MAG-MATE* Standard Terminals

1. INTRODUCTION

1.1. Purpose

Testing was performed on MAG-MATE* standard terminals to determine their conformance to the requirements of Product Specification 108-2012 Revision J4.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of MAG-MATE standard terminals. Testing was performed at the C&EP Group Laboratory between 12Dec83 and 14Aug85. The test file number for this testing is CTL1039-301-001.

Additional testing was performed at the Engineering Assurance Product Testing Laboratory between 20Jun07 and 05Oct07. The test file number for this testing is CTL1039-121.

A second round of additional testing was performed at the Engineering Assurance Product Testing Laboratory on 300 Series MAG-MATE terminals to the requirements of Test Groups 1 and 2 between 23Apr08 and 30Jun08. The test file numbers for this testing are EA20080360T and EA20080404T.

Additional testing was performed at the Engineering Assurance Product Testing Laboratory on 300 Series Poke-In MAG-MATE terminals to the requirements of Test Groups 1 and 2 between 12Dec11 and 03Feb12. The test file number for this testing is EA20110895T.

Additional testing was performed at Harrisburg Electrical Components Test Laboratory on 300 Series Box Poke-In Combination Tab MAG-MATE terminals to the requirements of Test Groups 1 and 2 between 04Aug17 and 26Sep17. The test file number for this testing is EA20170414T. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory.

Additional testing was performed at the Harrisburg Electrical Components Test Laboratory on 187 Box MAG-MATE terminals on aluminum magnet wire with single and double terminations to the requirements of Test Groups 1 and 2 between 26Feb15 and 28Apr15. The test file number for this testing is EA20150044T. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory.

Additional testing was performed at TE Connectivity Shanghai Electrical Test Laboratory on 300 Series Box Poke-In terminals on aluminum magnet wire with single termination with 16.5AWG to the requirements of Test Groups 1 and 2 between 4 March 19 and 11 July 19. The test file number for this testing are TP-19-00459 and TP-19-01884.The documentations are on file at and available from the TE Connectivity Shanghai Electrical Test Laboratory.

Additional testing was performed at TE Connectivity Shanghai Electrical Test Laboratory on 300 Series Box Poke-In terminals on copper and aluminum magnet wire with single termination with copper 20-18AWG and aluminum 19-18AWG to the requirements of Test Groups 1 and 2 between 19 Dec. 19 and 03 March. 20. The test file number for this testing are TP-19-03491.The documentations are on file at and available from the TE Connectivity Shanghai Electrical Test Laboratory.

Additional testing was performed at TE Connectivity Shanghai Electrical Test Laboratory on MAG-MATE W/250 CONN TAB TPBR on aluminum magnet wire with single termination with aluminum 24AWG [0.50mm] to the requirements of Test Groups 1 and 2 between 26 Aug. 20 and 22 Oct. 20. The test file number for this testing are TP-20-01212.The documentations are on file at and available from the TE Connectivity Shanghai Electrical Test Laboratory.

Additional testing was performed at the Harrisburg Electrical Components Test Laboratory on 300 Series Box Poke-In MAG-MATE terminal 62420-1 on 22.5 AWG copper and 21.5 AWG aluminum magnet wire with single and double terminations to the requirements of Test Groups 1 and 2 between 22Jan21 and 18Mar21. Documentation for testing is on file and maintained at HECTL under test file number EA20210013T.

Additional testing was performed at the Harrisburg Electrical Components Test Laboratory on 300 Series Box MAG-MATE with Multi-Spring Pin terminal 2238306-2 on #20 AWG copper and #23 AWG copper magnet wire with single and double terminations to the requirements of Test Groups 1 and 2 between 21Feb23 and 13Apr23. Documentation for testing is on file and maintained at HECTL under test file number EA20230054T.

1.3. Conclusion

The MAG-MATE standard terminals listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2012, Revision J1.

1.4. Product Description

These terminals are designed for general use as a magnet wire to external circuit interface and are compatible with copper wire in sizes 16.5(use 17AWG spec. in paragraph 2.2) through 32 AWG or aluminum wire in sizes 16.5(use 17AWG spec. in paragraph 2.2) through 34 AWG with a coating of organic polymer material having NEMA temperature ratings of 105 to 200°C.

1.5. Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for testing (See Figure 1).

Part Number	Description
63273-1	MAG-MATE 187 FASTON* tab
62511-1	MAG-MATE 187 FASTON tab
62514-1	MAG-MATE 300 Series 187 FASTON tab
62651-1	MAG-MATE 250 FASTON tab
62988-1	MAG-MATE 250 FASTON tab
63063-2	MAG-MATE Poke-In 110 FASTON tab TPBR
1742160-1	MAG-MATE 300 Series 187 FASTON terminal tab
1217924-1	MAG-MATE 250 FASTON tab
63591-1	MAG-MATE 300 Series Poke-in #19 IDC Slot
62833-1	MAG-MATE 300 Series Poke-In #24 IDC Slot
2825382-1	MAG-MATE 300 Series, 187 Combo Poke-In Tab with #9 IDC Slot
2825380-1	MAG-MATE 300 Series, Poke-In Terminal with #9 IDC Slot
2238061-1	MAG-MATE 187 Box Posted Sn Pl Brass Terminal (terminated to 31 AWG, 33 AWG, and 34.5 AWG aluminum magnet wire)
2238060-1	MAG-MATE 187 Box Posted Sn Pl Brass Terminal (terminated to 29 AWG, 30 AWG, and 31 AWG aluminum magnet wire)
2238062-1	MAG-MATE 187 Box Posted Sn Pl Brass Terminal (terminated to 27 AWG, 28 AWG, and 29 AWG aluminum magnet wire)
2232555-1	MAG-MATE W/250 CONN TAB TPBR (terminated to 24AWG [0.50mm] single aluminum magnet wire)
62420-1	MAG-MATE 300 Series, Poke-In on single and double #22.5 awg cu mag wire
62420-1	MAG-MATE 300 Series, Poke-In on single and double #21.5 awg al mag wire
2238306-2	MAG-MATE 300 Series with Multi-Spring Pin on single and double #20 awg and #23 awg cu mag wire

Figure 1

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)		
	1	2	3
	Test Sequence (b)		
Initial examination of product	1	1	1
LLCR	2,6		
Current cycling		2	
Insertion force (c)			2
Extraction force (c)			3
Thermal shock	5		
Humidity/temperature cycling	4		
Temperature life	3		
Final examination of product	7	3	4

Figure 2

NOTE

(a) See Paragraph 1.5

(b) Numbers indicate sequence which tests were performed.

1.7. 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 Examination of Product – All Test Groups

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

2.2. Low Level Contact Resistance (LLCR) – Test Group 1 and 2

All LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage met the requirements of Figure 3.

Wire Size (AWG)	Current Cycling				Temperature Life Humidity/Temperature Thermal Shock	
	Copper		Aluminum		Copper	Aluminum
	Resistance (milliohms max)	Test Current (amperes) See Note	Resistance (milliohms max)	Test Current (amperes) See Note	Resistance (milliohms max)	
17	1.4	22.0	2.9	15.0	1.1	2.2
18	1.8	20.0	3.6	13.5	1.4	2.8
19	2.2	18.0	4.4	12.0	1.7	3.4
20	2.7	16.0	5.5	11.0	2.1	4.2
21	3.5	14.0	7.0	9.5	2.7	5.4
21.5			7.8	8.0		6.0
22	4.3	12.5	8.6	8.5	3.3	6.6
22.5	4.45	11.75			3.4	
23	4.6	11.0	9.1	7.5	3.5	7.0
24	5.7	9.5	11.4	6.5	4.4	8.8
25	7.2	8.0	15.9	5.5	5.5	12.2
26	9.1	7.5	18.2	5.0	7.0	14.0
27	11.4	6.0	22.8	4.0	8.8	17.6
28	14.4	5.0	28.9	3.5	11.1	22.2
29	18.0	4.5	36.0	3.0	13.8	27.7
30	23.0	3.5	46.0	2.3	17.7	35.4
31	29.1	2.0	58.2	1.3	22.4	44.7
32	36.0	1.5	72.0	1.0	27.6	55.4
33	45.7	1.0	91.5	0.7	35.2	70.4
34	58.0	0.5	116.0	0.35	44.4	88.9

Figure 3

NOTE
Current which produces 100°C initial temperature on the magnet wire. Average reading from 3 thermocouples equally spaced on 12 inch lengths of magnet wire.

2.3. Current Cycling – Test Group 2

All termination resistance measurements taken at specified current met the requirements of Figure 3.

2.4. Insertion Force – Test Group 3

All insertion force measurements were less than 66.7 N [15 lbf] for poke-in connections and 355.9 N [80 lbf] for termination into plastic housings.

2.5. Extraction Force – Test Group 3

All extraction force measurements were greater than 22.2 N [5 lbf] poke-in connections, 22.2 N [5 lbf] for standard terminal cavity retention and 89 N [20 lbf] for latch-in type terminal cavity retention.

2.6. Thermal Shock – Test Group 1

No evidence of physical damage was visible as a result of thermal shock testing.

2.7. Humidity/Temperature Cycling – Test Group 1

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

2.8. Temperature Life – Test Group 1

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

2.9. Termination Resistance – Test Group 2

All initial and final termination resistance measurements were less than the maximum values specified in Figure 3 of TE Product Specification 108-2012, Rev. H.

2.10. Final Examination of Product – All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts. Testing was performed in accordance with EIA-364-18B.

3.2. Low Level Contact Resistance (LLCR)

Low level contact resistance measurements at low level current were made using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Current and voltage (+) was applied to the top of the terminal with a pogo pin probe and current and voltage (-) was applied to the magnet wire with a Kelvin clip probe. Refer to Figure for an image of the test setup and probe locations. Measurements were taken initially and finally. Testing was performed in accordance with Figure 4 of TE Product Specification 108-2012, Rev. H and EIA-364-23C.

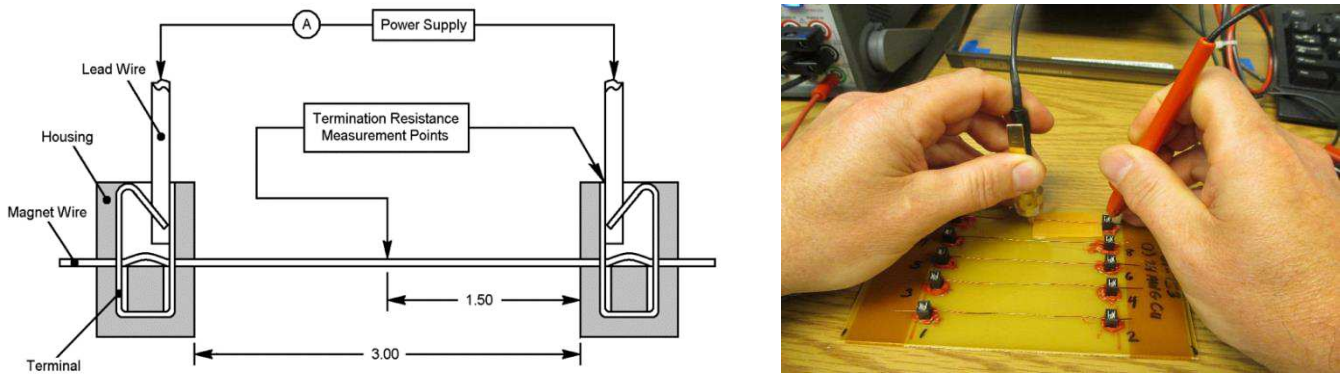

Figure 4

3.3. Current Cycling

Terminations were connected in a series circuit and energized at the appropriate current levels for 15 minutes ON and 15 minutes OFF for 480 cycles. Measurements were taken just prior to the end of the energized cycles. The ON cycle current was maintained at the current levels specified in Figure 3 of TE Product Specification 108-2012, Rev. H. Refer to Figure for an image of the test setup. Testing was performed in accordance with EIA-364-55A.

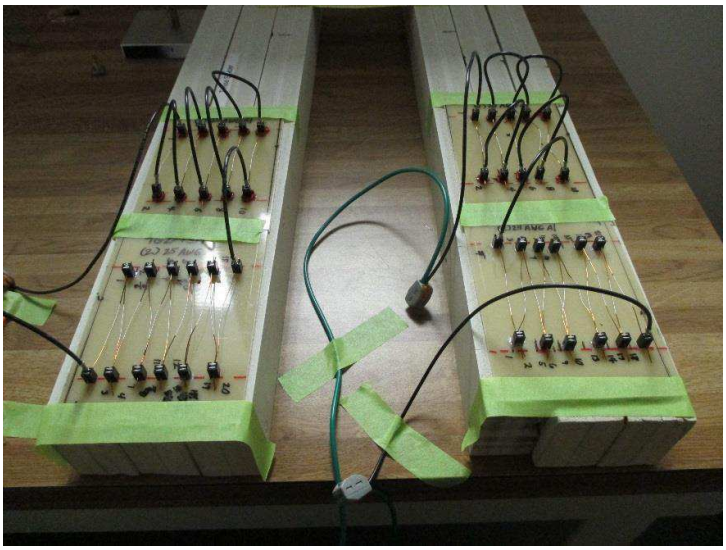

Figure 5

3.4. Insertion Force

The force necessary to insert poke-in connection or terminate terminal into plastic housing cavity was measured using a tensile/compression device with a free floating fixture and a rate of travel of 10 mm [.39 in] per minute.

3.5. Extraction Force

The force necessary to pull poke-in connection out of terminal or terminal out of cavity (polyester 30% glass-filled) was measured using a tensile/compression device with a free floating fixture and a rate of travel of 10 mm [.39 in] per minute.

3.6. Thermal Shock

Specimens were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minute durations at -65 and 125°C. The transition between temperatures was less than 1 minute. Testing was conducted in accordance with TE Product Specification 108-2012, Rev. H and EIA-364-32G, Test Condition III.

3.7. Humidity/Temperature Cycling

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 between 80% and 100% (Figure 6). Testing was conducted in accordance with TE Product Specification 108-2012, Rev. H and EIA-364-31E, Method IV.

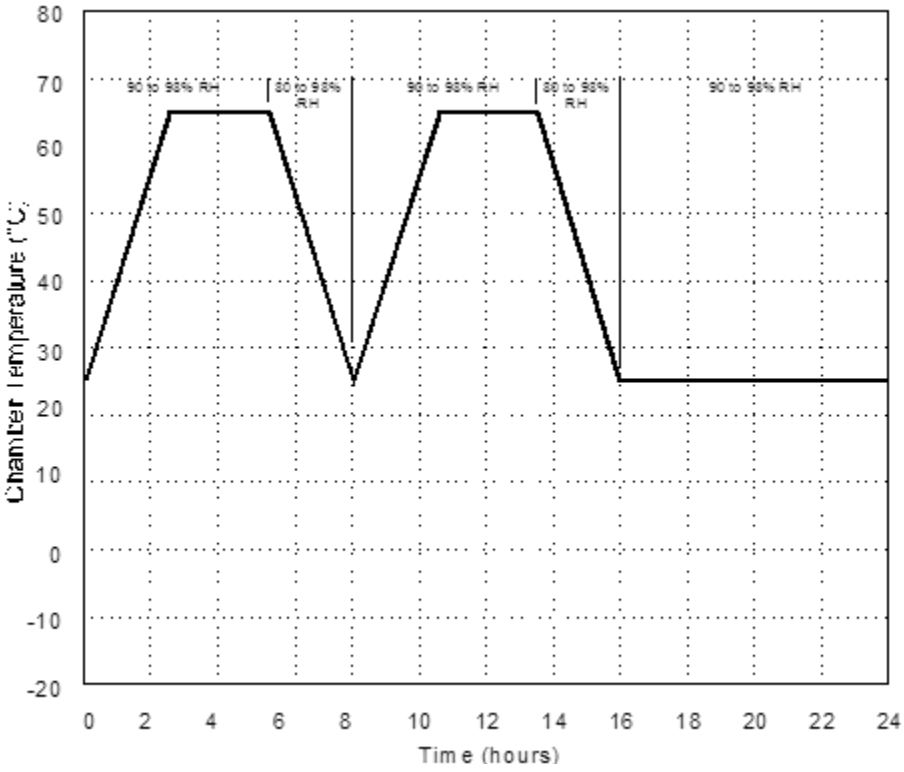

Figure 6

3.8. Temperature Life

Specimens were exposed to a temperature of 118°C for 792 hours (33 days). Testing was conducted in accordance with TE Product Specification 108-2012, Rev. H and EIA-364-17C, Method A.

3.9. Termination Resistance

Initial and final (after current cycling) termination resistance measurements were made at the current levels specific in Figure 3 of TE Product Specification 108-2012, Rev. H. Measurements were recorded after stabilization was achieved. Current (±) was applied to the ends of each series wired chain. Voltage (+) was applied to the top of the terminal with a probe and voltage (-) was applied to the magnet wire with a clip probe. Refer to Figure for an image of the test setup and probe locations. Testing was performed in accordance with EIA-364-6C and TE Product Specification 108-2012, Rev. H at the current levels listed in Figure 3.

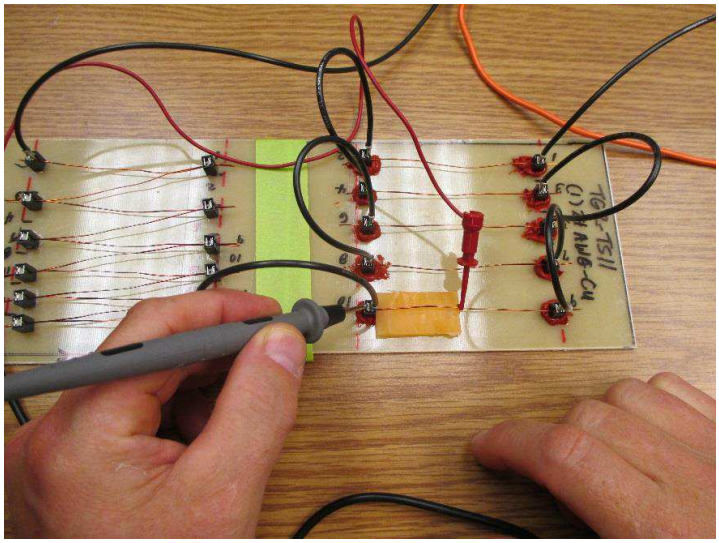

Figure 7

3.10. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance. Testing was performed in accordance with EIA-364-18B.