

SL Series Jacks, Category 6

1. SCOPE

1.1 Content

This specification covers performance, tests and quality requirements for AMP NETCONNECT*, Category 6 SL Jacks used to provide a universal connection interface between premise wiring of an office and the user's network of communications equipment (for data and voice networking systems). These assemblies are designed for installation into various outlet plates, surface mount boxes, panels and other similar type fittings. Jacks incorporate IDC terminals for terminating unshielded twisted pair communications cable. Jacks will accommodate:

Solid conductor cable range (AWG)	Stranded conductor cable range (AWG)	Max. conductor insulation diameter (mm [in])	Max. cable jacket outer diameter (mm [in])
22 - 24	24 - 26	1.45 [0.057]	5.8 [0.23]

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.

2. APPLICABLE DOCUMENTS

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 (TE) Documents

- 408-8417: Instruction Sheet (SL, KL and Secure SL Series 110Connect Modular Jacks)
- 408-8858: Instruction Sheet (SL Jack Tool Kit 1725150-X)
- 501-131000: Qualification Test Report (SL Series Jacks, Category 6) Revision A – covers assemblies utilizing component engine 2111323
- 501-131000: Qualification Test Report (SL Series Jacks, Category 6) Revision B – covers assemblies utilizing component engine 2111621

2.2 Industry Documents

- ANSI/TIA-568-C.2 April 2010: Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- IEC 60068: Basic Environmental Testing Procedures as indicated in Figure 1
- IEC 60352-4 Amendment 1 2000-07: Non-Accessible Insulation Displacement Connections – General Requirements, Test Methods and Practical Guidance
- IEC 60512: Basic Testing Procedures and Measuring Methods for Electromechanical Components for Electronic Equipment as indicated in Figure 1

- IEC 61935-1: Specification for the Testing of Balanced and Coaxial Information Technology Cabling – Part 1: Installed Balanced Cabling as Specified in ISO/IEC 11801 and Related Standards
- ISO/IEC 11801: Edition 2.2 2011-06: Generic Cabling for Customer Premises (2008/E)
- ISO/IEC 60603-7 Edition 3.1 2011-12: Detail Specification for 8-way, Unshielded, Free and Fixed Connectors
- ISO/IEC 60603-7-4 Edition 2.0 2010-04: Detail Specification for 8-way, Unshielded, Free and Fixed Connectors, for Data Transmission with Frequencies up to 250 MHz
- ITU-T-K.20 (2008-04): Resistibility of Telecommunication Equipment Installed in a Telecommunications Centre to Overvoltages and Overcurrents
- ITU-T-K.44 (2008-04): Resistibility Tests for Telecommunication Equipment Exposed to Overvoltages and Overcurrents - Basic Recommendation

2.3 Reference Document

TEC-138-702: Supplier Requirements for Product Environmental Compliance

3. REQUIREMENTS

3.1 Design and Construction

Product shall be of the design, construction 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 product drawing.

3.3 Wire Range

- Solid conductor range: 22 to 24 AWG
- Stranded conductor range: 24 to 26 AWG
- Conductor diameter range: 0.51 to 0.65 mm [0.020 to 0.026 inch]
- Insulation diameter range: 0.8 to 1.45 mm [0.031 to 0.057 inch]
- Cable diameter range: 4.7 to 5.8 mm [0.185 to 0.228 inch]

3.4 Ratings

- Voltage: 150 volts AC maximum
- Current: Signal application only, 0.75 ampere maximum
- Operating Temperature: -10 °C to +60 °C (per ISO/IEC 11801, Section 10.1.4)
- Climatic Temperature Limits: -40 °C to +70 °C (per IEC 60603-7, Table 7)

3.5 Tooling

Connector shall be terminated using SL Series Jack tool part number 1901551-1 (tool only) or 1725150-3 (tool kit).

3.6 Performance 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.

3.7 Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Initial examination of product.	ISO/IEC 11801, Annex C. There shall be no defects that would impair normal operation. The dimensions shall comply with those specified on product drawing.	IEC 60512-1-1 and -2. Visual and dimensional per quality inspection plan with Certificate of Conformance (C of C).
Visual examination of product.	ISO/IEC 11801, Annex C. There shall be no defect that would impair normal operation.	IEC 60512-1-1. Visual inspection.
ELECTRICAL		
Voltage proof.	IEC 60603-7, Section 6.4.2. One minute hold with no breakdown or flashover.	IEC 60512-4-1, Method A. 1000 volts DC or AC peak. Terminated jack with mated plug. One contact to all other contacts connected together.
Current carrying capacity (current temperature de-rating).	IEC 60603-7, Section 6.4.3 Shall comply with de-rating curve.	IEC 60512-5-2. See Figure 4.
Contact resistance, initial, Jack-plug interface.	IEC 60603-7, Section 6.4.4. Jack-plug interface Initial = 20 milliohms maximum.	IEC 60512-2-1. Subject mated connectors to 20 millivolts maximum open circuit voltage at 100 milliamperes maximum. The specimen may be disassembled to gain access to measurement points. See Figure 5.
IDC-wire interface.	IEC 60352-4, Section 12.3.1. IDC-wire interface, Initial = 5 milliohms maximum.	IEC 60512-2-1. Subject mated connectors to 20 millivolts maximum open circuit voltage at 100 milliamperes maximum. See Figure 5.
Contact resistance, ΔR_{AD} Connector assembly.	IEC 60603-7, Section 6.4.4. change of total connector R_{AD} =20 milliohms maximum. See Note (a).	IEC 60512-2-1. Subject mated connectors to 20 millivolts maximum open circuit voltage at 100 milliamperes maximum. See Figure 5.
Input to output DC resistance.	IEC 60603-7, Section 6.4.5. TIA-568-C.2, Section 6.3.1. 200 milliohms maximum, initial and final.	IEC 60512-2-1. Measure jacks mated to a patch cord. Test voltage shall be a minimum of 1 volt DC peak. See Figure 5.
Input to output DC resistance unbalance.	IEC 60603-7, Section 6.4.6. ΔR 50 milliohms maximum.	IEC 60512-2-2. Measure jacks mated to a patch cord. Test voltage shall be a minimum of 1 volt DC peak. See Figure 5.
Insulation Resistance.	IEC 60603-7, Section 6.4.7. 500 megaohms minimum.	IEC 60512-3-1, Method A. 100 volts DC, 1 minute hold.
Surge test.	IEC 60603-7, Section 7.7.2.8. ITU-T K.20, Table 2a/2b, Test Nos. 2.1.1.b, 2.2.1.b, 2.3.1.b. See Note (e).	ITU-T K.44, Clause 9. Test 2.1, 2.2: Acceptance Criteria A. Test 2.3: Acceptance Criteria B.
Gaging continuity.	IEC 60603-7, Section 7.7.2.6. Contact disturbance. No discontinuity \geq 10 microseconds.	IEC 60603-7, Annex A. IEC 60512-2-5. TE gage 1050714-1.

Figure 1 (continued)

Test Description	Requirement	Procedure
MECHANICAL		
Plug insertion force.	IEC 60603-7, Section 6.6.3. 20 N maximum.	IEC 60512-13-2. Measure force required to mate plug and jack with latch depressed at a constant speed with a maximum rate of 50 mm per minute.
Plug withdrawal force.	IEC 60603-7, Section 6.6.3. 20 N maximum.	IEC 60512-13-2. Measure force required to mate plug and jack with latch depressed at maximum rate of 50 mm per minute.
Plug retention in jack (effectiveness of connector coupling device).	IEC 60603-7, Section 6.6.2. Plug shall not dislodge from jack and shall maintain electrical continuity.	IEC 60512-15-6. Apply an axial load of 50 N to plug mated to jack with latch engaged and hold for 60 ± 5 seconds. Load shall be applied at a maximum rate of 44.5 N per second.
Mechanical operations, durability, 8 position plug gage, Jack-plug interface.	IEC 60603-7, Section 6.6.1. See Note (b).	IEC 60512-9-1. Mate and unmate 8 position plug to jack interface with locking device inoperative for 375 cycles at a maximum rate of 10 mm per second.
Mechanical operations, durability, 6 position plug gage, Jack-plug interface.	Permanent deflection of contacts in positions 1 and 8 are acceptable if the specimens meet the requirements of additional tests. See Note (b).	TE plug gage 1050719-1. Fully insert and remove gage into the jack interface for 10 cycles at a maximum rate of 10mm per second. See Figure 6.
Vibration, Jack-plug and IDC-wire interface.	IEC 60603-7, Section 7.7.2.5. No discontinuities greater than 10 microseconds. Shall remain mated and show no evidence of physical damage. See Note (b).	IEC 60512-6-4. Subject mated plug and terminated jack to: Frequency: 10 to 500 Hz. Amplitude: 0.35 mm Acceleration: 5g (50 m/s ²) 10 sweep cycles per axis of 3 mutually perpendicular planes. IEC 60603-7, Section 7.3, arrangement for vibration test.
Dimensional gaging, go/ no-go, Jack-plug interface.	IEC 60603-7, Annex C. Go gage: 8.9 N maximum insertion and removal force. No-go gages: 1.78 mm maximum allowable insertion depth with 8.9 N force applied.	IEC 60603-7, Section 5.1. Go gage per 5.1 Fig 5. (TE gage 1050720-1) Fully insert and remove at constant speed at maximum rate of 50mm per minute. No-go width gage per 5.1, Fig 6a. (TE gage 105722-1) No-go height gage per 5.1, Fig 6b. (TE gage 1050721-1) 44.5 N per second maximum rate of load.
ENVIRONMENTAL		
Rapid change of temperature (Thermal shock), Jack-plug interface and IDC-wire interface.	IEC 60603-7, Section 7.7.2.3. See Notes (b) and (c).	IEC 60068-2-14. Subject mated plug and terminated jack to 25 cycles between -40 and 70°C with 30 minute dwells at temperature extremes. Two hour recovery time.

Figure 1 (continued)

Test Description	Requirement	Procedure
Cycling damp heat (Humidity/temperature cycling), Jack-plug and IDC-wire interface.	IEC 60603-7, Section 7.7.2.3. See Notes (b) and (d).	IEC 60068-2-38. Subject mated plug and terminated jack to 21 cycles (21 days) between 25 and 65°C at 93% RH with a -10°C sub-cycle shock. Half the specimens mated, the remaining half unmated.
Electrical load and temperature (Dry heat, stress relaxation), Jack-plug and IDC-wire interface.	IEC 60603-7, Section 7.7.2.6. See Note (b).	IEC 60068-2-2, Tests Bd and Be. Subject mated plug and terminated jack to 70°C for 500 hours with 2 hour recovery period. Half the specimens energized with 0.8 ampere DC, the remaining half not energized.
Flowing mixed gas corrosion, Jack-plug and IDC-wire interface.	IEC 60603-7, Section 7.7.2.4. See Note (b).	IEC 60512-11-7, Method 1. H ₂ S: 100 ± 20 (10 ⁻⁹ vol/vol), SO ₂ : 500 ± 100 (10 ⁻⁹ vol/vol), Temperature: 25 ± 1°C, RH: 75 ± 3%, Test time: 4 days, Half the specimens mated, the remaining half unmated.

TRANSMISSION
Cat 6 / Class E **Permanent Link** Configuration

Return loss.	ISO 11801, Section A.2.2, Class E. TIA-568-C.2, Section 6.2.6 Cat 6.	IEC 61935-1, Section 4.11. TIA-569-C.2, Appendix C.2.2.
Insertion loss.	ISO 11801, Section A.2.2, Class E. TIA-568-C.2, Section 6.2.6 Cat 6.	IEC 61935-1, Section 4.11. TIA-569-C.2, Appendix C.2.2.
Pair to Pair Near End Crosstalk (NEXT) loss.	ISO 11801, Section A.2.3, Class E. TIA-568-C.2, Section 6.2.7 Cat 6.	IEC 61935-1, Section 4.5. TIA-569-C.2, Appendix C.2.3.
Power Sum NEXT loss (PS NEXT).	ISO 11801, Section A.2.4.1, Class E. TIA-568-C.2, Section 6.2.8 Cat 6.	IEC 61935-1, Section 4.7. TIA-569-C.2, Appendix C.2.4.
Attenuation to Crosstalk Ratio, Near End (ACR-N)	ISO 11801, Section A.2.4.2, Class E. TIA-568-C.2, Section 6.2.9 Cat 6.	IEC 61935-1, Section 4.7. TIA-569-C.2, Appendix C.2.4.
Power Sum ACR-N (PS ACR-N).	ISO 11801, Section A.2.5.2, Class E.	IEC 61935-1, Section 4.8.
Attenuation to Crosstalk Ratio Far End (ACR-F).	ISO 11801, Section A.2.5.3, Class E.	IEC 61935-1, Section 4.8.
Power Sum ACR-F (PS ACR-F).	ISO 11801, Section A.2.6.2, Class E. TIA-568-C.2, Section 6.2.11 Cat 6.	IEC 61935-1, Section 4.10. TIA-568-C.2, Appendix C.2.7.
Propagation Delay.	ISO 11801, Section A.2.6.3, Class E. TIA-568-C.2, Section 6.2.13 Cat 6.	IEC 61935-1, Section 4.10. TIA-568-C.2, Appendix C.2.7.
Delay Skew.	ISO 11801, Section A.2.9, Class E. TIA-568-C.2, Section 6.2.18 Cat 6.	IEC 61935-1, Section 4.6. TIA-569-C.2, Appendix C.2.3.

TRANSMISSION
Cat 6 / Class E, **Channel** Configuration

Return loss.	ISO 11801, Section 6.4.2, Class E. TIA-568-C.2, Section 6.2.6, Cat 6.	IEC 61935-1, Section 4.11. TIA-569-C.2, Appendix C.2.2.
Insertion loss.	ISO 11801, Section 6.4.3, Class E. TIA-568-C.2, Section 6.2.7, Cat 6.	IEC 61935-1, Section 4.5. TIA-569-C.2, Appendix C.2.3.
Pair to Pair Near End Crosstalk (NEXT) loss.	ISO 11801, Section 6.4.4.1, Class E. TIA-568-C.2, Section 6.2.8, Cat 6.	IEC 61935-1, Section 4.7. TIA-569-C.2, Appendix C.2.4.
Power Sum NEXT loss (PS NEXT).	ISO 11801, Section 6.4.4.2, Class E. TIA-568-C.2, Section 6.2.9, Cat 6.	IEC 61935-1, Section 4.7. TIA-569-C.2, Appendix C.2.4.

Figure 1 (continued)

Test Description	Requirement	Procedure
Attenuation to Crosstalk Ratio, Near End (ACR-N)	ISO 11801, Section 6.4.5.2, Class E.	IEC 61935-1, Section 4.8.
Power Sum ACR-N (PS ACR-N).	ISO 11801, Section 6.4.5.3, Class E.	IEC 61935-1, Section 4.8.
Attenuation to Crosstalk Ratio Far End (ACR-F).	ISO 11801, Section 6.4.6.2, Class E. TIA-568-C.2, Section 6.2.11 Cat 6.	IEC 61935-1, Section 4.10. TIA-568-C.2, Appendix C.2.7.
Power Sum ACR-F (PS ACR-F)	ISO 11801, Section 6.4.6.3, Class E. TIA-568-C.2, Section 6.2.13, Cat 6.	IEC 61935-1, Section 4.10. TIA-568-C.2, Appendix C.2.7.
Propagation Delay.	ISO 11801, Section 6.4.12, Class E. TIA-568-C.2, Section 6.2.18, Cat 6.	IEC 61935-1, Section 4.6. TIA-569-C.2, Appendix C.2.3.
Delay Skew.	ISO 11801, Section 6.4.13, Class E. TIA-568-C.2, Section 6.2.19, Cat 6.	IEC 61935-1, Section 4.6. TIA-569-C.2, Appendix C.2.3.

NOTES:

- (a) *Change of resistance shall be measured over the total connector assembly which includes both the jack-plug interface and IDC-wire interface contact resistance. The requirements for change of resistance shall be per IEC 60603-7 for this product application.*
- (b) *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 2.*
- (c) *Rapid change of temperature test per IEC 60352-4 for IDC-wire interface specifies temperature limits that exceed the ratings defined in IEC 60603-7, section 6.3 for the jack-plug interface. Therefore, rapid change of temperature test per IEC 60603-7 shall only be performed when evaluating the complete connector assembly of this product application.*
- (d) *Cycling damp heat test per IEC 60352-4 for IDC-wire interface specifies the same environmental conditions, but with a lower number of cycles. Therefore, the more severe cycling damp heat test per IEC 60603-7 for jack-plug interface shall only be performed when evaluating the complete connector assembly of this product application.*
- (e) *Surge test is based on IEC 60603-7, Section 7.7.2.8 except as follows:*
 - 1) *2.1.1.a is not performed because the product is unshielded.*
 - 2) *2.1.1.b is performed as specified.*
 - 3) *2.1.3 is not performed because the product is not multiple port.*
 - 4) *2.2.1.a is replaced by 2.2.1.b because the product is unshielded.*
 - 5) *2.3.1.a is replaced by 2.3.1.b because the product is unshielded.*

Figure 1 (end)

3.8 Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)								
	1(b)	2(b)	3(b)	4(b)	5(b)	6(b)	7(b)	8	9(c)
	Test Sequence (d)								
Initial examination of product	1	1	1	1	1	1	1	1	1
Visual examination of product	12,18	12	9	8	5	7	3		
ELECTRICAL									
Voltage proof	4,11	3,11	3,8	4,7		4			
Current carrying capacity							2		
Contact resistance, initial					2				
Contact resistance, R _{AD}	2,10,14	4,7,9	4,6	2,9,1		2		2,4,6	
Input to output resistance					4				
Input to output resistance unbalance					3				
Insulation resistance	3,9	2,10	2,7	3,6		3,6			
Surge test						5			
Gaging continuity				10					
MECHANICAL									
Plug insertion force	5,15								
Plug withdrawal force	6,16								
Plug retention in jack	7,17								
Durability, 8 position plug		5,8							
Durability, 6 position plug								3	
Vibration			5						
Dimensional gaging				9					
Thermal shock	8								
Humidity/temperature cycling	13								
Electrical load and temperature				5				5	
Flowing mixed gas corrosion		6							
TRANSMISSION: Permanent Link Configuration (e)									
Return loss									2
Insertion loss									2
NEXT									2
PSNEXT									2
ACR									2
PSACR									2
ELFEXT									2
PSELFEXT									2
Propagation delay									2
Delay skew									2
TRANSMISSION: Channel Configuration (f)									
Return loss									3
Insertion loss									3
NEXT loss									3
PS NEXT loss									3
ACR-N									3
PS ACR-N									3
ACR-F									3
PS ACR-F									3
Propagation Delay									3
Delay Skew									3

NOTES:

- (a) See paragraph 4.1.A.
- (b) Test groups 1 thru 7 are based on the "full test schedule" defined in IEC 60603-7 and IEC 60603-7-4.
- (c) Test group 9 is based on ISO/IEC 11801. See Figure 7.
- (d) Numbers indicate sequence in which tests are performed.
- (e) Transmission parameters are checked as Class E permanent link configuration per ISO/IEC 11801, Annex A.
- (f) Transmission parameters are checked as Class E channel configuration per ISO/IEC 11801, Section 6.4.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 10 specimens, except as noted: Test Groups 5, 7, and 9 may use a minimum of 2 specimens. Category 6 patch cords TE part number 1933116-X or equivalent shall be used to test specimens. See Figure 3 for horizontal cable type and TE catalog numbers recommended for use with this product (other cables may be used upon engineering approval).

Cable Conductor	24 AWG Solid	23 AWG Solid	24 AWG Solid	23 AWG Solid	24 AWG Solid
Cable Type	UTP, CMR	UTP, CMP	UTP, CMR	UTP, CMP	UTP, CMP
Category	Cat 6	Cat 6	Cat 6	Cat 6	Cat 6
Series Number	630	630	620	620	610
Catalog Number	TE630R-XX02	TE630P-XX02	TE620R-XX02	TE620P-XX02	TE610P-XX02

Figure 3

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2 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.

4.3 Acceptance

Acceptance is based on verification that the product meets the requirements of 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 re-submittal.

4.4 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 application product drawing and this specification.

5. FIGURES RELATED TO TEST PROCEDURES

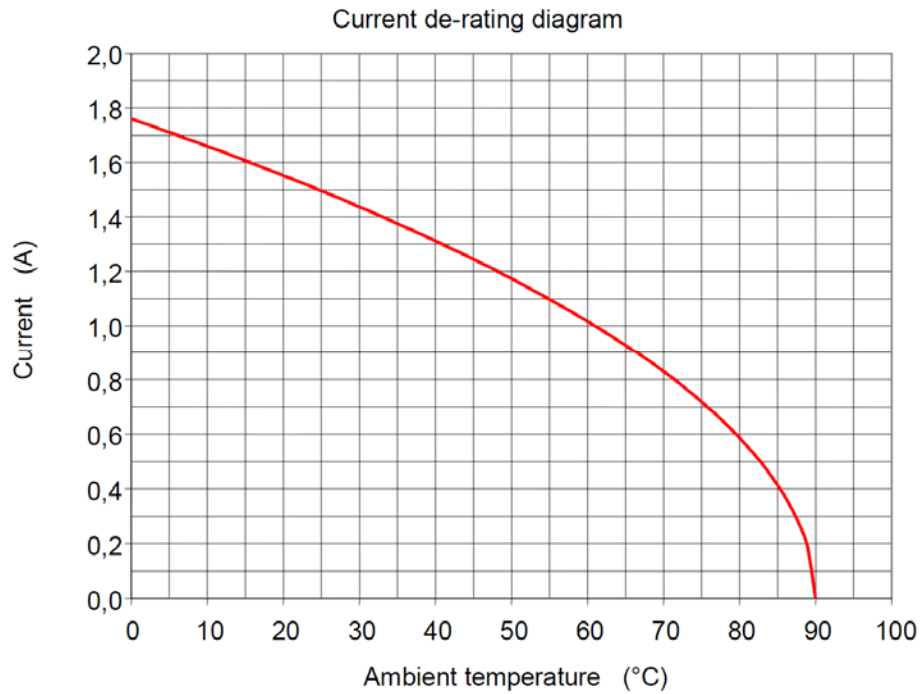
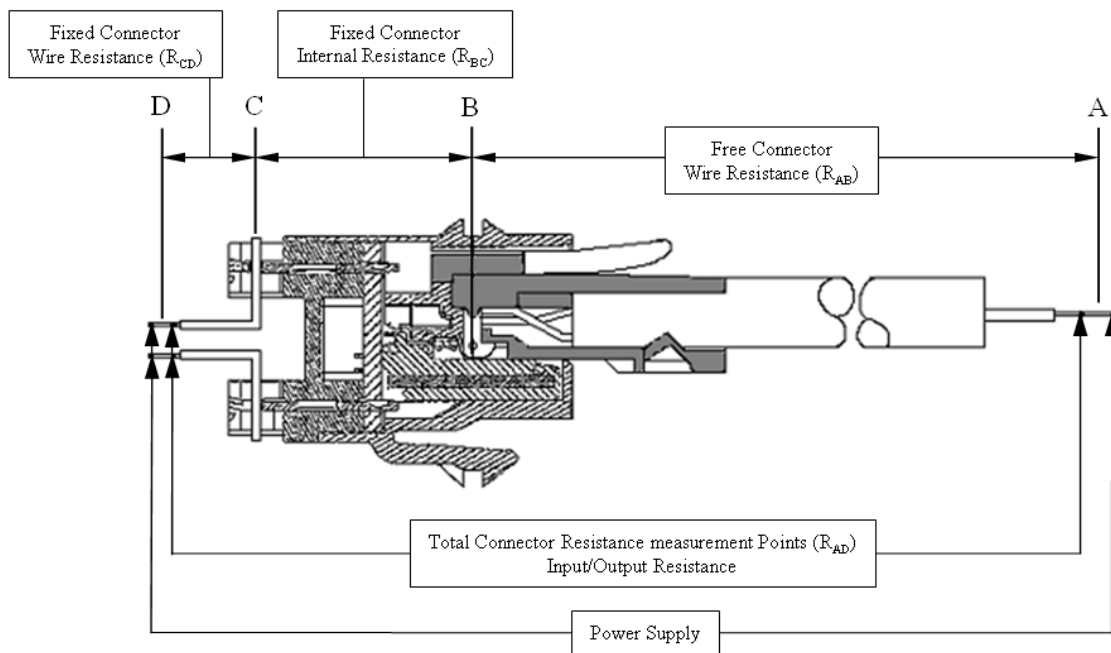


Figure 4
Current Carrying Capacity Derating Curve, per IEC 60603-7, Figure 10



Jack-plug interface resistance: $R_I = R_B = R_{AD} - (R_{AB} + R_{BD})$ [for reference only]
 IDC-wire interface resistance: $R_I = R_C = R_{AD} - (R_{AC} + R_{CD})$ [for reference only]
 Connector Assembly Contact Resistance; $\Delta R = R_{AD}(\text{initial}) - R_{AD}(\text{final})$

Figure 5
Contact Resistance Measurement Points

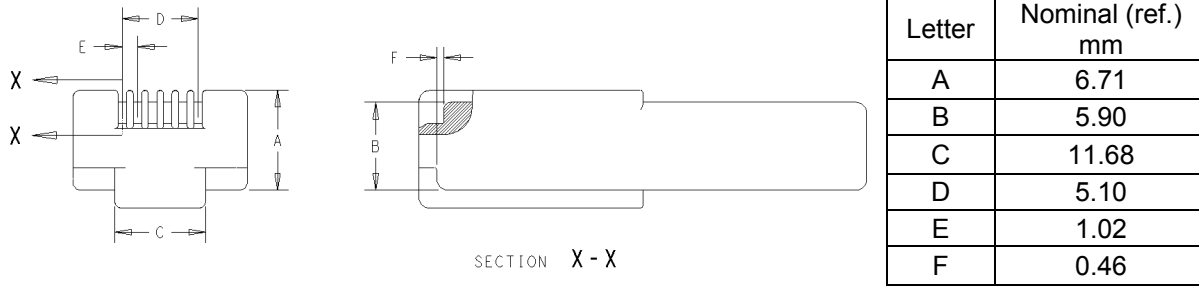


Figure 6
Mechanical Operations Conditioning, 6 Position Plug Gage

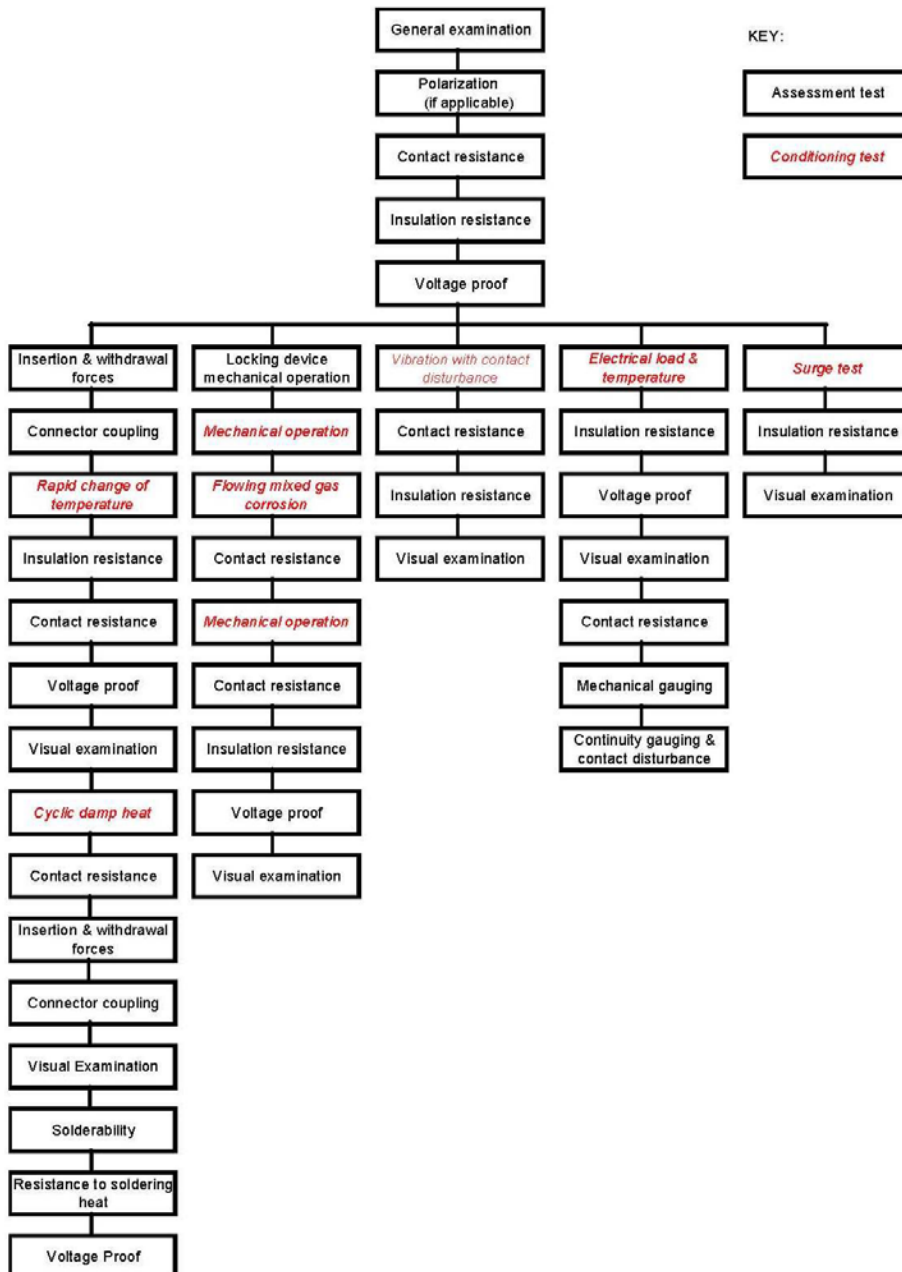


Figure 7
Reference Test Schedule Required for Modular Jacks, per IEC 60603-7 Series

6. REVISION SUMMARY

- Revision A – Initial release.
- Revision A1 – Section 3.7, Figure 1, Electrical requirements, Input to output DC resistance unbalance, Procedure, specification reference corrected to IEC 60512-2-1. Section 4.1.A, change Test Group 7 to a minimum of 3 specimens.
- Revision B – Paragraph 2.1, added referenced specification 501-131000 Revision B. Paragraph 2.2, updated industry standard references. Paragraph 2.3, updated environmental compliance document reference. Figure 1, added Transmission: Channel Configuration to requirements table. Figure 2, updated Transmission: Permanent Link Configuration procedure references and added Transmission: Channel Configuration to test sequence table. Figure 3, updated current catalog numbers and added 610 and 630 Series cables to table.