AMPSEAL* Reduced Wire Size Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMPSEAL* Reduced Wire Size Connectors to determine their conformance to the requirements of Product Specification 108-160402

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the AMPSEAL Reduced Wire Size Connectors. Testing was performed at the TE Product Testing Laboratory

1.3. Conclusion

The AMPSEAL*Reduced Wire Size Connectors listed in paragraph 1.5, conform to the electrical, mechanical, and environmental requirements of Product Specification 108-160402 Revision A

1.4. Product Description

AMPSEAL Reduced Wire Size Connectors are high density, general purpose, environmentally sealed connectors used for wire to PCB applications in automotive, consumer, industrial, trucking, off-highway, construction, farming, and marine markets

1.5. Test Specimens

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

TERMINAL TESTING			
Test Group	Quantity	Part Number	Description
1	6	770520-5	Tin receptacle with 20 AWG wire
	5	770520-5	Tin receptacle with 22 AWG wire
	6	770520-6	Tin receptacle with 22 AWG wire
	5	770520-6	Tin receptacle with 24 AWG wire
2	100	770520-5	Tin receptacle with 20 AWG wire
	100	770520-5	Tin receptacle with 22 AWG wire
	100	770520-6	Tin receptacle with 22 AWG wire
	100	770520-6	Tin receptacle with 24 AWG wire
3	50	770520-5	Tin receptacle with 20 AWG wire
	50	770520-5	Tin receptacle with 22 AWG wire
	50	770520-6	Tin receptacle with 22 AWG wire
	50	770520-6	Tin receptacle with 24 AWG wire
4	10	770520-5	Tin receptacle with 20 AWG wire
	10	770520-5	Tin receptacle with 22 AWG wire
	10	770520-6	Tin receptacle with 22 AWG wire
	10	770520-6	Tin receptacle with 24 AWG wire
5	6	2371884-1	23 position plug assembly
	6	776228-1	23 position tin header assembly
	69	770520-5	Tin receptacle with 20 AWG wire
	69	770520-6	Tin receptacle with 22 AWG wire

Figure 1

1.5 Test Specimens (cont)

MAT SEAL TESTING			
Group	Quantity	Part Number	Description
1	10	2371884-1	23 position plug assembly
	10	776200-1	23 position tin header assembly
	230	770520-6	Tin receptacle with 24 AWG wire
2	10	2371884-1	23 position plug assembly
	10	776200-1	23 position tin header assembly
	230	770520-6	Tin receptacle with 24 AWG wire
3	10	2371884-1	23 position plug assembly
	10	776200-1	23 position tin header assembly
	230	770520-6	Tin receptacle with 24 AWG wire
4	3	2371884-1	23 position plug assembly
	23	770520-6	23 position plug assembly
5	2	2371884-1	23 position plug assembly
	2	776200-1	23 position tin header assembly
	46	770520-6	Tin receptacle with 24 AWG wire
6	1	2371884-1	23 position plug assembly
	1	776200-1	23 position plug assembly
	11	770520-1	Tin receptacle with 20 AWG wire
	12	776264-1	Sealing plug, size 20 cavity
7	1	2371884-1	23 position plug assembly
	1	776200-1	23 position plug assembly
	11	770520-1	Tin receptacle with 20 AWG wire
	12	776264-1	Sealing plug, size 20 cavity

Figure 2

1.6. Environmental Conditions

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

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

1.7 Qualification Test Sequence

TERMINAL TEST OR EXAMINATION	TEST GROUP (a)				
	1	2	3	4	5
	TEST SEQUENCE (b)				
Examination of product	1	1	1,7	1,7	1,7
Termination resistance, dry circuit			2,4,6		
Insulation resistance					2,5
Dielectric withstand voltage					3,6
Temperature rise vs current				4	
Current cycling				5	
Voltage drop				3,6	
Crimp tensile, USCAR-21		2			
Terminal cycling				2	
Conductor crimp cross section, USCAR-21	2				
Temperature/humidity cycling, Figure 3					4
Temperature/humidity cycling, USCAR-21			5		
Thermal shock			3		

Figure 3a

MAT SEAL TEST OR EXAMINATION	TEST GROUP (a)						
	1	2	3	4	5	6	7
	TEST SEQUENCE (b)						
Examination of product	1,11	1,6	1,5	1,3	1,4	1,3	1,3
Insulation resistance	2,5,9	2,5	2,4				
Dielectric withstand voltage	3,6,10						
Terminal insertion				2			
Maintenance aging, durability					2		
Temperature life	7						2
Immersion, TE Spec 109-74-5	4,8						
Immersion, ISO 20653:2006		3					
Dust		4					
High pressure spray			3			2	
Pressure					3		

Figure 3b

NOTE

(a) See paragraph 1.5

(b) Numbers indicate sequence in which tests are performed

2. SUMMARY OF TESTING

2.1 Examination of Product
All specimens submitted for testing were selected from normal current production

2.2 Termination Resistance, Dry Circuit
All termination resistance measurements, taken at 50 milliamperes and 20 millivolts maximum open circuit voltage were less than 10 milliohms.

2.3 Insulation Resistance
All insulation resistance measurements were greater than 100 megohms

2.4 Dielectric Withstand Voltage
No dielectric breakdown or flashover occurred

2.5 Temperature Rise vs Current
All specimens had a temperature rise of less than 40°C above ambient

2.6 Current cycling
No physical damage occurred as a result of current cycling

2.7 Voltage Drop
All termination resistance measurements, taken at the specified current, were less than 10 milliohms

2.8 Crimp Tensile
All crimp tensile values met the minimum requirement for the tested wire size

2.9 Terminal Cycling
No physical damage occurred as a result of mating and unmating the specimens 10 times

2.10 Conductor Crimp Cross Section
Cross section views met the requirements for each crimp height

2.11 Temperature/Humidity Cycling
No evidence of physical damage was visible as a result of temperature/humidity cycling. Samples passed subsequent testing

2.12 Temperature/Humidity Cycling USCAR-21
No evidence of physical damage was visible as a result of temperature/humidity cycling. Samples passed subsequent testing

2.13 Thermal Shock
No evidence of physical damage was visible as a result of thermal shock. Samples passed subsequent testing

2.14 Terminal Insertion
Insertion forces were less than the 10N maximum requirement

2.15 Maintenance Aging, Durability
No evidence of physical damage was visible as a result of maintenance aging, durability cycling. Samples passed subsequent testing

2.16 Temperature Life
No evidence of physical damage was visible as a result of temperature life testing. Samples passed subsequent testing

2.17 Immersion, TE Spec 109-74-5
No water ingress was found after a 100mm deep immersion for 1 hour

2.18 Immersion, ISO 20653:2006E
No water ingress was found after a 1 meter deep immersion for 30 minutes

2.19 Dust
No ingress of dust was observed after testing

2.20 High Pressure Spray
No water ingress was found after high pressure spray testing. Samples passed subsequent testing

2.21 Pressure
No air leakage was observed during the internal pressure testing

3. TEST METHODS

3.1 Examination of Product
Product drawings and test plans were used to examine the specimens visually and functionally

3.2 Termination Resistance, Dry Circuit
Each sample was subjected to 20-mV maximum open circuit voltage at 100 mA maximum current potential. Measurements were taken using a 4-wire method. Current was forward and reversed bias for each reading

3.3 Insulation Resistance
Measurements were taken between adjacent contacts of the mated assembly by applying 500 VDC for 15 seconds.

3.4 Dielectric Withstand Voltage
The test samples were subjected to 500VDC with a 1-minute hold. Measurements were taken between adjacent contacts of the mated assembly. The test potential of 500VDC was applied while monitoring a maximum leakage current of 5.0mA

3.5 Temperature Rise vs Current
T -Rise above ambient. Start at 1 A and increase by 1 A until 40°C average. 3 consecutive readings within 5 minutes Max. 2°C delta T -Rise before increasing to next current level

3.6 Current cycling
The power supplies were set to provide 45 minutes of ON time at 125% of test current and 15 minutes of OFF time. Millivolt drop and temperature measurements were recorded twice per week, 30 minutes into the ON cycle

3.7 Voltage Drop
Each sample was subjected to voltage drop testing before and after current cycling testing.

3.8 Crimp Tensile
Samples were pulled by the wire until the crimps were fully separated

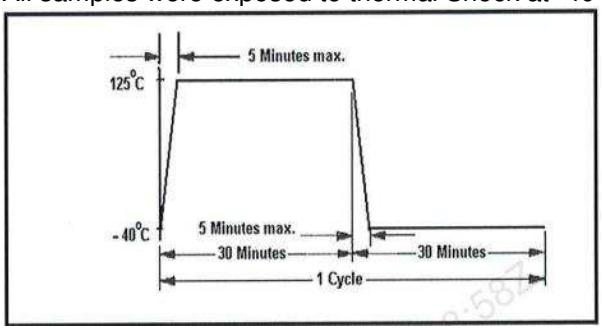
3.9 Terminal Cycling
Each terminal pair was completely mated and unmated manually, for a total of 10 cycles as a precondition to current cycling

3.10 Conductor Crimp Cross Section
Cross-section analysis was performed on all conductor crimps at each crimp height, nominal, min, and max tolerance

3.11 Temperature/Humidity Cycling
Samples were subjected to the following profile for a total of ten (10) cycles
a. 23C @ 75% for 4 hours
b. 55C @ 96% for 10 hours
c. -40C for 2 hours
d. 125C for 2 hours

3.12 Temperature/Humidity Cycling USCAR-21
Samples were subjected to the following profile for a total of four (4) cycles
a. 16 hours@ 95-98 percent relative humidity at +65°C ± 3°C. Humidity is controlled
b. 2 hours @ -40°C ± 3 °c
c. 2 hours @ +85°C ± 3 °C. Humidity not controlled
d. 4 hours @ +23°C ± 3 °c

3.13 Thermal Shock
All samples were exposed to thermal Shock at -40°C to 125°C for 72 cycles



3.14 Terminal Insertion
Terminals were inserted in the connector using an Instron machine and the insertion forces were recorded

3.15 Maintenance Aging, Durability
Insert and remove the terminal from its respective circuit 5 times

3.16 Temperature Life
All samples were exposed to 105°C for 250 hours.

3.17 Immersion, TE Spec 109-74-5

3.18 Immersion, ISO 20653:2006E
Samples were submerged in ambient tab water for 30 minutes at a depth of 1 meter

3.19 Dust
Test samples were placed in a sealed chamber where they were sprayed with Arizona Road Dust (Fine Grade) for 6 seconds with a 15-minute break

3.20 High Pressure Spray
Spray at 0°, 30°, 60°, 90° at a distance of 100 to 150 mm

3.21 Pressure
Samples were submerged in a salt solution (15g NaCl to 1-liter tap water ratio). The samples were then subjected to 7psi pressure before a conditioning loop and 5 psi after a conditioning loop. Samples were observed for 15 seconds to verify there were no bubbles