminated onto 0,35mm ² wires
	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	3	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	3	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	3	terminated onto 1,50mm ² wires
6	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	2	terminated onto 0,35mm ² wires
	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	2	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	2	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	2	terminated onto 1,50mm ² wires
7	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	3	with cover and without wire
	2407717-4	1	Multifitting Mk2 assy 4P,16A	3	with cover and without wire

Test Group	Part No.	Part Rev.	Description	Qty (pcs)	Comments
8	2407711-4	1	Multifitting Mk2 assy 4P,10Asilver	3	terminated onto 1,00mm ² wires
	2407717-4	1	Multifitting Mk2 assy 4P,16A	3	terminated onto 1,50mm ² wires
	2-1971896-4	1	4P, RAST 5 Tab Header, THV	6	/

1.5 Test Sequence

Test Item	Test Group ^a							
	1	2	3	4	5	6	7	8
	Test Sequence ^b							
Cold Storage				2				
Contact Resistance		1,3	1,4	1,5				
Contact Voltage Drop								1,3
Crimp Tensile Strength Test						1		
Current Temperature Derating Curve			2					
Dielectric Withstanding Voltage			5	6				
Dry Heat				3				
Examination of Product	1							
Impact Test							1	
Engaging Force and Separating Force	2							
Engaging and Separating of Connector		2						
Contact Retention Force	3							
Sulfuration for Gold Surface				4				
Temperature Rise			3					
Thermal Cycling Test/Damp Heat Cyclic								2
Wire Bending Test					1			

Note: a). Test group defined per customer requirement.
 b). Numbers indicate sequence in which tests are performed.

1.6 Environmental Conditions

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

Temperature: 15 °C to 35 °C
 Relative Humidity: 25 %RH to 75 %RH

2. Summary of Test

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max.	Min.	Avg.	Unit		
1	1	All Samples	Examination of Product	4	No Physical Damage.			/	No Physical Damage.	Meet Spec.
	2	2407711-4 with cover and without wire	Engaging Force	1	11.2	7.6	9.3	N	12 N Max.	Meet Spec.
	2	2407711-4 without cover and without wire	Engaging Force	1	10.5	8.7	9.6	N	12 N Max.	Meet Spec.
	2	2407717-4 without cover and without wire	Engaging Force	1	11.0	9.0	10.0	N	12 N Max.	Meet Spec.
	2	2407717-4 with cover and without wire	Engaging Force	1	8.9	7.9	8.2	N	12 N Max.	Meet Spec.
	2	2407711-4 with cover and without wire	Separating Force	1	18.5	9.8	13.5	N	3 N Min.	Meet Spec.
	2	2407711-4 without cover and without wire	Separating Force	1	15.8	8.6	11.9	N	3 N Min.	Meet Spec.
	2	2407717-4 without	Separating	1	15.4	11.9	13.3	N	3 N Min.	Meet Spec.

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max.	Min.	Avg.	Unit		
		cover and without wire	Force							
	2	2407717-4 with cover and without wire	Separating Force	1	15.6	7.0	10.7	N	3 N Min.	Meet Spec.
	3	All Samples	Contact Retention Force	4	No Physical Damage & No Displacement			/	No Physical Damage & No Displacement	Meet Spec.
2	1	2407711-4 & 2-1971896-4 (Blue)	Contact Resistance	1	0.86	0.77	0.81	mΩ	10 mΩ Max.	Meet Spec.
	1	2407717-4 & 2-1971896-4 (Pink)	Contact Resistance	1	0.81	0.73	0.76	mΩ	10 mΩ Max.	Meet Spec.
	2	2407711-4 & 2-1971896-4 (Blue)	Engaging and Separating of Connector	1	No physical damage.			/	No physical damage.	Meet Spec.
	2	2407717-4 & 2-1971896-4 (Pink)	Engaging and Separating of Connector	1	No physical damage.			/	No physical damage.	Meet Spec.
	3	2407711-4 & 2-1971896-4 (Blue)	Contact Resistance	1	0.96	0.89	0.93	mΩ	(1.5 x R _{initial}) mΩ or R _{initial} +5 mΩ Max.	Meet Spec.
	3	2407717-4 & 2-1971896-4 (Pink)	Contact Resistance	1	0.85	0.79	0.83	mΩ	(1.5 x R _{initial}) mΩ or R _{initial} +5 mΩ Max.	Meet Spec.
	3	2407711-4 & 2-1971896-4 (Blue) Δ R	Contact Resistance	1	0.17	0.07	0.13	mΩ	5 mΩ Max.	Meet Spec.
	3	2407717-4 & 2-1971896-4 (Pink) Δ R	Contact Resistance	1	0.10	0.03	0.07	mΩ	5 mΩ Max.	Meet Spec.
3	1	2407717-4 with 1.50 mm ² wire	Contact Resistance	3	0.78	0.62	0.70	mΩ	10 mΩ Max.	Meet Spec.
	1	2407711-4 with 1.00mm ² wire	Contact Resistance	3	0.80	0.63	0.71	mΩ	10 mΩ Max.	Meet Spec.
	2	2407717-4 with 1.50 mm ² wire	Current Temperature Derating Curve	3	Please see appendix.			/	/	Judge by client.
	2	2407711-4 with 1.00mm ² wire	Current Temperature Derating Curve	3	Please see appendix.			/	/	Judge by client.
	3	2407717-4 with 1.50 mm ² wire only the monitor temperature	Temperature Rise	3	116.3	115.0	115.6	°C	130°C Max.	Meet Spec.
	3	2407711-4 with 1.00 mm ² wire only the monitor temperature	Temperature Rise	3	122.1	120.2	121.1	°C	130°C Max.	Meet Spec.
	4	2407717-4 with 1.50mm ² wire for delta resistance	Contact Resistance	3	0.41	-0.07	0.20	mΩ	5 mΩ Max.	Meet Spec.
	4	2407711-4 with 1.00mm ² wire for delta resistance	Contact Resistance	3	0.65	0.21	0.42	mΩ	5 mΩ Max.	Meet Spec.
	5	All Samples	Dielectric Withstanding Voltage	6	No breakdown or flashover.			/	No breakdown or flashover.	Meet Spec.
4	1	2407711-1&2407711-4 with 0.35mm ² wire	Contact Resistance	3	1.28	0.95	1.13	mΩ	10 mΩ Max.	Meet Spec.

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max.	Min.	Avg.	Unit		
	1	2407717-1&2407717-4 with 1.00mm ² wire	Contact Resistance	3	0.95	0.81	0.87	mΩ	10 mΩ Max.	Meet Spec.
	2	All Samples	Cold Storage	6	No physical damage.			/	No physical damage.	Meet Spec.
	3	All Samples	Dry Heat	6	No physical damage.			/	No physical damage.	Meet Spec.
	4	All Samples	Sulfuration for Gold Surface	6	No physical damage.			/	No physical damage.	Meet Spec.
	5	2407711-1&2407711-4 with 0.35mm ² wire	Contact Resistance	3	1.32	0.86	1.15	mΩ	(1.5 x R _{initial}) mΩ or R _{initial} +5 mΩ Max.	Meet Spec.
	5	2407717-1&2407717-4 with 1.00mm ² wire	Contact Resistance	3	0.98	0.75	0.89	mΩ	(1.5 x R _{initial}) mΩ or R _{initial} +5 mΩ Max.	Meet Spec.
	5	2407711-1&2407711-4 with 0.35mm ² wire for delta resistance	Contact Resistance	3	0.36	-0.18	0.09	mΩ	5 mΩ Max.	Meet Spec.
	5	2407717-1&2407717-4 with 1.00mm ² wire for delta resistance	Contact Resistance	3	0.00	-0.24	-0.06	mΩ	5 mΩ Max.	Meet Spec.
	6	All Samples	Dielectric Withstanding Voltage	6	No breakdown or flashover.			/	No breakdown or flashover.	Meet Spec.
5	1	All Samples	Wire Bending Test	12	No physical damage.			/	No physical damage.	Meet Spec.
6	1	2407711-4 with 0.35mm ² wire	Crimp Tensile Strength Test	2	62.1	46.8	54.3	N	30 N Min.	Meet Spec.
	1	2407711-4 with 1mm ² wire	Crimp Tensile Strength Test	2	149.9	119.6	132.9	N	50 N Min.	Meet Spec.
	1	2407717-4 with 1mm ² wire	Crimp Tensile Strength Test	2	131.5	103.8	117.5	N	50 N Min.	Meet Spec.
	1	2407717-4 with 1.5mm ² wire	Crimp Tensile Strength Test	2	202.1	163.3	179.5	N	60 N Min.	Meet Spec.
7	1	All Samples	Impact Test	6	No physical damage.			/	No physical damage.	Meet Spec.
8	1	2407717-4 with 1.50mm ² wire	Contact Voltage Drop	3	14.65	11.67	12.95	mV	Judged by customer.	Judged by customer.
	1	2407711-4 with 1.00mm ² wire	Contact Voltage Drop	3	8.57	7.27	7.98	mV	Judged by customer.	Judged by customer.
	2	All Samples	Thermal Cycling Test	6	No physical damage.			/	No physical damage.	Meet Spec.
	3	2407717-4 with 1.50mm ² wire after 24 cycles	Contact Voltage Drop	3	13.77	10.96	12.08	mV	22.5 mV Max.	Meet Spec.
	3	2407711-4 with 1.00mm ² wire after 24 cycles	Contact Voltage Drop	3	8.86	7.31	8.08	mV	22.5 mV Max.	Meet Spec.
	3	2407717-4 with 1.50mm ² wire final	Contact Voltage Drop	3	15.71	12.19	13.56	mV	22.5 mV Max.	Meet Spec.
	3	2407711-4 with 1.00mm ² wire final	Contact Voltage Drop	3	8.97	8.02	8.39	mV	22.5 mV Max.	Meet Spec.

3. Test Procedures and Requirements

2.1 Cold Storage

Subject mated connector to -40 °C for 96 hours.
Requirement: No physical damage.
Test Method: IEC 60512-11-10-2002

2.2 Contact Resistance

Measure the contact resistance with 1A electricity.
Requirement: $R_{\text{initial}} \leq 10 \text{ m}\Omega$
Final $R \leq (1.5 \times R_{\text{initial}}) \text{ m}\Omega$ or $R_{\text{initial}} + 5 \text{ m}\Omega$
Test Method: IEC 60512-2-2-2003

2.3 Contact Voltage Drop

Measure the voltage drop for the IDC area. Test current: 10A with 1,0mm² and 16A with 1,5mm².
Requirement: 22.5 mV Max or $U_{\text{IDC}} \leq 1.5 \times U_{\text{IDC Initial}}$ (after 24 cycles)
Test Method: IEC 60512-2-2-2003

2.4 Crimp Tensile Strength Test

Measure the force to keep the insulation barrel crimp to be disabled at a rate of 25 mm/min.
Requirement: 0,35mm² : 30 N 1,0mm² : 50 N 1,5mm² : 60 N
Test Method: EIA-364-08C-2015 (R2020)

2.5 Current Temperature Derating Curve

Category temperature = +130 °C
Nominal Current: 2407717-4 with 1.5mm² wire: 7.0A, 11.0A, 16.0A, 20.0A.
2407711-4 with 1.0mm² wire: 5.0A, 8.0A, 10.0A, 12.5A.
Drawing the derating curve refer to the temperature rise for the defined current.
Test Method: Customized Requirement and IEC 60512-2-5-2003.

2.6 Dielectric Withstanding Voltage

Specimens shall be subjected to a test voltage of 1390V ac which shall be maintained at the specified value for a period of 60 seconds between adjacent contacts.
Requirement: No breakdown or flashover.
Test Method: IEC 60512-4-1-2003

2.7 Dry Heat

Subject mated connector to 110 °C for 7 days.
Requirement: No physical damage.
Test Method: IEC 60512-11-9-2002

2.8 Examination of Product

Visual Inspection: Appearance and function examination according to the applicable inspection spec.
Requirement: No physical damage.
Test Method: IEC 60512-1-1-2002

2.9 Impact Test

Single fall of all 3 axis from a height of 1m onto uncoated concrete floor at room temperature.
Requirement: No physical damage
Test Method: IEC60512-7-2-2010

2.10 Engaging and Separating of Connector

Engaging and separating connector for 10 times by manual.
Requirement: No physical damage.
Test Method: Customized Requirement

2.11 Engaging Force and Separating Force

Measure the force the keep the contact mated and un-mated at a rate of 25mm/min.
Requirement: Engaging Force of contact: 12N Max.
Separating Force of contact: 3N Min.
Test Method: IEC 60512-13-1-2006

2.12 Contact Retention Force

Apply a defined force on the terminal for 10s, for the samples without cover and without wire is 20N, and for the samples with cover and without wire is 40N.

Requirement: No physical damage.

Test Method: EN 60512-15-1-2009

2.13 Sulfuration for Gold Surface

Inject 2 dm³ distilled water into chamber and 0.2 dm³ sulfur dioxide together.

First heating for 8 h chamber, temperature is (40±3) °C, relative humidity is 100%; second ventilating for 16 h chamber temperature needs between 18~28 °C, relative humidity should less than 75 %; only one cycle and each cycle is 24h.

Requirement: No physical damage.

Test Method: DIN EN ISO 6988

2.14 Temperature Rise

Apply 10A for 2407711-4 and 16A for 2407717-4 with the mated samples under defined environment temperature, record the temperature on the samples after the sample achieve stable condition.

Requirement: 130 °C Max.

Test Method: IEC 60512-5-1-2002

2.15 Thermal Cycling Test

Subject the mated samples for thermal cycling, total 192 cycles, different samples with different condition, the detail condition as below:

2407711-4 with 1.0mm² wire: step 1 - from 30 °C to 78 °C duration is 20 minutes, step 2 - hold 78 °C, duration is 10 minutes, step 3 – from 78 °C to 30 °C duration is 20 minutes, step 4 – hold 30 °C, duration is 10, during step 1 and step 2 should apply 10A.

2407717-4 with 1.5mm² wire: step 1 - from 30 °C to 70 °C duration is 20 minutes, step 2 - hold 70 °C, duration is 10 minutes, step 3 – from 70 °C to 30 °C duration is 20 minutes, step 4 – hold 30 °C, duration is 10, during step 1 and step 2 should apply 16A.

Test Method: Customer Requirement

2.16 Wire Bending Test

Clamp the specimen with a fixture which have a plate, the bushing hole diameter is 6.5mm, the height of the wire which is clamped is 260mm, and apply a force to the wire is 4N, then rotate the plate at a rate of (10 ± 2) r/min, the test duration is 15 minutes.

Requirement: During the test, the conductor shall neither slip out of the clamping unit nor break near the clamping unit.

Test Method: EN 60998-2-3-2004

4. Validation

Requested by:

Chiarelli, Davide

2022-07-15

TE Connectivity Product Engineering

Prepared by:

John Han

2023-09-07

TE Connectivity Shanghai Electrical Components Test Lab.

Approved by:

Xu, Coco

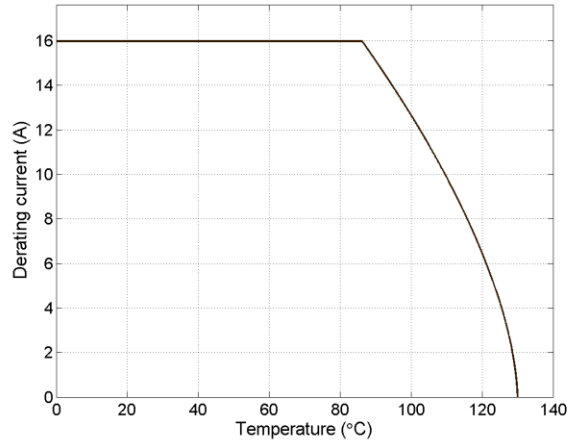
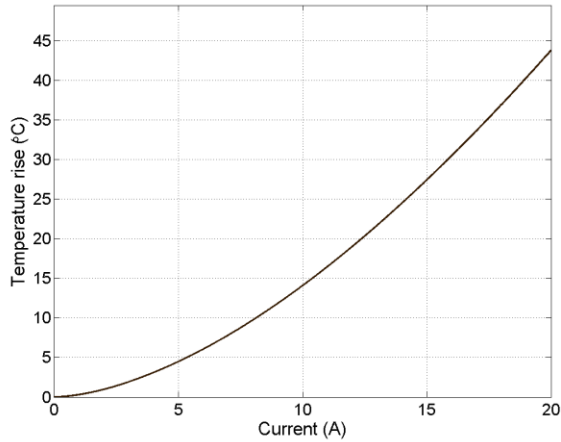
2023-09-15

Test Manager

TE Connectivity Shanghai Electrical Components Test Lab.

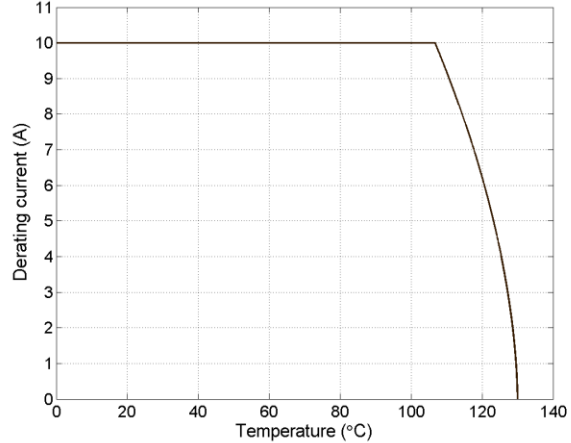
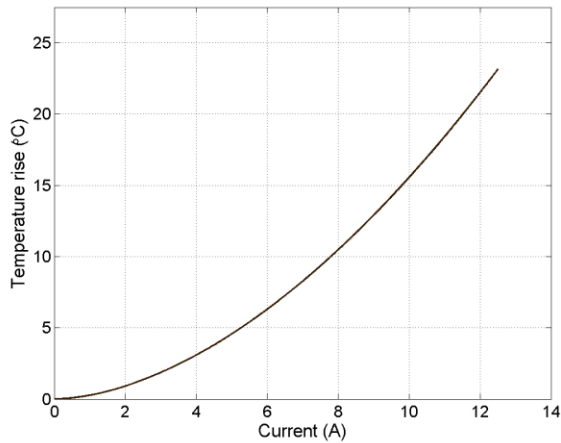
Appendix

2407717-4 with 1.5mm² Wire:



PS: The break-point of derating curve corresponds to the current 16.0A&85.7°C.

2407711-4 with 1.0mm² Wire:



PS: The break-point of derating curve corresponds to the current 10.0A&106.6°C.

-----**END OF REPORT**-----