



Val-U-Lok Plus Connectors with Integrated Terminal Position Assurance (TPA)

1. SCOPE

1.1. Content

This specification covers performance, tests, and quality requirements for TE Connectivity (TE) Val-U-Lok Plus Connectors system. The Val-U-Lok Plus Connectors is a wire-to-wire connection consisting of crimp-snap contacts seated in a receptacle housing that mates to 1.14 mm square plug housing on 4.2 mm centerline and is designed to be terminated to 18 to 26 AWG wire. A complete connector consists of a receptacle housing and plug housing with integrated TPA, socket and pin contact.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 3 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 Aug, 2022. The Qualification Test Report number for this testing is 501-160804 .

1.4. Revision Summary

Revisions to this specification include:

- First release of specification.

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

- [114-160449](#) Application Specification
- [501-160804](#) Qualification Test Report

2.2. Commercial Standards and Specifications

- IEC 61984 International Standard – Safety Requirements and Tests
- IEC 60335 International Standard – Safety of Household and Similar Appliance
- IEC 60512 International Standard – Connectors for Electronic Equipment – Tests and Measurements
- IEC 60695 International Standard – Fire Hazard Testing
- UL 1977 Safety Standards – Component Connectors for Use in Data, Signal, Control, and Power Applications
- EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications

2.3. Reference Documents

- [109-1](#) General Requirements for Testing
- [102-950](#) Qualification of Separable Interface Connectors

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.

- A. Housing: PA66
- B. Contacts: Brass, Tin plated.

3.3. Ratings

- A. Voltage Rating: 600VAC
- B. Current Rating: 9A
- C. Temperature Rating: -55°C to +105°C

3.4. Performance Requirements and Test Description

The product should meet the electrical, mechanical and environmental performance requirements specified in Figure 3. All tests shall be performed at ambient environmental conditions otherwise specified.

3.5. Test Requirements and Procedure Summary

Test Description	Requirement	Procedure
Initial examination of product	Meets requirements of product drawing and Application specification 114-160449.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product	Meets visual requirements.	EIA-364-18. Visual examination.
Electrical		
Low Level Contact Resistance (LLCR).	10 milliohms maximum initial. 20 milliohms maximum final.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. See Figure 3.
Temperature rise vs. current.	30°C maximum temperature rise.	EIA-364-70, Method 1. Stabilize at a single current level until 3 readings at 5 minutes intervals are within 1°C. See Figure 4.
Insulation resistance.	1000 megohms minimum initial. 500 megohms minimum final.	EIA-364-21. 500 volts DC, 2 minutes hold. Test between adjacent contacts.
Withstanding voltage.	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 1500 volts AC at sea level. Test between adjacent contacts.

Figure 1 (cont'd)

Mechanical		
Sinusoidal vibration	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition I. Subject mated specimens to 10 to 55 to 10Hz traversed in 1 minute with 1.5 mm maximum total excursion. Two hours in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Condition A. Subject mated specimens to 50 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability.	See Note.	EIA-364-9. Mate and unmate specimens for 30 cycles at a maximum rate of 500 cycles per hour.
Mating force.	8.9N maximum per contact	EIA-364-13. Measure force necessary to mate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
Unmating force.	0.9 N minimum per contact.	EIA-364-13, Method A. Measure force necessary to unmate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
Contact insertion force.	15 N maximum	EIA-364-5. Measure force necessary to properly seat the terminal into the housing at a maximum rate of 12.7 mm per minute.
Contact retention.	30N minimum	EIA-364-29. Method C. Measure force necessary to remove the terminal from the housing at a maximum rate of 12.7 mm per minute.
Connector locking strength.	30N minimum	EIA-364-98. Measure connector locking strength at a maximum rate of 12.7 mm per minute.
Hinge TPA locking force	30N maximum Only suitable to plug housing: 2385533-* & 2386014-*	EIA-364-98. Measure TPA locking force at a maximum rate of 12.7 mm per minute.
Pre-assembly TPA locking force	30N maximum Only suitable to receptacle housing: 2385532-* & 2386011-*	EIA-364-98. Measure TPA locking force at a maximum rate of 12.7 mm per minute.

Figure 2 (cont'd)

Environmental		
Thermal shock.	See Note.	EIA-364-32. Subject mated specimens to 5 cycles between -55 and 105°C with 30 minutes dwells at temperature extremes and 1 minute transition between temperatures.
Humidity/temperature cycling.	See Note.	EIA-364-31. Subject specimens to 40°C and 90 to 95% RH for 96 hours.
Temperature life.	See Note.	EIA-364-17. Subject mated specimens to 105°C for 96 hours.
GWT test	Te-Ti≤2s	IEC 60335-1-2016. Test specimens were subjected to the Glow Wire test for a duration of thirty seconds at 750°C ± 10°C with a glow wire penetration depth of 7 mm after being subjected to a temperature of 25°C and relative humidity of 60% for a minimum of 24 hours.
Salt spray.	See Note.	EIA-364-26. Subject mated specimens to 5% salt concentration for 48 hours.
Hydrogen sulfide.	See Note.	Subject mated specimens to 3 ± 1 ppm H ₂ S gas concentration maintained at 40 ± 2°C for 96 hours.
Ammonia.	See Note.	Subject mated specimens in 10 liter desiccator with 500ml of 3% ammonia solution for 7 hours.

Figure 3 (end)



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 4.

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Groups (a)										
	1	2	3	4	5	6	7	8	9	10	11
	Test Sequence (b)										
Initial examination of product	1	1	1	1	1	1	1	1	1	1	1
LLCR	3,7	2,7	2,7						2,4	2,4	2,4
Temperature rise vs current		3,8									
Insulation resistance			3,8								
Withstanding voltage			4,9								
Random vibration	5	6									
Mechanical shock	6										
Durability	4										
Mating force	2										
Unmating force	8										
Contact insertion force					2						
Contact retention force					3						
Connector locking strength				2							
Thermal shock			5								
Humidity/temperature cycling		4	6								
Temperature life		5									
GWT test						2					
Hinge TPA locking force							2				
Pre-assembly TPA locking force								2			
Salt spray									3		
Hydrogen sulfide										3	
Ammonia											3
Final examination of product	9	9	10	3	4	3	3	4	5	5	5



NOTE

(a) See paragraph 4.2.

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

Figure 4

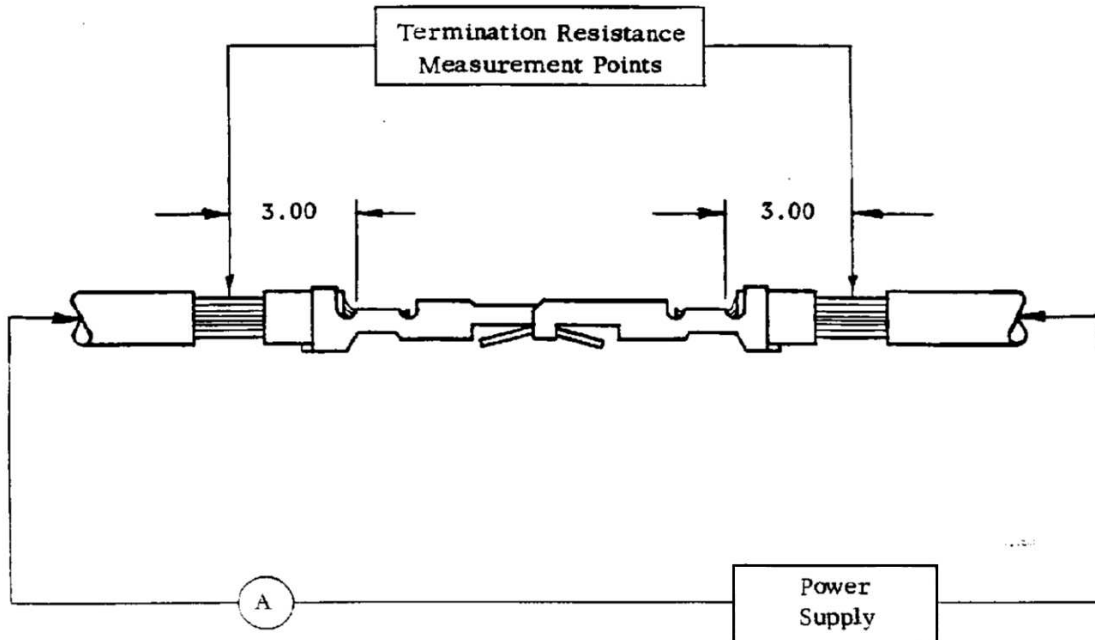


Figure 3
LCR Measurement Points
(Subtract Wire Bulk)

Standard contact:

Wire size	Dual row			Single row		
	2P	4P	6P	3P	4P	5P
18AWG	9A	8A	7A	8A	8A	8A
20AWG	6A	6A	6A	6A	6A	6A
22AWG	4A	4A	4A	4A	4A	4A
24AWG	3A	3A	3A	3A	3A	3A
26AWG	2A	2A	2A	2A	2A	2A

High conductivity contact:

Wire size	Dual row			Single row		
	2P	4P	6P	3P	4P	5P
18AWG	11A	9A	9A	10A	9A	9A
20AWG	9.5A	8A	8A	9A	8A	8A
22AWG	8A	7A	7A	7A	7A	7A

Figure 4
Temperature rise spec

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 5.

Temperature	15°C – 35°C
Relative Humidity	45% – 75%
Atmospheric Pressure	86.6 – 106.6 kPa

Figure 5

4.2. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable instruction sheets and shall be selected at random from current production.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 4.

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 3. 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.