Electrical Pre-Testing on High Temperature Positive Lock* Terminals

1. INTRODUCTION

1.1 Purpose

Testing was performed to generate pre-test data on high temperature Positive Lock Terminals for a customer.

1.2 Scope

Testing was performed at the Norwood Electrical Components Test Laboratory between January 20, 2017 and January 25, 2017. Detailed test data is on file and maintained at the Harrisburg Electrical Components Laboratory under test number EA20170015T.

1.3 Conclusion

Specimens from both test sets had temperature rise results lower than the standard 30°C. No requirements were available for current cycling.

1.4 Test Specimens

Refer to Table 1 for the allocation and attributes of submitted test specimens.

Table 1 – Test Specimens

Test Set	Qty	Part Number	Attributes
1	14	2238104-1	High Temperature Positive Lock Terminal Crimped onto 16AWG UL3071 Wire
	14	62627-3	Double Sided Brass Test Tab
2	14	2238104-1	High Temperature Positive Lock Terminal Crimped onto 14AWG UL3321 Wire
	14	62627-3	Double Sided Brass Test Tab

1.5 Test Sequence

Refer to Table 2 for the sequence of testing performed on the specimens listed in Table 1.

Table 2 – Performed Test Sequence

Test or Evaluation	Test Set	
	1	2
	Test Sequence	
Temperature Rise vs Current	1,3	1,3
Current Cycling	2	2

Numbers indicate sequence in which tests were performed.

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 Temperature Rise vs Current

Test Set 1 temperature rise data for a 10 ampere current and 16AWG wire is shown in Table 3. Final temperature rise was performed after 48 cycles of current cycling. All values were less than the standard 30°C limit. No requirement was supplied with the test request.

Table 3 – Temperature Rise (°C) – Test Set 1

Specimen	Initial	Final
Min	9.7	9.4
Max	11.2	11.6
Mean	10.4	10.6
Std Dev	0.5	0.6
N	14	14

Test Set 2 temperature rise data for a 15 ampere current and 14AWG wire is shown in Table 4. Final temperature rise was performed after 48 cycles of current cycling. All values were less than the standard 30°C limit. No requirement was supplied with the test request.

Table 4 – Temperature Rise (°C) – Test Set 2

Specimen	Initial	Final
Min	17.3	16.9
Max	19.8	20.3
Mean	18.8	18.9
Std Dev	0.7	1.1
N	14	14

2.2 Current Cycling

Test Set 1 temperature rise generated during 20 ampere current cycling with 16AWG wire is shown in Table 5. No requirement was supplied with the test request.

Table 5 – Temperature Rise (°C) – Test Set 1

Specimen	Cycle 1	Cycle 48
Min	37.5	37.7
Max	42.3	42.5
Mean	40.1	40.3
Std Dev	1.5	1.6
N	14	14

Test Set 2 temperature rise generated during 30 ampere current cycling with 14AWG wire is shown in Table 6. No requirement was supplied with the test request.

Table 6 – Temperature Rise (°C) – Test Set 2

Specimen	Cycle 1	Cycle 48
Min	67.0	68.1
Max	76.2	79.9
Mean	72.9	75.6
Std Dev	2.6	3.6
N	14	14

3. TEST METHODS

3.1 Temperature Rise vs Current

Test specimens were submitted to the lab crimped onto 12 inch lengths of wire. The specimens were spaced out and mounted to a test board in accordance with UL310, Oct 17, 2014, using ¾" standoffs and TE double sided brass test tabs (p/n 62627-3) as shown in Figure 1.

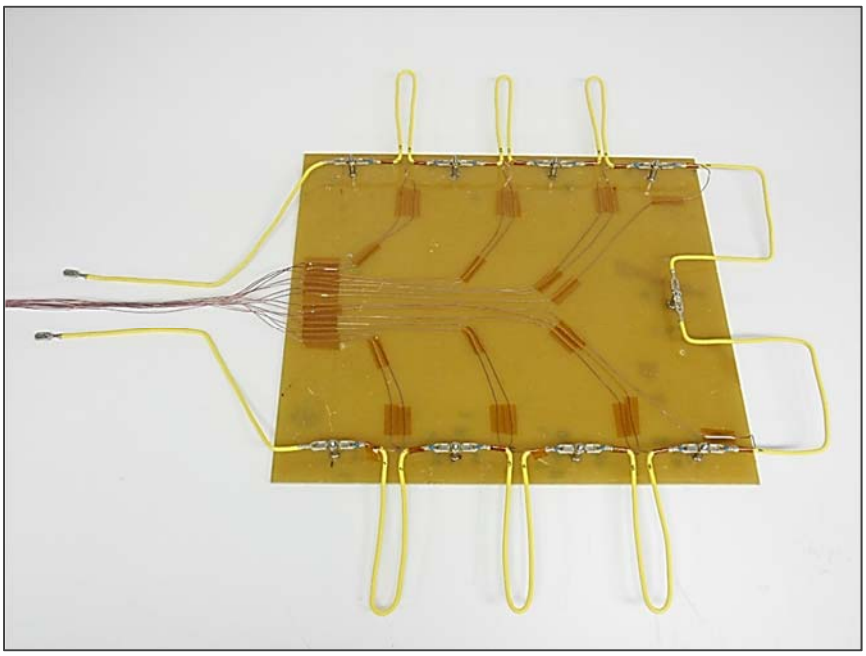

Figure 1 – Test Specimen Layout

30AWG Type "T" thermocouples were attached to the test specimens with thermally conductive epoxy as shown in Figure 2.

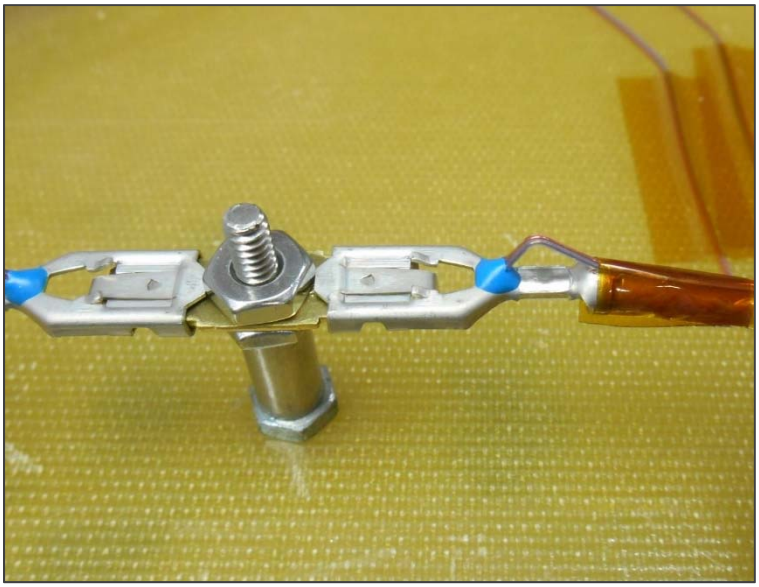

Figure 2 – Thermocouple Attachment

The test specimens were placed inside a vented enclosure located inside the thermal test chamber as shown in Figure 3.

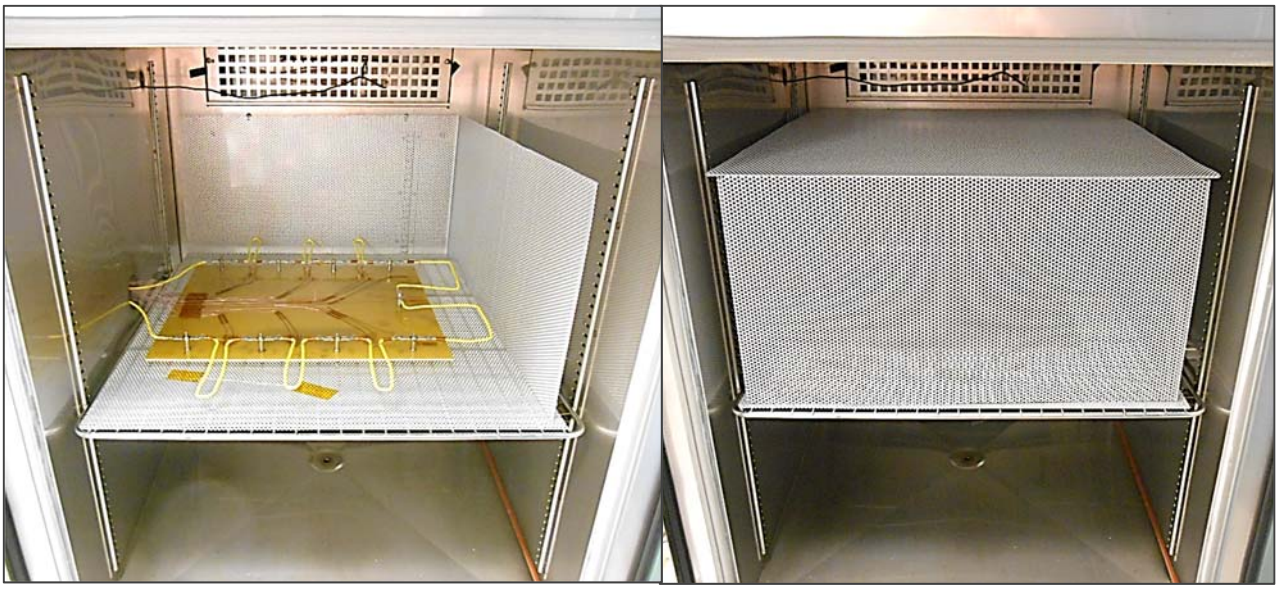

Figure 3 – Test Setup

The voltage applied to the chamber fan was reduced from 220 Vac to 120 Vac to limit the air flow. The chamber temperature was set to 60°C and enclosure was allowed to stabilize until the ambient thermocouple, located in the center of the test board and in the same plane as the test specimens, registered 60°C. Temperature rise testing was performed according to EIA-364-70C, Method 1. A test current of 10 amperes was applied for Test Set 1 specimens and 15 amperes for Test Set 2 specimens. A current reversing unit was used to reverse the polarity of the test current to eliminate thermocouple error. The specimen temperatures were monitored until stable. Stability occurred when three consecutive temperature measurements taken at five minute intervals did not differ by more than 1°C.

3.2 Current Cycling

Current cycling testing used the same test setup described in section 3.1. The chamber temperature was set to 60°C and enclosure was allowed to stabilize until the ambient thermocouple, located in the center of the test board and in the same plane as the test specimens, registered 60°C. The chamber setpoint was adjusted slightly during the test to maintain a 60°C ambient inside the enclosure. Testing was performed according to Paragraph 6.5 of UL 310, October 17, 2014 by subjecting test specimens to 48 current cycles. A test current of 20 amperes was applied for Test Set 1 specimens and 30 amperes for Test Set 2 specimens. One cycle consisted of 45 minutes with the current on and 15 minutes with the current off. Temperature rise was measured at the end of the on period.