Ultra-Fast Fully Insulated FASTON* Receptacle Qualification Testing

1. INTRODUCTION

1.1 Purpose

Qualification Testing was performed on TE Connectivity's Ultra-Fast 250 Series Receptacle Terminals to determine its conformance to the Product Specifications of 108-2043 Rev D.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Ultra-Fast 250 Series Receptacle Terminals. Testing was performed at the Harrisburg Electrical Components Test Laboratory (HECTL) between October 21, 2022 and December 13, 2022. Documentation is on file and maintained at the HECTL under EA20220312T.

1.3 Conclusion

All specimens conformed to Product Specifications of 108-2043 Rev D. See section 2 for testing details.

1.4 Product Description

TE Connectivity's Ultra-Fast receptacle terminals consist of a FASTON receptacle body enclosed in a fully insulated housing. They mate with FASTON tabs on devices used in home entertainment centers, business machines, copying equipment, computer peripherals, appliances and other commercial equipment.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test see Table 1.

Table 1 – Test Specimens

Test Set	Quantity	Part Number	Description
1a	20	2-520183-2, Rev V	9 double ended 6.5" leads on 22 AWG wire 2 single ended leads on 22 AWG wire
	10	62627-2	Electrical Test Tabs
1b	20	2-520183-2, Rev V	9 double ended 6.5" leads on 20 AWG wire 2 single ended leads on 20 AWG wire
	10	62627-2	Electrical Test Tabs
1c	20	2-520183-2, Rev V	9 double ended 6.5" leads on 18 AWG wire 2 single ended leads on 18 AWG wire
	10	62627-2	Electrical Test Tabs
2a	20	2-520183-2, Rev V	20 single ended leads on 22 AWG wire
2b	20	2-520183-2, Rev V	20 single ended leads on 20 AWG wire
2c	20	2-520183-2, Rev V	20 single ended leads on 18 AWG wire
3a	20	2-520183-2, Rev V	20 single ended leads on 22 AWG High-Temp wire
3b	20	2-520183-2, Rev V	20 single ended leads on 20 AWG High-Temp wire
3c	20	2-520183-2, Rev V	20 single ended leads on 18 AWG High-Temp wire

Table 1 – Test Specimens *(continued)*

Test Set	Quantity	Part Number	Description
4a	20	2-520183-2	30 assembly pcs on strip – subjected to Examination and Heat Age and then returned for crimping (22AWG wire) before Dielectric Withstanding Voltage Test Condition A
4b	20	2-520183-2	30 assembly pcs on strip – subjected to Examination and Heat Age and then returned for crimping (20AWG wire) before Dielectric Withstanding Voltage Test Condition A
4c	20	2-520183-2	30 assembly pcs on strip – subjected to Examination and Heat Age and then returned for crimping (18AWG wire) before Dielectric Withstanding Voltage Test Condition A
5	20	2-520183-2	20 single ended leads on 22 AWG wire
6	20	2-520183-2	20 single ended leads on 22 AWG wire
7	20	2-520183-2	20 loose piece assemblies
8	20	2-520183-2	20 single ended leads on 22 AWG wire
9	20	2-520183-2	20 assembly pcs on strip, to be loose pieced after Heat Age
10	20	2-520183-2	20 single ended leads on 22 AWG High-Temp wire
11	20	2-520183-2	30 assembly pcs on strip – subjected to Examination and Heat Age and then returned for crimping (22AWG wire) before Secureness of Insulation (Assembled) Test
12	20	2-520183-2	20 single ended leads on 18 AWG wire
	20	60447-1	Mechanical Test Tabs

1.5 Test Sequence

The specimens in Table 1 were subjected to the testing outlined in Table 2.

Table 2 – Specimens Test Sequence

Test or Examination	Test Set											
	1	2	3	4	5	6	7	8	9	10	11	12
	Test Sequence *(a)*											
Examination of Product	1	1	1	1	1	1	1	1	1	1	1	1
Dielectric Withstanding Voltage, Test Condition A		2	3	3(b)								
Dielectric Withstanding Voltage, Test Condition C					2							
Dielectric Withstanding Voltage, Receptacle, Tab Entry Position						2						
Heating (Temperature Rise)	2											
Heat Cycling (Current Cycling)	3											
Pull Out Strength (Crimp Tensile)		3										
Secureness of Insulation (Unassembled)							2		3			
Secureness of Insulation (Assembled)								2		3	3(b)	
Engagement-Disengagement (Engaging-Separating)												2
Heat Age, 136°C			2							2		
Heat Age/Humidity				2					2		2	

(a) Numbers indicate sequence in which tests are performed.

(b) Uncrimped terminals and wires in test groups 4 and 11 shall be conditioned in the environments indicated. After conditioning, each sample is crimped to the appropriate wire and the electrical or mechanical test is performed.

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1.6 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

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

2.2 Dielectric Withstanding Voltage, Test Condition A

Specimens had no dielectric breakdown or flashover occurrences at 3400VAC.

2.3 Dielectric Withstanding Voltage, Test Condition C

Specimens had no dielectric breakdown or flashover occurrences at 3000VAC.

2.4 Dielectric Withstanding Voltage, Receptacle, Tab Entry Position

Specimens had no dielectric breakdown or flashover occurrences at 1000VAC.

2.5 Heating (Temperature Rise)

All specimens passed testing with temperature rises less than 20°C above ambient. See Table 3 for summary of test results.

Table 3 – Heating (Temperature Rise) Summary Data in °C

	TS1a (22AWG)	TS1b (20AWG)	TS1c (18AWG)
Test Current	**3 amps**	**4 amps**	**7 amps**
Minimum	.969	1.244	2.683
Maximum	2.987	2.319	5.507
Average	1.620	1.729	4.356
Count	20	20	20

2.6 Heat Cycling (Current Cycling)

All specimens passed testing with temperature rises less than the 65°C maximum requirement and less than a 15°C change from cycles 24 and 500. See Table 4 for summary of test results.

Table 4 – Heat Cycling (Current Cycling) Summary Data in °C

	TS1a (22AWG)		TS1b (20AWG)		TS1c (18AWG)	
Test Current	**6 amps**		**8 amps**		**14 amps**	
Cycle Number	**24**	**500**	**24**	**500**	**24**	**500**
Minimum	5.552	4.915	5.415	5.179	10.920	10.025
Maximum	12.498	12.763	9.001	8.279	18.291	18.119
Average	6.898	6.745	6.964	6.375	15.908	15.767
Count	20	20	20	20	20	20

2.7 Pull Out Strength (Crimp Tensile)

All specimens were pulled to their specified force and held for one minute. All specimens passed with no crimp failure. See Table 5 for data summary.

Table 5 – Pull Out Strength (Crimp Tensile) Summary Data in Pounds

	TS2a (22AWG)	TS2b (20AWG)	TS2c (18AWG)
Tensile Force	**10 lbs**	**16 lbs**	**20lbs**
Minimum	9.99	15.98	19.98
Maximum	9.99	16.08	20.00
Average	9.99	15.99	19.98
Count	20	20	20

2.8 Secureness of Insulation (Unassembled)

The insulation of the unassembled terminals remained secure when subjected to a 3-pound pull between the insulation and terminal with a 1-minute hold.

2.9 Secureness of Insulation (Assembled)

The insulation of the assembled terminals remained secure when subjected to a 6-pound pull between the insulation and terminal with a 1-minute hold.

2.10 Engagement-Disengagement (Engaging-Separating)

All Specimens did not exceed the 17lbf Maximum for the first insertion. Specimens exceeded the 3lbf minimum withdrawal force. See Table 6 for summary of results. See Figure 1 for example of Engagement-Disengagement graph.

Table 6 - Engagement-Disengagement Summary Data in lbf

TS12 (18AWG)	First Engagement	Final Disengagement
Minimum	4.01	5.24
Maximum	8.5	14.56
Average	5.75	9.97
Std Dev	1.22	1.95
Count	20	20

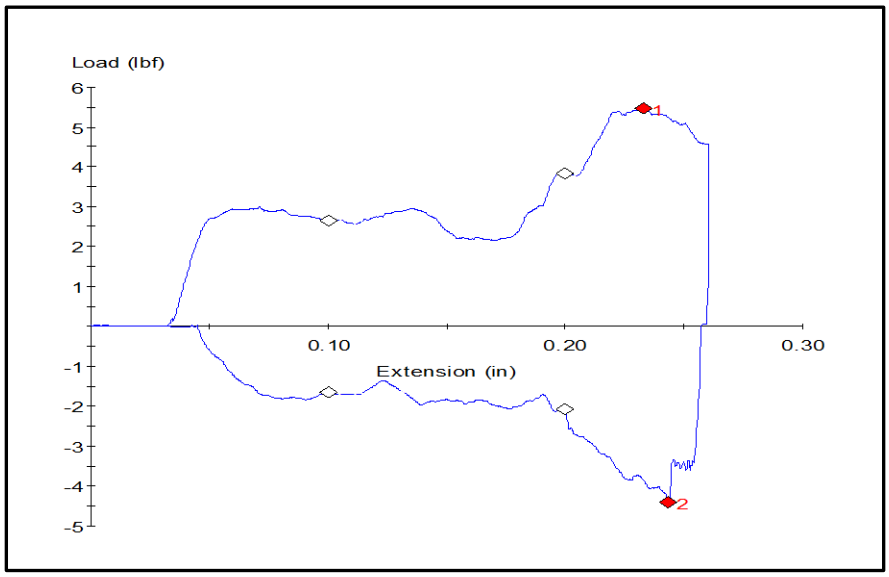

Figure 1 – Engagement-Disengagement Graph

2.11 Heat Age, 136°C

Specimens showed no signs of damage that would be detrimental to product performance.

2.12 Heat Age/Humidity

Specimens showed no signs of damage that would be detrimental to product performance.

3. TEST METHODS

3.1 Initial Visual Examination

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

3.2 Dielectric Withstanding Voltage, Test Condition A

The ends of the test specimens' terminals were coated with an insulating wax layer. The test specimen was imbedded into number 12 lead shot and a test potential of 3,400 volts AC was applied between a copper contact inserted into the number 12 lead shot and the specimen's terminal. This potential was applied for one minute and then returned to zero. See Figure 2 for test setup. Testing was done in accordance with Product Specification 108-2043.

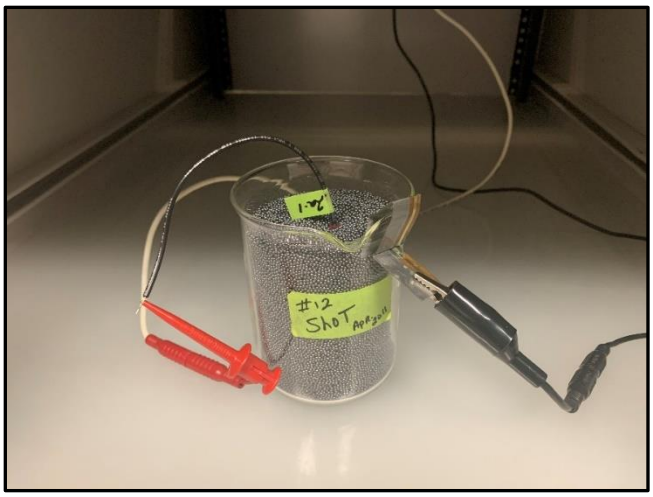

Figure 2 – DWV Test Condition A Setup

3.3 Dielectric Withstanding Voltage, Test Condition C

The test specimen was held with the base of the terminal flush with a metal plate that was covered with a conductive copper layer and a test potential of 3,000 volts AC was applied between the copper layer of the metal plate and the inserted terminal in the specimen. This potential was applied for one minute and then returned to zero. See Figure 3 for test setup. Testing was done in accordance with Product Specification 108-2043.

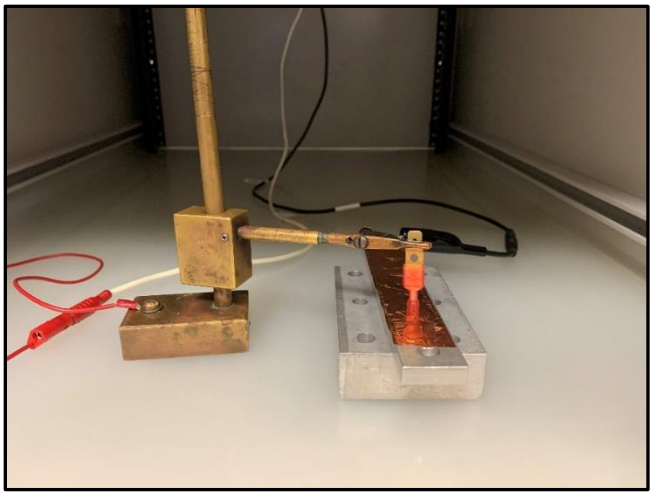

Figure 3 – DWV Test Condition C Setup

3.4 Dielectric Withstanding Voltage, Receptacle, Tab Entry Position

The test specimen was held with the receptacle entry position of the terminal flush with a metal plate that was covered with a conductive copper layer and a test potential of 1,000 volts AC was applied between the copper layer of the metal plate and the specimen wire. This potential was applied for one minute and then returned to zero. See Figure 4 for test setup. Testing was done in accordance with Product Specification 108-2043.

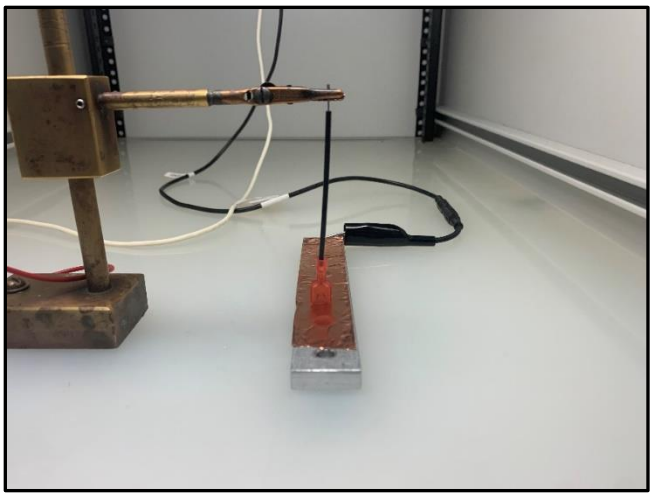

Figure 4 – DWV Test Receptacle, Tab Entry Position Setup

3.5 Heating (Temperature Rise)

Thermocouples were attached to the wire crimp of each specimen to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded. See Figure 5 for test setup. Testing was done in accordance with Product Specification 108-2043.

3.6 Heat Cycling (Current Cycling)

Thermocouples were attached to the wire crimp of each specimen to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. Specimens were subjected to 500 current cycles of 45 minutes on and 15 minutes off. See Figure 5 for test setup. Testing was done in accordance with Product Specification 108-2043.

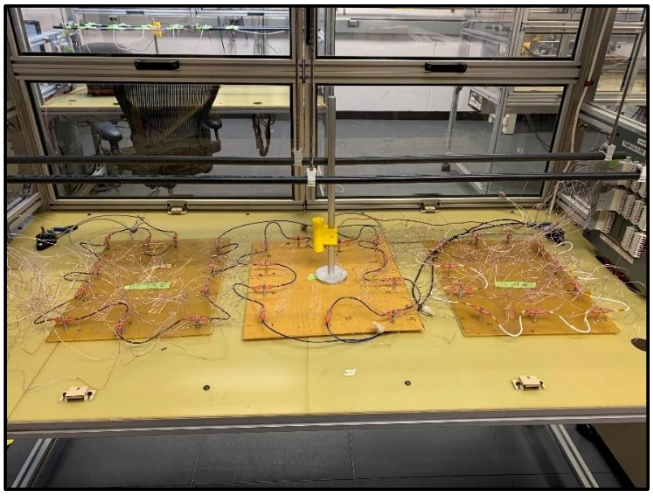

Figure 5 – Heating & Heat Cycling Test Setup

3.7 Pull Out Strength (Crimp Tensile)

The specimen was secured in a slotted bracket that was attached to a free-floating table that was attached to the base of a tensile/compression machine. An air jaw clamp was secured to the movable crosshead of the tensile/compression machine. Force was applied in the tensile direction at a rate of 1 inch per minute until reaching specimens specified force and held for one minute before returning to starting position. See Figure 6 for test setup. Testing was done in accordance with Product Specification 108-2043.

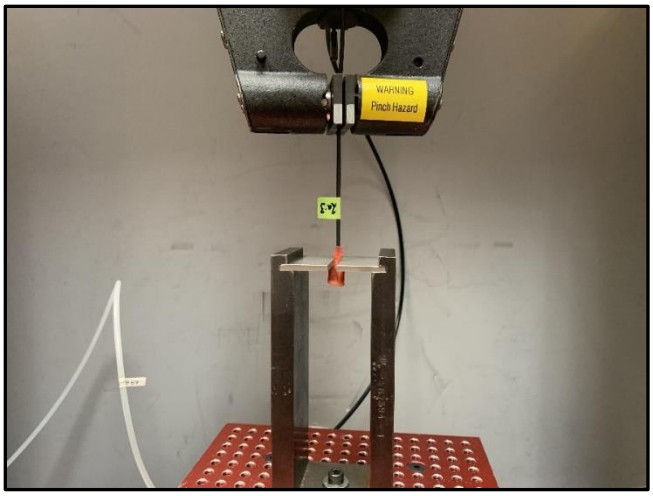

Figure 6 - Tensile Strength Test Setup

3.8 Secureness of Insulation (Unassembled)

A goal post bracket with a slotted plate, that was used to hold the specimen, was mounted to a free-floating table that was secured to the base of a tensile/compression machine. A clamp was secured to the movable crosshead of the tensile/compression machine. Force was applied in the tensile direction at a rate of 1 inch per minute subjecting the specimens to 3 pounds of force with a hold time of 1 minute. See Figure 7 for test setup. Testing was done in accordance with Product Specification 108-2043.

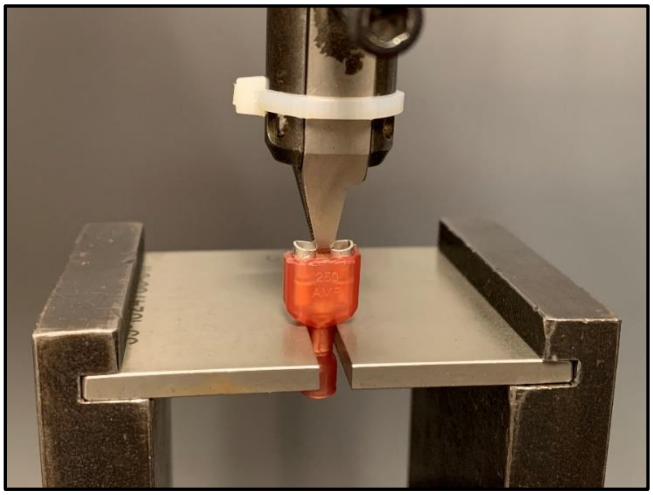

Figure 7 – Secureness of Insulation (Unassembled)

3.9 Secureness of Insulation (Assembled)

A goal post bracket with a slotted plate, that was used to hold the specimen, was mounted to a free-floating table that was secured to the base of a tensile/compression machine. A clamp was secured to the movable crosshead of the tensile/compression machine. Force was applied in the tensile direction at a rate of 1 inch per minute subjecting the specimens to 6 pounds of force with a hold time of 1 minute. See Figure 8 for test setup. Testing was done in accordance with Product Specification 108-2043.

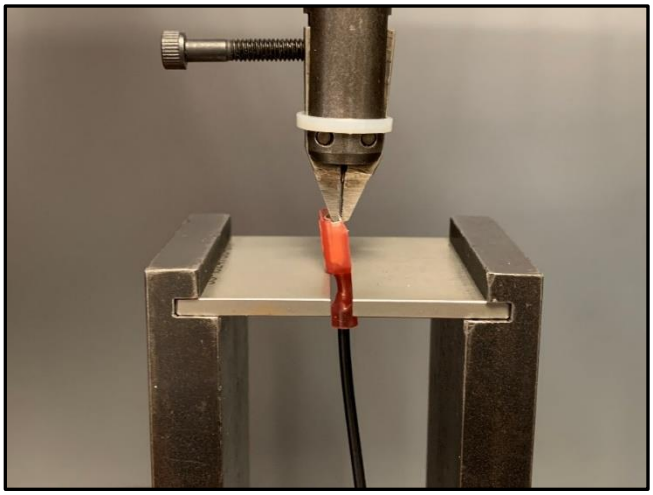

Figure 8 – Secureness of Insulation (Assembled)

3.10 Engagement-Disengagement (Engaging-Separating)

An air jaw clamp was attached to a free-floating table that was secured to the base of a tensile/compression machine. A test tab was secured to the movable crosshead of the tensile/compression machine. Force was applied in the compression direction at a rate of .5 inch per minute and fully mating the test tab with the contact. The test tab was then pulled in the tensile direction until the specimens were unmated at a rate of .5 inch per minute. The specimens were subjected to 6 cycles of Engagement-Disengagement. See Figure 9 for test setup. Testing was done in accordance with Product Specification 108-2043.

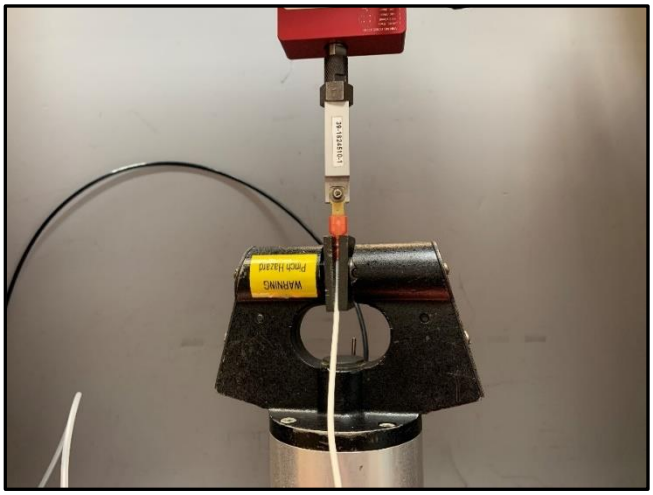

Figure 9 - Engagement-Disengagement Test Setup

3.11 Heat Age, 136°C

Specimens were exposed to a temperature of 136°C for 7 days. Testing was done in accordance with Product Specification 108-2043.

3.12 Heat Age/Humidity

Specimens were exposed to a temperature of 100°C for 7 days followed by exposure to 85% RH at 30°C for 24 hours. Testing was done in accordance with Product Specification 108-2043.