2D Amplivar* Thru Splice

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity 2D AMPLIVAR Thru Splice to determine its conformance to the requirements of Product Specification 108-143147 Rev C.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the 2D AMPLIVAR Thru Splice. Testing was performed at the Harrisburg Electrical Components Test Laboratory between May 02, 2022 and March 01, 2023. Documentation is on file and maintained at the Harrisburg Electrical Components Test Laboratory under EA20220062T.

1.3 Conclusion

The specimens listed in Paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-143147 Rev. C.

1.4 Product Description

The 2D Amplivar 9-Serration Open Barrel Thru Splice Terminal is designed to splice unstripped copper magnet wires together or along with stranded lead wire within a combined total range of 1500-7000 CMA

1.5 Test Specimens

The test specimens were representative of normal production lots, and specimens identified in Table 1 were used for test:

Table 1 – Test Specimens

Test Set	Quantity	Part Number	Description
1	10	2238235-1 rev A	2D Amplivar Thru Splice: (2) #27 awg cu + (1) #18 awg lead wire CMA 2118 @ .059 CH x .130 CW @ 4.75A
2	10	2238235-1 rev A	2D Amplivar Thru Splice: (2) #27 awg cu + (1) #18 awg lead wire CMA 2118 @ .059 CH x .130 CW @ 9.5A
3	10	2238235-1 rev A	2D Amplivar Thru Splice: (2) #22 awg cu mag CMA 1534 @ .057 CH x .130 CW

1.6 Qualification Test Sequence

Specimens identified in Table 1 were subjected to the test sequences listed in Table 2.

Table 2 – Test Sequence

Test or Examination	Test Sets		
	1	2	3
	Test Sequence (a)		
Initial Examination	1	1	1
Low Level Contact Resistance	2, 6, 9	2, 4	
T-Rise vs Current	3, 10		
Temperature Life	4		
Thermal Shock	5		
Humidity Exposure	7		
Vibration	8		
Current Cycling		3	
Termination Tensile Strength			2
Final Examination	11	5	3

Note: *(a) Numbers indicate the sequence in which tests were performed.*

1.7 Environmental Conditions

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

Temperature: 15°C to 35°C
Relative Humidity 20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Visual Examination

Specimens showed no signs of visual defects detrimental to testing. All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance.

2.2 Low Level Contact Resistance

All readings met the 10mΩ max requirement for 27AWG and 2mΩ max requirement for 18AWG found in the Product Specification. See Table 3 for Test Set 1 summary results and Table 4 for Test Set 2 summary results.

Table 3 – TS1 LLCR Summary Data (mΩ)

Test Set 1 (18 awg stranded wire)			
	Initial LLCR	2nd LLCR	Final LLCR
Minimum:	0.804	0.710	0.750
Maximum:	0.880	1.146	0.934
Average:	0.837	0.856	0.849
Test Set 1 (27 awg cu mag wire)			
	Initial LLCR	2nd LLCR	Final LLCR
Minimum:	5.590	5.754	5.754
Maximum:	6.389	6.345	6.260
Average:	6.001	6.053	6.023

Table 4 – TS2 LLCR Summary Data (mΩ)

Test Set 2 (18 awg stranded wire)		
	Initial LLCR	Final LLCR
Minimum:	0.747	0.724
Maximum:	1.054	1.012
Average:	0.948	0.917
Test Set 2 (27 awg cu mag wire)		
	Initial LLCR	Final LLCR
Minimum:	5.695	5.629
Maximum:	6.587	6.289
Average:	5.981	5.902

2.3 T-Rise vs Current

All specimens had a temperature rise of less than 30°C above ambient. See Table 5 for T-rise Summary table results.

Table 5 – Test Set 1 T-Rise Summary Data (°C)

Test Current	4.75 Amps (2 #27awg @404 CMA)	
	Initial T-Rise	Final T-Rise
Minimum	7.018	7.865
Maximum	8.146	8.473
Average	7.578	8.222

2.4 Temperature Life

No evidence of physical damage was visible following temperature life.

2.5 Thermal Shock

No evidence of physical damage was visible following exposure to thermal shock.

2.6 Humidity Exposure

No evidence of physical damage was visible following humidity exposure.

2.7 Vibration

All specimens met the Product Specification requirements by having no discontinuities exceeding 1 microsecond during the exposure. After each axis was completed, the operator performed a visual inspection of the samples with the naked eye. No damage was found.

2.8 Current Cycling

No evidence of physical damage was visible as a result of current cycling.

2.9 Termination Tensile Strength

All specimens met the requirements of the Product Specification. See Table 6 for test results.

Table 6 - Test Set 3 Results

22 awg cu mag		
Specimen ID	**Position ID**	**Termination Tensile Strength (lbs)** ***(min requirement 11.2lbs)***
1	1	16.30
2	1	18.95
3	1	18.38
4	1	17.33
5	1	16.68
6	1	18.43
7	1	16.86
8	1	16.32
9	1	18.67
10	1	16.77
Minimum		16.30
Maximum		18.95
Average		17.47

3. TEST METHODS

3.1. Initial Examination of Product

A C of C 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 Low Level Contact Resistance

Low level contact resistance measurements at low level current were made using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20-millivolt maximum open circuit voltage. See Figure 1 for test setup. Testing was done in accordance with EIA-364-23C.

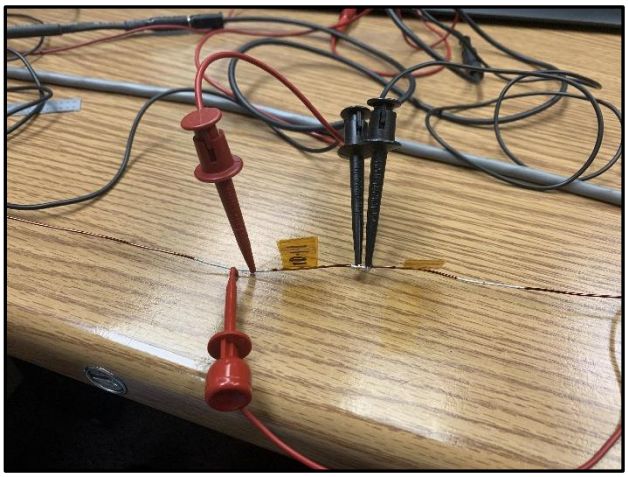

Figure 1 – LLCR Test Setup

3.3 T-Rise vs Current

Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rises of 3 consecutive readings taken at 5-minute intervals did not differ by more than 1°C, the temperature measurement was recorded. See figure 2 for test setup. Testing was done in accordance with EIA-364-70C, Method 1.

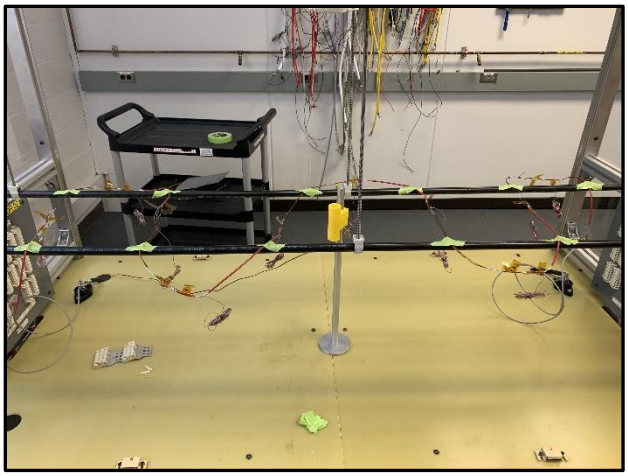

Figure 2 – T-rise Test Setup

3.4 Temperature Life

Specimens were exposed to a temperature of 150°C for 96 hours. Testing was done in accordance with EIA-364-17C, Method A.

3.5 Thermal Shock

Specimens were subjected to 50 cycles of thermal shock with each cycle consisting of 30-minute dwells at -65 and 150°C. Testing was done in accordance with EIA-364-32G.

3.6 Humidity Exposure

Specimens were subjected to 96 hours at 90-95% RH and 40°C. Testing was done in accordance with EIA-364-31F, Method IV.

3.7 Vibration

Test specimens were subjected to a Random Vibration test in accordance with the Product Specification and EIA-364-28F test condition “VII”, test condition letter “D”.

The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hertz (Hz). The spectrum remains flat at 0.02 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS.

Test specimens were subjected to this test condition for 3 hours in each of the three mutually perpendicular axes, for a total test time of 9 hours per test specimen.

An electrical load was applied and maintained at 100 milliamperes maximum to all test specimens and was monitored for discontinuities of 1 microsecond or longer. Random vibration profile run is shown in (Figure 9). Random vibration test setups are shown in (Figures 3, 4 & 5).

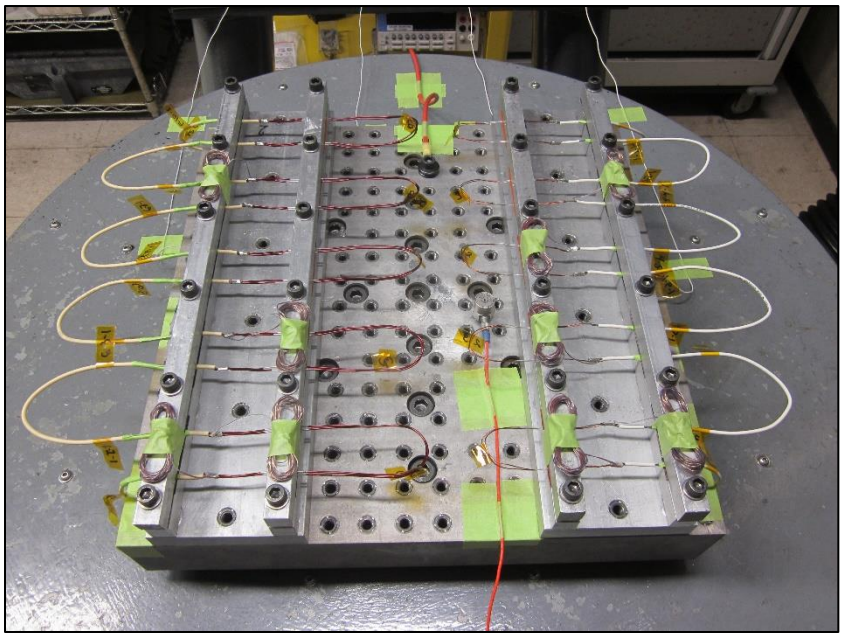

Figure 3 – Random Vibration, Vertical Axis, Test Setup

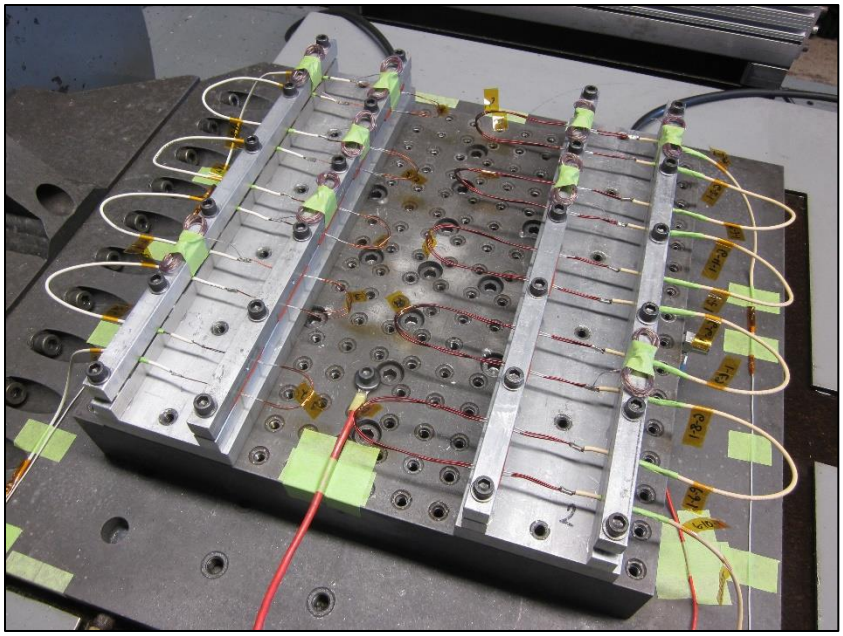

Figure 4 – Random Vibration, Longitudinal Axis, Test Setup

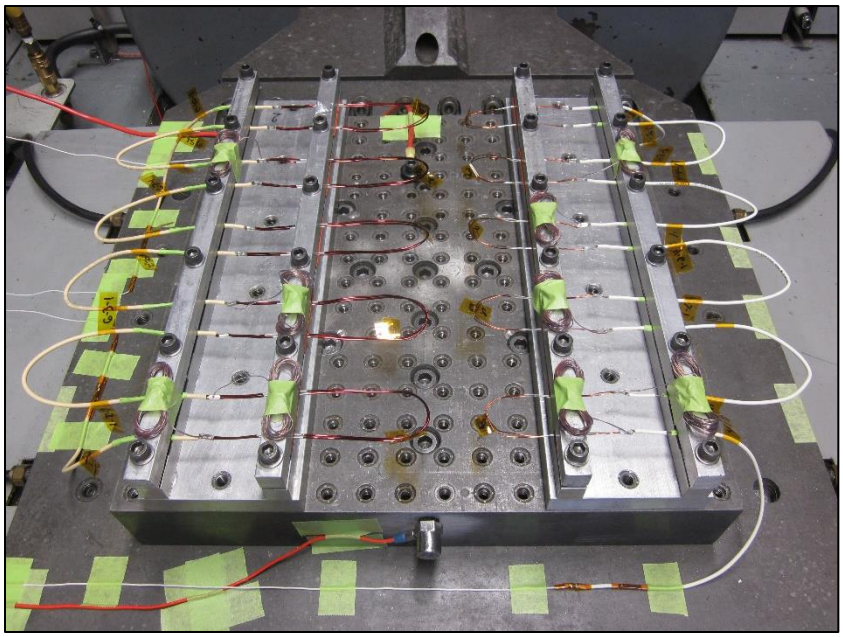

Figure 5 – Random Vibration, Perpendicular Axis, Test Setup

3.8 Current Cycling

Testing consisted of 10,000 cycles of current cycling, with each cycle having current on for 3 minutes and current off for 3 minutes. Specimen were subjected to a test current of 9.5 amperes AC. The test current was selected from the Product Specification by calculating a CMA of 404 for the two 27 awg wires used. See Figure 6 for Test Setup. Testing was done in accordance with EIA-364-55B, Test Condition B.

Figure 6 – Current Cycling Test Setup

3.9 Termination Tensile Strength

Specimen was secured using metal plates and brackets, which was mounted to a free-floating X-Y table that was attached to the base of a tensile/ compression machine. A self-tightening clamp was used to hold the specimen wire. The clamp fixtures were attached to the movable crosshead of the tensile / compression machine. Force was applied in an upward direction at a rate of 25 mm per minute until reaching specimen failure and recording the measurements. Testing was conducted per EIA-364-08C. See Figure 7 for the test setup.

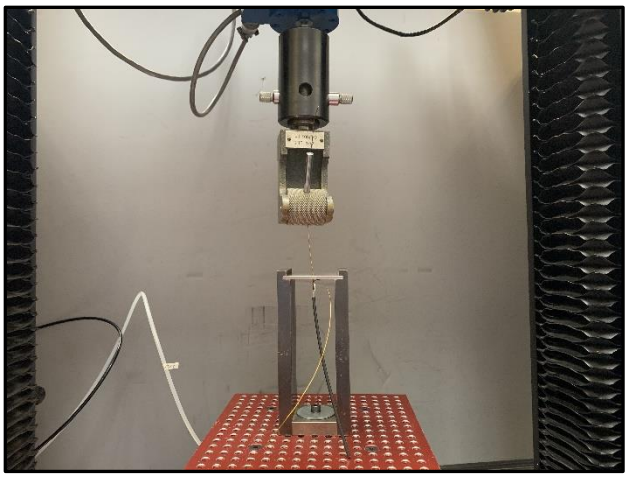

Figure 7 – Termination Tensile Strength Test Setup

3.10 Final Visual Examination

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