# Miniature Universal MATE-N-LOK* II Connector (Mini-UMNL II)

## 1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the AMP* Miniature Universal MATE-N-LOK* II (Mini-UMNL II) connectors. These connectors provide a compact means of grouping multiple-lead connections in appliances, computers and other commercial equipment. This system is totally compatible to existing Mini-UMNL product.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed in Apr 1999. The Qualification Test Report number for this testing is 501-488.

## 2. APPLICABLE DOCUMENTS AND FORMS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity Specifications

| | |
|---|---|
| 114-1111 | Application Specification |
| 501-488 | Qualification Test Report |

2.2. Commercial Standards and Specifications

| | |
|---|---|
| EIA-364 | Electrical Connector/Socket Test Procedures Including Environmental Classifications |

2.3. Reference Documents

| | |
|---|---|
| 109-1 | General Requirements for Testing |

## 3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable TE drawing.

3.3. Ratings

A. Voltage Rating: 600 V (AC or DC)

B. Current Rating: See Figure 4 and Figure 5 for applicable current carrying capacity

C. Temperature Rating:

1. Gold: –20°C to 105°C
2. Tin: –20°C to 85°C

3.4. Performance Requirements and Test Description

Product is designed to meet the electrical, mechanical, and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedure Summary

<table>
<tr><th>Test Description</th><th>Requirement</th><th>Procedure</th></tr>
<tr><td>Examination of Product</td><td>Meets requirements of product drawing and Application Specification (114-1111)</td><td>EIA 364-18<br>Visual, dimensional and functional per applicable quality inspection plan.</td></tr>
<tr><td colspan="3">Electrical</td></tr>
<tr><td>Termination Resistance</td><td>Initial: 10 milliohms (mΩ) (maximum)<br>Final: 20 milliohms (mΩ) (maximum)</td><td>EIA 364-23<br>Subject mated contacts assembled in housing to 20 mV (maximum) open circuit at 100 mA (maximum).<br>See Figure 2.</td></tr>
<tr><td>Insulation Resistance</td><td>1000 megaohms (MΩ) (minimum)</td><td>EIA 364-21<br>Test between adjacent contacts of mated specimen.</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>1500 VAC at sea level<br>1 minute hold with no breakdown or flashover</td><td>EIA 364-20, Method B<br>Test between adjacent contacts of mated specimen.</td></tr>
<tr><td>Temperature Rise vs. Current</td><td>30°C maximum temperature rise at specified current.</td><td>EIA 364-70, Method 2<br>Measure temperature rise vs. current with contacts crimped onto wire of length specified below.
<table>
<tr><th>Wire Size (AWG)</th><th>Length (cm [in]) (minimum)</th></tr>
<tr><td>26</td><td>11 [4.5]</td></tr>
<tr><td>24</td><td>14 [5.5]</td></tr>
<tr><td>22</td><td>16 [6.5]</td></tr>
<tr><td>20</td><td>20 [8.0]</td></tr>
<tr><td>18</td><td>25 [10.0]</td></tr>
<tr><td>16</td><td>29 [11.5]</td></tr>
</table>
See Figure 4 and Figure 5.</td></tr>
<tr><td colspan="3">Mechanical</td></tr>
<tr><td>Crimp Tensile Strength</td><td>
<table>
<tr><th>Wire Size (AWG)</th><th>Strength (N [lbs]) (minimum)</th></tr>
<tr><td>26</td><td>17.8 [4]</td></tr>
<tr><td>22</td><td>48.9 [11]</td></tr>
<tr><td>20</td><td>57.8 [13]</td></tr>
<tr><td>18</td><td>66.7 [15]</td></tr>
<tr><td>16</td><td>80.1 [18]</td></tr>
</table>
</td><td>EIA 364-8<br>Determine crimp tensile at a maximum rate of 25.4 mm [1 inch] per minute.</td></tr>
</table>

**Figure 1 (continued)**

| | | |
|---|---|---|
| Sinusoidal Vibration | No electrical discontinuity greater than 1 µs shall occur.<br>No physical damage. | EIA 364-28, Condition I<br>Subject mated specimens to 10-55-10 Hz traversed in 1 minute with 1.5 mm [.06 in.] maximum excursion. 2 hours in each of 3 mutually perpendicular planes. |
| Mechanical Shock (Specified Pulse) | No electrical discontinuity greater than 1 µs shall occur.<br>No physical damage. | EIA 364-27<br>Subject mated specimen to 50 G's half-sine shock pulses of 11 milliseconds duration. 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks. |
| Durability | No physical damage. | EIA 364-9<br>Mate and unmate specimens for 25 cycles at a maximum rate of 500 cycles per hour. |
| Contact Retention Force | 66.7 N [15 lb] per contact (minimum).<br>Contacts shall not dislodge.<br>No damage which could impair normal usage. | EIA 364-29<br>Apply axial load to contacts at a maximum rate of 25.4 mm [1 in] per minute with housing in fully locked position. |
| Contact Insertion Force | 11.1 N [2.5 lb] per contact (maximum) | EIA 364-5<br>Measure force necessary to insert contact into housing at a maximum rate of 25.4 mm [1 in] per minute with housing in pre-stage locking position. |
| Connector Mating Force | Initial: 11.1 N [2.5 lb] per circuit (maximum) | EIA 364-13<br>Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute. |
| Connector Unmating Force | Final: 1.1 N [.25 lb] per circuit (minimum) | EIA 364-13<br>Measure force necessary to unmate specimens at a maximum rate of 12.7 mm [.5 in] per minute. |
| Secondary Lock Strength | Final: 89 N [20 lb] (minimum) | EIA 364-98<br>Determine secondary lock strength at a maximum rate of 25.4 mm [1 in] per minute. |
| Housing Lock Strength | Final: 26.7 N [6 lb] (minimum) | EIA 364-98<br>Determine housing lock strength at a maximum rate of 25.4 mm [1 in] per minute. |
| **Environmental** | | |
| Thermal Shock | No damage which could impair normal usage. | EIA 364-32<br>Subject mated specimens to 25 cycles between –20°C and 105°C. |
| Humidity-Temperature Cycling | No damage which could impair normal usage. | EIA 364-31<br>Subject mated specimens to 10 cycles between 25°C and 65°C at 95% RH. |
| Temperature Life | No damage which could impair normal usage. | EIA 364-17<br>Subject mated specimens to temperature life at 85°C for tin product and 105°C for gold product for 580 hours. |

**Figure 1 (continued)**

| | | |
|---|---|---|
| Mixed Flowing Gas | No damage which could impair normal usage. | EIA 364-65<br>Subject mated specimens to environmental class II for 14 days. |

***NOTE***
*Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 3.*

**Figure 1 (end)**

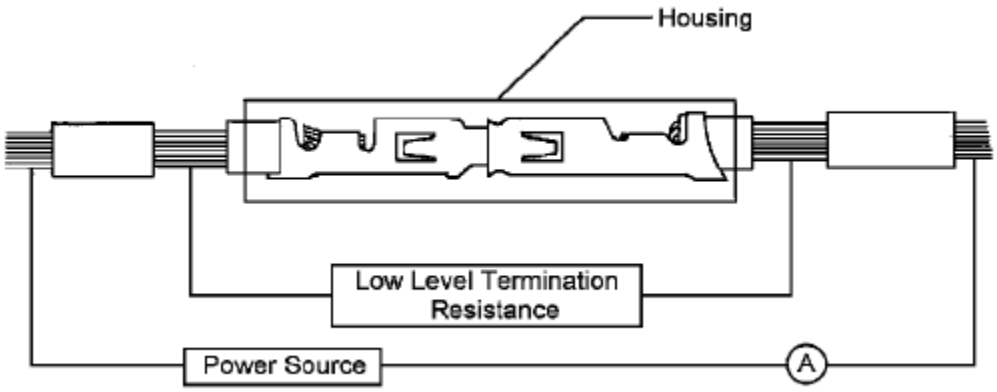


**Figure 2:** Termination Resistance Measurement Points

3.6. Product Qualification and Requalification Test Sequence

| TEST OR EXAMINATION | TEST GROUP (a) | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | TEST SEQUENCE (b) | | | | | |
| Examination of Product | 1, 9 | 1, 9 | 1, 8 | 1, 4 | 1, 5 | 1, 7 |
| Termination Resistance | 3, 7 | 2, 7 | | | | 2, 4, 6 |
| Insulation Resistance | | | 2, 6 | | | |
| Dielectric Withstanding Voltage | | | 3, 7 | | | |
| Temperature Rise vs. Current | | 3, 8 | | | | |
| Crimp Tensile Strength | | | | | 4 | |
| Sinusoidal Vibration | 5 | 6(c) | | | | |
| Mechanical Shock (Specified Pulse) | 6 | | | | | |
| Durability | 4 | | | | | |
| Contact Retention | | | | | 3 | |
| Contact Insertion Force | | | | | 2 | |
| Connector Mating Force | 2 | | | | | |
| Connector Unmating Force | 8 | | | | | |
| Secondary Lock Strength | | | | 3 | | |
| Housing Lock Strength | | | | 2 | | |
| Thermal Shock | | | 4 | | | |
| Humidity-Temperature Cycling | | 4(d) | 5 | | | |
| Temperature Life | | 5 | | | | 5 |
| Mixed Flowing Gas | | | | | | 3(e) |

***NOTE***

*(a) See paragraph 4.2.*

*(b) Numbers indicate sequence in which tests are performed.*

*(c) Discontinuities shall not be measured. Energize at 18°C level for 100% loadings per 109-151.*

*(d) Connectors for these tests shall be preconditioned by mating and unmating for 10 preconditioning cycles, tin plated specimens only.*

*(e) Connectors for these tests shall be preconditioned by mating and unmating for 10 preconditioning cycles, gold plated specimens only.*

**Figure 3**

## 4. QUALITY ASSURANCE PROVISIONS

4.1. Test Conditions

Unless otherwise specified, all the tests shall be performed in any combination of the following test conditions shown in Figure 4.

| | |
|---|---|
| Temperature | 15°C – 35°C |
| Relative Humidity | 20% – 80% |
| Atmospheric Pressure | 685 – 785 mmHg |

**Figure 4**

4.2. Qualification Testing

A. Test Specimens

The test specimens to be employed for tests shall conform to the requirements specified in the applicable product drawings. The crimped contacts shall be prepared in accordance with the requirements of Application Specification 114-1111. Test Groups 2, 4 and 6 shall consist of at least 5 assemblies for each requirement of Figure 3. Test groups 1, 3 and 5 shall consist of at least 5 random connector assemblies.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 3.

4.3. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.4. Acceptance

Acceptance is based on verification that the product meets the requirements in Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.5. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

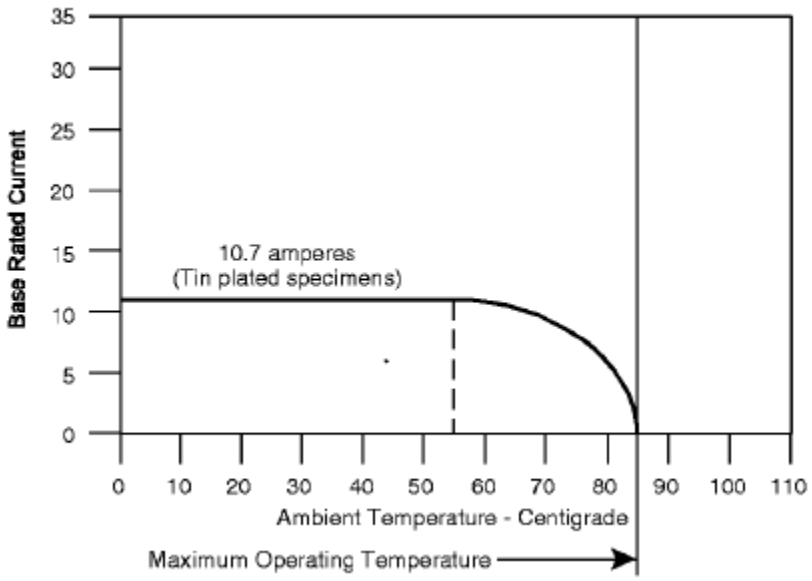


**Figure 4:** Current Carrying Capacity

| Percent Connector Loading | Wire Size [AWG] | | | | |
|---|---|---|---|---|---|
| | 26 | 24 | 22 | 20 | 18 |
| Single Contact | .533 | .611 | .709 | .835 | 1 |
| 50 | .321 | .368 | .428 | .503 | .603 |
| 100 | .231 | .265 | .308 | .362 | .434 |

***NOTE***
*To determine acceptable current carrying capacity for the percentage connector loading and wire gage indicated, use the Multiplication Factor (F) from the above chart and multiply it times the Base Rated Current for a single circuit at the maximum ambient operating temperature shown in Figure 4.*

**Figure 5**