

**Engineering Report for Mini UMNL Plug HSG- RM #2136597**

**1. INTRODUCTION**

1.1 Purpose

Testing was performed on 16P MINI UMNL PLUG HSG to determine its conformance related to the requirements of product specification 108-1542 Rev. D. The verification is performed to qualify 'Additional resin # 2136597'. 16P Plug housing is considered representative of all other positions.

1.2 Scope

This specification covers the electrical, mechanical, and environmental performance for 16P MINI UMNL PLUG HSG made from raw material #2136597. Testing was performed at Harrisburg Electrical Components Test Laboratory between 2022-07-20 and 2022-09-13. The associated test number is EA20220166T.

Re-tested 16P Plug HSG made from raw material #2136597 at Medway Electrical Components Test Laboratory on June 8, 2023 for 'Housing Locking Mechanism Strength Test' under EA20230216T Rev A.

1.3 Conclusion

Based on the test results, all samples meet the requirement according to product specification 108-1542 Rev D.

1.4 Test Specimens

Specimens with the following part numbers were used for test:

Test Group	Test Set	Quantity	Part Number	Description
1	2	3	770583-1	16P MINI UMNL PLUG HSG (RM #2136597)
		3	1-794068-0	16P MINI UMNL HDR W/DH SN
		48	794407-1	20-16AWG, Socket, Tin (Crimped with wire)
2	4	3	770583-1	16P MINI UMNL PLUG HSG with contact 794407-1 (RM #2136597)
		3	1-794068-0	16P MINI UMNL HDR W/DH SN
		48	794407-1	20-16AWG, Socket, Tin (Crimped with wire)

1.5 Test Sequence

Test Item	Test Group 1	Test Group 2
	Test Sequence (a),( b)	
Initial Examination of Product	1	1
Dry Circuit Resistance	3,7	
Insulation Resistance		3,7
Dielectric Withstanding Voltage		4,8
Vibration, Sinusoidal	5	
Mechanical Shock	6	
Durability	4	
Contact Retention		9
Contact Insertion Force		2
Mating Force	2	
Un-mating Force	8	
Housing Lock Strength		10
Thermal Shock		5
Humidity-Temperature Cycling		6
Final Examination of Product	9	11

**NOTE :** (a) Test group defined per custom requirement.

(b) Numbers indicate sequence in which tests performed

1.6 Environmental Conditions

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

Temperature: 15°C to 35°C  
 Relative Humidity: 25% to 80%

**2. Summary of Testing**

**2.1 Examination of Product – All Test Group**

All specimens submitted for testing were representative of normal production lots. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

**2.2 Dry Circuit Resistance- Test Group 1**

All dry circuit resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage met the initial requirement of 10 milliohms maximum and 20 milliohms after testing.

**2.3 Insulation Resistance- Test Group 2**

All insulation resistance measurements were greater than 1000 megohms initially and 100 megohms after testing.

**2.4 Dielectric Withstanding Voltage- Test Group 2**

No dielectric breakdown or flashover occurred.

**2.5 Vibration- Test Group 1**

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

**2.6 Mechanical Shock- Test Group 1**

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

**2.7 Durability- Test Group 1**

No physical damage occurred as a result of mating and unmating tin plated specimens 20 times.

**2.8 Contact Retention- Test Group 2**

No physical damage occurred to either the contacts or the housing, and no contacts dislodged from the housings as a result of supplying an axial load of 35.6 N [8 lbf] to the contacts.

**2.9 Contact Insertion- Test Group 2**

The force required to insert each contact into its housing cavity was less than 13.3 N [3 lbf].

**2.10 Mating Force- Test Group 1**

All mating force measurements were less than 6.7 N [1.5 lbf].

**2.11 Unmating Force- Test Group 1**

All unmating force measurements were greater than 0.7 N [.15 lbf].

**2.12 Housing Lock strength- Test Group 2**

Mated specimens did not unmate under an axial load of 40 N [9 lbf].

**2.13 Thermal Shock- Test Group 2**

No evidence of physical damage was visible as a result of exposure to thermal shock and meet requirements of additional tests as specified in the test sequence

**2.14 Humidity-Temperature Cycling- Test Group 2**

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling and meet requirements of additional tests as specified in the test sequence

## 2.15 Final Examination of Product- All Test Group

Specimens were visually examined and no damage detrimental to product performance were observed.

## 3. TEST METHODS

### 3.1 Examination of Product- All Test Sets

Specimens were visually examined without magnification and no evidence of physical damage detrimental to product performance was observed.

### 3.2 Dry Circuit Resistance

Low level dry circuit resistance measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

### 3.3 Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

### 3.4 Dielectric Withstanding Voltage

A test potential of 1500 volts AC was applied between the adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero

### 3.5 Vibration, Sinusoidal

Mated specimens were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 1.5 mm [0.06 in], double amplitude. The vibration frequency was varied uniformly between the limits of 10 and 55 Hz and returned to 10 Hz in 1 minute. This cycle was performed 120 times in each of 3 mutually perpendicular planes for a total vibration time of 6 hours. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

### 3.6 Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units(g<sub>peak</sub>) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

### 3.7 Durability

Specimens were mated and unmated for 20 cycles at less than a maximum rate of 500 cycles per hour

**3.8 Contact Retention**

An axial load of 35.6 N [8 lbf] was applied to each contact and held for 60 seconds. The force was applied in a direction to cause removal of the contacts from the housing.

**3.9 Contact Insertion force**

Contact insertion force was measured by applying a force to each contact until the contact was properly seated in the housing.

**3.10 Mating Force**

The force required to mate individual specimens was measured using a tensile/compression device with a free-floating fixture and a rate of travel of 12.7 mm (0.5 inch) per minute.

**3.11 Unmating Force**

The force required to unmate individual specimens was measured using a tensile/compression device with a free-floating fixture and a rate of travel of 0.5 inch per minute.

**3.12 Housing Lock Strength**

An axial load was applied to mated specimens in a manner which would cause the specimen locking latches to disengage.

**3.13 Thermal Shock**

Specimens were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 105°C. The transition between temperatures was less than 1 minute.

**3.14 Humidity/Temperature Cycling**

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

**3.15 Final Examination of Product**

Specimens were visually examined for evidence of physical damage detrimental to product performance.

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