Ultra-Pod Fully Insulated FASTON* Receptacle and Tab

1. INTRODUCTION

1.1. Purpose

Testing was performed on Ultra-Pod Fully Insulated FASTON* Receptacles and Tabs to determine their conformance to the requirements of Product Specification 108-1285 Revision D.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Ultra-Pod Fully Insulated FASTON Receptacles and Tabs. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 08Apr91 and 04Jun91. The test file number for this testing is CTL7112-023-001. Additional testing was performed by Underwriters Laboratories Inc., 1285 Walt Whitman Road, Melville, NY 11747 (Project 09ME03135), and 2600 NW Lake Rd, Camas, WA 98607 (Project 09ME09820). This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory and Underwriters Laboratories Inc. respectively.

1.3. Conclusion

The Ultra-Pod Fully Insulated FASTON Receptacles and Tabs listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-1285 Revision D.

1.4. Product Description

The fully insulated FASTON Ultra-Pod system consists of a FASTON receptacle body partially assembled in an insulated housing and mated with FASTON tabs. The contact is brass and tin-plated brass; the housing is 6/6 Nylon per UL94V-2; the test tabs are brass, temper 2 CDA 26000 and dimensioned in accordance with NEMA DC-2.

1.5. Test Specimens

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

Test Group	Quantity	Part Number	Description
1,2,6,7	80	520963-2	250 Ultra-Pod receptacle with 18 AWG wire
1,2	40	520963-2	250 Ultra-Pod receptacle with 16 AWG wire
1,2,3,5,8	100	520963-2	250 Ultra-Pod receptacle with 14 AWG wire
4	20	520963-2	250 Ultra-Pod receptacle
9,10	6 each	520973-1	187 Ultra-Pod receptacle with 20 AWG wire
		520974-2	250 Ultra-Pod receptacle with 10 AWG wire
		520988-1	250 Ultra-Pod receptacle with 22 AWG wire
		521050-1	250 Ultra-Pod flag with 22 AWG wire
		521112-1	250 Ultra-Pod flag with 14 AWG wire
		521212-2	250 Ultra-Pod receptacle with 18 to 14 AWG wire
		521225-2	250 Ultra-Pod receptacle with 20 AWG wire
		521213-1	250 Ultra-Pod receptacle with 18 AWG wire

Figure 1 (continued)

| Indicates Change

Test Group	Quantity	Part Number	Description
9,10	6 each	521213-2	250 Ultra-Pod receptacle with 14 AWG wire
		521217-2	250 Ultra-Pod tab with 18 to 14 AWG wire
		521228-2	110 Ultra-Pod receptacle with 22 to 18 AWG wire
		521271-1	187 Ultra-Pod receptacle with 18 to 14 AWG wire
		521293-2	187 Ultra-Pod receptacle with 18 AWG wire
		521317-2	250 Ultra-Pod receptacle with 18 to 14 AWG wire
		521366-2	250 Ultra-Pod receptacle with 10 AWG wire
		521368-1	250 Ultra-Pod receptacle with 22 AWG wire
		521411-1	250 Ultra-Pod flag with 22 AWG wire
		521411-2	250 Ultra-Pod flag with 22 AWG wire
		521451-2	250 Ultra-Pod tab with 18 to 14 AWG wire
		521470-2	187 Ultra-Pod flag with 22 AWG wire
		521586-2	187 Ultra-Pod receptacle with 18 AWG wire
		521596-2	187 Ultra-Pod flag with 22 AWG wire
		521599-2	187 Ultra-Pod flag with 14 AWG wire
		521601-1	187 Ultra-Pod flag with 14 AWG wire
		521601-2	187 Ultra-Pod flag with 14 AWG wire
		521633-2	250 Ultra-Pod flag with 14 AWG wire
		521716-2	250 Ultra-Pod flag with 18 to 14 AWG wire
		521848-1	250 Ultra-Pod receptacle with 18 to 14 AWG wire
		521863-1	250 Ultra-Pod receptacle with 18 to 14 AWG wire

Figure 1 (end)

1.6. Environmental Conditions

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

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

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)									
	1	2	3	4	5	6	7	8	9	10
	Test Sequence (b)									
Examination of product	1,4	1,4	1,4	1,3	1,3	1,3	1,3	1,9	1,4	1,4
Termination resistance, dry circuit								2.7		
Dielectric withstanding, Condition A		2	3						3	
Dielectric withstanding, Condition C				2						
Dielectric withstanding, receptacle, tab entry portion					2					
Temperature rise vs current	2(c)							3,8		
Current cycling	3(c)									
Crimp tensile		3								
Durability								4		
Contact retention, Condition A						2				
Contact retention, Condition B										3
Engagement/disengagement force							2			
Humidity/temperature cycling								6		
Temperature life								5		
Heat age, Condition A			2							
Heat age, Condition B									2	2

NOTE

(a) See paragraph 1.5.

(b) Number indicates sequence in which tests are performed.

(c) Temperature rise and voltage drop measurements during current cycling are to be collected simultaneously. Prepare samples in accordance with UL 310. Use 30 AWG iron constantan wire thermocouple pressure fitted between contact and insulation as shown. (Welded arrangement optional). Fit must be sufficient to produce good thermal contact, void of free movement between thermocouple and contact. Thermocouple lead must have strain relief suitable to protect interface.

Figure 2

2. SUMMARY OF TESTING

2.1. Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of 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. Termination Resistance, Dry Circuit - Test Group 8

All termination resistance LLCR measurements, taken at 100 milliamperes maximum and 50 millivolts maximum open circuit voltage were less than 1 milliohm initially and less than 5 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
8	20	Initial	0.38	0.43	0.400
		Final	0.88	2.70	1.377

NOTE *All values in milliohms.*

Figure 3

2.3. Dielectric Withstanding, Condition A - Test Groups 2, 3 and 9

No dielectric breakdown or flashover occurred when the test voltage was applied between the terminal and lead shot.

2.4. Dielectric Withstanding, Condition C - Test Group 4

No dielectric breakdown or flashover occurred when the test voltage was applied between the terminal and a metal plate.

2.5. Dielectric Withstanding, Receptacle, Tab Entry Portion - Test Group 5

No dielectric breakdown or flashover occurred when the test voltage was applied between the terminal and a metal plate.

2.6. Temperature Rise vs Current - Test Groups 1 and 8

All specimens had a temperature rise of less than 30°C above ambient initially and less than 45°C after testing with specified current applied.

Test Group	Wire Size (AWG)	Test Current (amperes)	Temperature Rise Above Ambient (°C)
1	18	7.0	6.0
	16	10.0	8.4
	14	15.0	13.7
8 Initial	14	15.0	15.4
8 Final	14	15.0	42.3

Figure 4

2.7. Current Cycling - Test Group 1

No evidence of physical damage was visible as a result of current cycling. All specimens had a temperature rise of less than 85°C above ambient and less than a 15°C change in temperature rise (ΔT) between the 24th and 500th cycles when the specified current was applied. All specimens had voltage drops below the maximum requirement after the 24th and 500th cycles.

Cycle Number	Wire Size (AWG)	Test Current (amperes)	Temperature Rise Above Ambient (°C maximum)	Maximum Millivolt Drop	
				Actual	Requirement
24	18	14.0	22.70	6.58	13.0
	16	20.0	30.40	10.80	15.0
	14	30.0	43.30	14.10	20.0
500	18	14.0	21.80	6.72	17.0
	16	20.0	39.70	11.00	19.0
	14	30.0	46.10	14.70	26.0

Figure 5

2.8. Crimp Tensile - Test Group 2

All crimp tensile measurements were less than 20 pounds for 18 AWG wire, 30 pounds for 16 AWG wire and 50 pounds for 14 AWG wire.

2.9. Durability - Test Group 8

No evidence of physical damage was visible as a result of mating and unmating the specimens 6 times.

2.10. Contact Retention, Condition A - Test Group 6

No physical damage occurred to either the contacts or the housing, and no contacts dislodged from the housings as a result of supplying a minimum axial load of 10 pounds to the contacts of 187 and 250 product, and 8 pounds to the contacts of 110 product.

2.11. Contact Retention, Condition B - Test Group 10

No physical damage occurred to either the contacts or the housing, and no contacts dislodged from the housings as a result of supplying a minimum axial load of 5 pounds to the contacts.

2.12. Engagement/disengagement Force - Test Group 7

All contact engagement force measurements were less than 10 pounds for 250 product and less than 8 pounds for 187 and 110 product.

All contact disengagement force measurements for the first withdrawal were less than 17 pounds for 250 product, 20 pounds for 187 product and 14 pounds for 110 product. All contact disengagement force measurements for the sixth withdrawal were greater than 4 pounds for 250 product, 3 pounds for 187 product and 2 pounds for 110 product.

2.13. Humidity/temperature Cycling - Test Group 8

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

2.14. Temperature Life - Test Group 8

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

2.15. Heat Age, Condition A - Test Group 3

No evidence of physical damage was visible as a result of Condition A heat age testing.

2.16. Heat Age, Condition B - Test Groups 9 and 10

No evidence of physical damage was visible as a result of Condition B heat age testing.

3. TEST METHODS

3.1. Examination of Product

All specimens were examined visually and functionally.

3.2. Termination Resistance, Dry Circuit

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 6). The test current was maintained at 100 milliamperes maximum with a 50 millivolt maximum open circuit voltage.

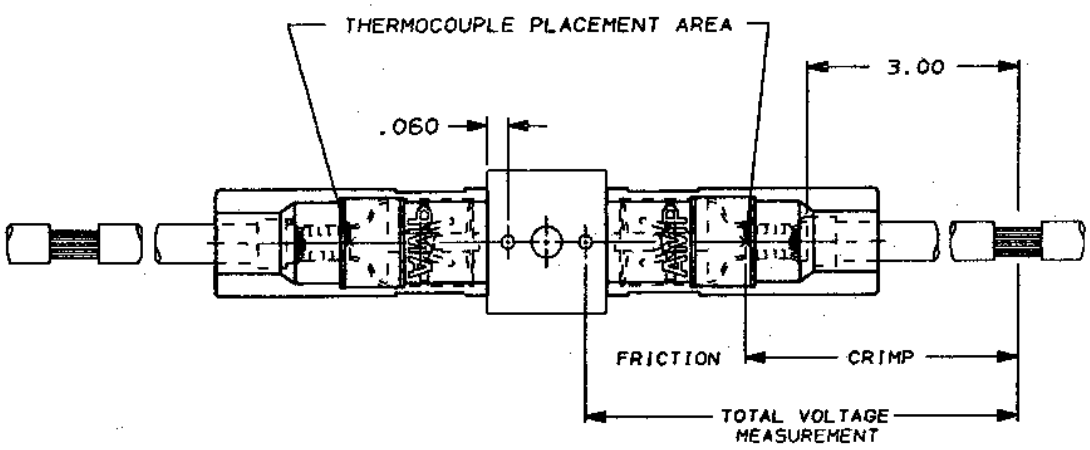

Figure 6
Termination Resistance Measurement Points

3.3. Dielectric Withstanding, Condition A

A test potential of 3400 volts AC was applied between the terminal and a beaker containing #12 lead shot for 1 minute and then returned to zero. The end of the terminal was coated with wax to prevent breakdown.

3.4. Dielectric Withstanding, Condition C

A test potential of 3000 volts AC was applied between the terminal and a metal plate for 1 minute and then returned to zero.

3.5. Dielectric Withstanding, Receptacle, Tab Entry Portion

A test potential of 1000 volts AC was applied between the terminal and a metal plate for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Specimen temperature was measured while energized at a specified 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 rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded.

3.7. Current Cycling

Specimens were subjected to specified current for 500 cycles consisting of current ON for 45 minutes and current OFF for 15 minutes. Temperature measurements were taken at 24 and 500 cycles.

3.8. Crimp Tensile

Crimp tensile was measured using a tensile/compression device with a free floating fixture and a rate of travel of 1 inch per minute.

3.9. Durability

Specimens were mated and unmated 6 times at a maximum rate of 600 cycles per hour.

3.10. Contact Retention, Condition A

An axial load of 10 pounds for 250 and 187 product and 8 pounds for 110 product was applied to each contact in a direction to cause removal of the contact from the housing.

3.11. Contact Retention, Condition B

An axial load of 5 pounds was applied to each contact in a direction to cause removal of the contact from the housing.

3.12. Engagement/disengagement Force

The force required to engage and disengage a test tab and a FASTON receptacle was measured using a tensile/compression device with a free floating fixture.

3.13. Humidity/temperature Cycling

Mated specimens were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity.

3.14. Temperature Life

Mated specimens were exposed to a temperature of 118 ± 2°C for 33 days.

3.15. Heat Age, Condition A

Wired terminals were exposed to a temperature of 136°C for 7 days.

3.16. Heat Age, Condition B

Wired terminals were exposed to a temperature of 180°C for 7 days.