

MODULAR RJ45 JACKS – SHIELDED

1 Document Revision History

Revision	Date	Description	Author(s)
A	27-Apr-2018	Initial Release	P. Pepe
B	10May2018	Changes per 40065197CMO	L Smith

2 SCOPE

2.1 Content

This specification covers performance, tests and quality requirements for **AMP-TWIST** 6 and 6A SLX series shielded Modular Jacks for Cat 6 & 6A component, Class E systems and Class EA systems (min length), 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 faceplates, surface mount boxes, panels, and other similar type fittings. Jacks incorporate IDC terminal for terminating twisted pair communications cable. Jacks will accommodate:

Solid conductor Cable range (AWG)	Stranded conductor Cable range (AWG)	Conductor insulation Diameter (mm)	Cable diameter Range (mm)
22-23-24-26	24-26	0.8 -1.60	5.0 – 8.5

Table 1: Cable types accommodated by jack connector

2.2 Qualification

When tests are performed on the subject product line, procedures specified in Table 2 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

3 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.

3.1 CommScope® Documents

- 501-93052: Qualification Test Report
- 860638777: Instruction sheet

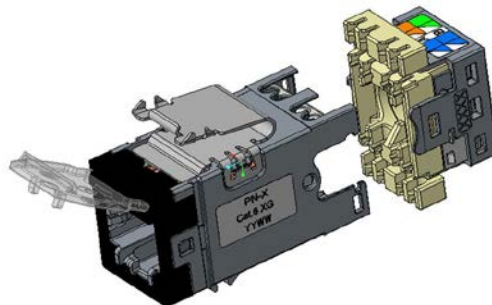
3.2 Industry Documents

- ISO/IEC 11801: Edition 2.2: Generic Cabling for Customer Premises
- ISO/IEC 60603-7 Edition 3.1: Detail Specification for 8-way, Unshielded, Free and Fixed Connectors
- ISO/IEC 60603-7-1 Edition 3.0: Detail Specification for 8-way, Shielded, Free and Fixed Connectors
- ISO/IEC 60603-7-5 Edition 3.0: Detail Specification for 8-way, Shielded, Free and Fixed Connectors, for data transmission up to 250MHz
- ISO/IEC 60603-7-51 Edition 3.0: Detail Specification for 8-way, Shielded, Free and Fixed Connectors, for data transmission up to 500MHz
- ANSI/TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- IEC 60352-4 Edition 1.0: Solderless 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 Table 2)
- IEC 60068: Basic Environmental Testing Procedures (as indicated in Table 2)
- UL1863 4th Edition: Communications-Circuit Accessories, Current Carrying Parts.

4 REQUIREMENTS

4.1 Design and Construction

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



Product view: Product Part Number 2153365-x, for reference only

4.2 Materials

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

4.3 Wire Range

- See specific Product Specification sheet for appropriate cable dimensions compatibility.

4.4 Ratings

- Voltage: 150 volts AC maximum
- Current: Signal application only, 0.75 ampere maximum
- Testing Temperature: -40 to 70°C
- Operating Temperature: -10 to 60°C.

4.5 Tooling

Connectors shall be terminated using tooling shown in the application specification and instruction sheets appropriate for each part number.

4.6 Performance and Test Description

Product is designed to meet the electrical, mechanical, and environmental performance requirements specified in Table 2.

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

Test description	Requirement	Procedure																		
EXAMINATION																				
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																				
Contact resistance, Plug/Jack interface	IEC 60603-7, Section 6.4.4 IEC 60603-7-1, Section 6.4.4 Initial: Signal contacts (R_B): 20 m Ω max. Shield contacts: 20 m Ω max. Change from initial after conditioning: Signal contacts (ΔR_{AD}): 20 m Ω max. Shield contacts (ΔR_{AD}): 20 m Ω max.	IEC 60512-2-1 Derived by measuring the total voltage drop of the mated connectors and terminated wire, then subtracting the average bulk resistance of these components. Test voltage shall not exceed 20 mV d.c. or peak voltage a.c. and test current shall not exceed 100 mA, a.c. or d.c.																		
Contact resistance, IDC/wire interface	IEC 60352-4, Section 3, Table 2 A = initial max resistance m Ω B = max change allowed m Ω <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Wire</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Solid</td> <td>Plated</td> <td>5</td> <td>1</td> </tr> <tr> <td>Un-plated</td> <td>10</td> <td>1</td> </tr> <tr> <td rowspan="2">Stranded</td> <td>Plated</td> <td>10</td> <td>2</td> </tr> <tr> <td>Un-plated</td> <td>10</td> <td>5</td> </tr> </tbody> </table> IDCs plated	Wire		A	B	Solid	Plated	5	1	Un-plated	10	1	Stranded	Plated	10	2	Un-plated	10	5	IEC 60512-2-1 Derived by measuring the voltage drop between the IDC contact and terminated wire. Test voltage shall not exceed 20 mV d.c. or peak voltage a.c. and test current shall not exceed 100 mA, a.c. or d.c.
Wire		A	B																	
Solid	Plated	5	1																	
	Un-plated	10	1																	
Stranded	Plated	10	2																	
	Un-plated	10	5																	
Input to output DC resistance	IEC 60603-7, Section 6.4.5. TIA-568-C.2, Section 6.8.1. Signal conductors (R_{AD}): 200 m Ω max. IEC 60603-7-1, Section 6.4.5 Shield (R_{AD}): 100 m Ω max.	IEC 60512-2-1. Derived by measuring the total voltage drop of terminated plugs mated to the cable terminated in the jacks.																		
Input to output DC resistance for mechanical test in sequence B6 (Shield).	Shield delta resistance 100 m ohm max. $\Delta R = R(\text{initial}) - R(\text{test}) $	IEC 60512-2-1 Derived by measuring the total voltage drop of terminated plug mated to the cable terminated in the jack.																		
Input to output DC resistance unbalance	IEC 60603-7, Section 6.4.6. Difference between all signal conductors (R_{AD}): 50 m Ω max.	IEC 60512-2-1.																		

		Derived by calculating the maximum difference between input to output DC resistance measurements.
Insulation Resistance	IEC 60603-7, Section 6.4.7 500 mega Ω minimum	IEC 60512-3-1, Method A. 100 volts DC, 1 minute hold.
Voltage proof	IEC 60603-7, Section 6.4.2 One minute hold with no breakdown or flashover. Max leakage current 2mA	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. All contacts bundled to shield, 1500 volts DC or AC peak.
Current carrying capacity (All contacts) (Shield)	IEC 60603-7 Section 6.4.3. All contacts, connected in series. The current carrying capacity of connectors in accordance with the requirements of 2.5 of IEC 61076-1:2006 shall comply with de-rating curve. IEC 60603-7-1 Section 6.4.3. The current carrying capacity of the screen shall be two times the current carrying capacity of the signal contacts per IEC 60603-7 Clause 6.	IEC 60512, Test 5b
Signal continuity and short to shield	Continuity of all signal paths and no shorts to the shield	Using a continuity tester ensure that there are no discontinuities between the free end of the cable and the jack signal contacts. Ensure that there are no shorts between the cable wires and the jack body (shield).
Current-carrying parts (UL 1863)	Product shall withstand for period of time require per a and b, without breakdown accordance with UL 1863	a) An open-circuit test voltage of 600 volts AC, 50-60 hertz, with a short circuit current level of 2,2 amperes, is to be applied for a period of 30 minutes. b) An open-circuit test voltage of 600 volts AC, 50-60 hertz, with a short circuit current level of 7.0 amperes, is to be applied for a period of 5 seconds. Shall be in accordance with UL 1863.
Dielectric Voltage-Withstand (UL 1863)	Product shall withstand for 1 minute, without breakdown accordance with UL 1863	b) 100 volts rms (1414 volts, when a DC potential is used) - for a unit rated between 31 and 250 vols AC rms. Shall be in accordance with UL 1863.
MECHANICAL		
Gauging continuity test	All signal contacts and screen 10 μ S max	IEC 60603-7 1(Annex A)
Plug insertion/withdrawal forces	30N max	IEC 60512-1 Test 13b. Latch inoperative. Max rate of load application 25mm/min
Plug retention in jack (effectiveness of connector coupling device)	IEC 60603-7, Section 6.6.2. No discontinuities greater than 10 μ s. Shall remain mated and show no evidence of physical damage.	IEC 60512-15-6. Apply an axial load of 50 N to plug mated to jack with latch engaged and hold for 60 \pm 5 seconds. Load shall be applied at a maximum rate of 44.5 N per second.
Jack retention in panel/faceplate	50N & visual	Mount jack in panel/faceplate and via plug/patch cord apply 50N pull for 1 minute and then a push for 1 minute.

		<p>Jack shall remain in panel/faceplate with no damage.</p> <p>Any salient observations from the mounting of the jack to the end of the test shall be recorded.</p> <p>A range of panels and faceplates suitable for the jack shall be used. Keystone and SL mounting apertures shall be covered.</p>
Mating durability	IEC 60603-7-1, Section 6.5.1. (Performance level 1 – 750 cycles in total)	IEC 60512-9-1. Mate and un-mate plug to jack interface with locking device inoperative for 375 cycles at a maximum rate of 10mm per second.
Mating durability under electrical load (PSE 30 W)	IEC60512-99-001 (IEEE 802.3at Type 2; 2-Pair PoE Plus)	Mate and un-mate plug to jack interface with locking device inoperative for 25 cycles per polarity at a maximum rate of 10mm per second for total of 50 cycles. Max current 0.6A (600mA) Open voltage 60V d.c. RCL circuit loading (see IEC60512-9-3) Contacts to be in parallel.
Mating durability under electrical load (PSE 100 W)	IEC60512-99-001 (IEEE 802.3bt Type 4; 4-Pair PoE)	Mate and un-mate plug to jack interface with locking device inoperative for 25 cycles per polarity at a maximum rate of 10mm per second for total of 50 cycles. Max current 1A (960mA) per pair Open voltage 60V d.c. RCL circuit loading (see IEC60512-9-3) Contacts to be in parallel.
Vibration	IEC 60603-7-1 No discontinuities greater than 10 μ s. including shield. There shall be no evidence of damage.	IEC 60512-6-4. Subject mated plug & jack to: Frequency: 10 to 500 Hz. Displacement Amplitude (peak): 0.35 mm Acceleration: 5g (50 m/s ²) 10 sweep cycles per axis of 3 mutually perpendicular planes. Sweep rate: 1 octave per minute. Monitor contact disturbance per IEC 60512-2-5.
IDC Re-termination	Samples to meet contact resistance requirements	IEC 60352-4 12.2.3 1 group 4 terminations with 22awg solid, 5 th termination with 24awg solid, 6 th termination with 26awg solid. 1 group 5 terminations with 24awg stranded. 1 group 5 terminations with 26awg stranded.
Bending of the wire/cable (IDC)	No discontinuities greater than 10 μ s. Termination shall not be damaged and conductors shall not be broken.	IEC 60352-4, Section 12.2.1. Apply a 50 N axial load to the free end of the terminated cable. Bend cable α = 30 degrees in both directions from vertical position for 5 cycles each direction (10 cycles total). Monitor contact disturbance per IEC 60512-2-5.
Cable clamp resistance to torsion	There shall be no defect that would impair normal operation.	Based upon concept of IEC 60512-17-4 Test 17d

	Shield delta resistance 100 m ohm max	Axial load 10N, cable terminated to IDCs. At 300mm twist cable +180° and hold for 1 min. Return to rest and twist to -180°, hold for 1 min. Return to rest
Cable clamp robustness	There shall be no defect that would impair normal operation. Shield delta resistance 100 m ohm max	IEC 60512-17-1 Test 17a Load 10N. Applied at 300mm. Hold at each bend for 1 minute. A cycle consists of 1 bend to 90° in each of the 4 axes with the jack horizontal Number of cycle = 5
Cable clamp resistance to cable rotation	There shall be no defect that would impair normal operation. Shield delta resistance 100 m ohm max	IEC 60512-17-2 Test 17b Load sufficient to just maintain the alignment. Deflect the cable 45° to the axis at point of entry and rotate 360°, speed of rotation 5s, number rotations = 5 in each direction
Cable clamp resistance to cable pull	There shall be no defect that would impair normal operation. The cable shall not have moved by more than 1mm. Shield delta resistance 100 m ohm max	IEC 60512-17-3 Test 17c Mount sample vertically and apply 10N axially for 1 minute.
ENVIRONMENTAL		
Rapid change of temperature, Plug/Jack interface	IEC 60603-7-1, Section 7.7.2.3.	IEC 60068-2-14, Test Na or Nb Subject mated connectors to 25 cycles between -40°C & 70°C with 30 minute dwells at temperature extremes. 2 hour recovery time.
Rapid change of temperature, IDC/wire interface	IEC 60352-6, Section 12.4.1	IEC 60068-2-14, Test Na or Nb Subject terminated jacks to 5 cycles between -40°C & 70°C with 30 minute dwell at temperature extremes. 2 hour recovery time.
Cyclic damp heat	IEC 60603-7-1, Section 7.7.2.7.	IEC 60068-2-38. Subject connectors to 21 cycles (21 days) between 25°C & 65°C at 93% RH with 5 sub-cycle shocks at -10°C in the 1 st 9 cycles. Half specimens mated, the remaining half unmated.
Climatic sequence (IDC)	60352-4 Section 12.4.2	IEC 60068-2-61, Method 1 Subject terminated plugs to dry heat +70°C & cold -40°C with a total of 6 damp heat cycles.
Electrical load & temperature	IEC 60603-7 & 7-1 Section 7.7.2.6	IEC 60068-2-2, Tests Bd & Be Temperature: 70°C, RH: uncontrolled Test Time: 500 hours & 2 hours recovery Test Currents: Signal contacts: 0.8A d.c. per contact Shield contacts: 1.6A d.c. Half the specimens energized [test Bd], the remaining half not energized [test Be].
High temperature	IEC 60603-7-1	IEC 60068-2-2, Tests B Temperature: 70°C, RH: uncontrolled Test Time: 500 hours & 2 hours recovery All specimens mated.
Flowing mixed gas corrosion	IEC 60603-7, Section 7.7.2.4 IEC 60603-7-1, Section 7.7.2.4	IEC 60512-11-7, Method 1 H ₂ S: 100 ± 20 (10 ⁻⁹ vol/vol), SO ₂ : 500 ± 100 (10 ⁻⁹ vol/vol), Temp.: 25 ± 1°C, RH: 75 ± 3%, Test time: 4 days, Half the specimens mated, the remaining half unmated.
TRANSMISSION		

Transfer Impedance (shielded only)	60603-7-1, per 6.4.7	IEC 60512-26-100, test 26e Mated connectors.
Coupling Attenuation (shielded only)	60603-7-1, per 6.4.8	EN 50289-1-14 Mated connectors.
Transmission performance (Cat6 or 6a) IL, NEXT, RL, FEXT, TCL, TCTL Channel & permanent link For Cat6a only PSANEXT & PSAFEXT	The most onerous limits from ISO11801 TIA568-C-2 IEC60603-7-5 (Cat 6) IEC60603-7-51 (Cat 6a)	IEC60512-25-x IEC60512-27-x Where x depends upon the actual test ISO11801 TIA568-C-2

Table 2

4.7 Product Qualification and Requalification Test Sequence

Test or Examination	Test Sequence												
	IDC / Wire Interface		Plug/Jack										Jack
	A1	A2	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	C1
Visual examination of product	1, 7	1, 5	1, 14, 20	1, 18	1, 11	1, 12	1	1, 5, 9, 13, 17	1,5	1	1, 11	1, 11	1, 4
Contact resistance, Plug/Jack interface incl shield			2, 11, 17	2, 8, 11, 14	2, 9	2, 11	2			2	2, 9, 12	2, 9, 12	
Contact resistance, IDC/wire interface	2, 6	2, 4											
Input to output DC resistance incl shield			3, 9, 16	3, 9, 12, 15	3, 8	3, 10	3	shield only 3		3	3	3	
Input to output DC resistance for mechanical test in sequence B6 (Shield).								7, 11, 15, 19					
Input to output DC resistance unbalance			4	4	4	4	4				4	4	
Signal continuity and short to shield								2, 6, 10, 14, 18					
Insulation Resistance			5, 12	5, 16	5, 10	5, 8	5				5, 13	5, 13	
Voltage proof			6, 13	6, 17	6	6, 9	6				6, 14	6, 14	
Current carrying capacity - shield									2				
Current carrying capacity									3				
IDC Re-termination		3											
Vibration,					7								
Gauging continuity test						13							
Plug insertion and withdrawal forces			7, 18										
Plug retention in jack			8, 19										
Panel Housing retention									4				
Mechanical operation durability				7, 13									
Mechanical operation durability with power (PSE 30 W)											7, 10		
Mechanical operation durability with power (PSE 100 W)												7, 10	
Bending of the wire/cable (IDC)	3												
Cable clamp resistance to torsion								16					
Cable clamp robustness								4					
Cable clamp resistance to cable rotation								8					
Cable clamp resistance to cable pull								12					
Rapid change of temperature, Plug/Jack interface			10										
Rapid change of temperature, IDC/wire interface	4												
Cyclic damp heat			15				8						
Climatic sequence	5												
Electrical load & temperature						7							
High temperature							7						
Flowing mixed gas corrosion				10							8	8	
Transfer Impedance							9						
Coupling Attenuation							10						
Transmission performance (NEXT, RL etc.)										4			
Transmission performance (Channel etc.)										5			
Fault Current Test "a and b" Per UL 1863													2
Dielectric Voltage – Withstand Test "b" Per UL 1863													3

Table 3

5 Quality Assurance Provisions

5.1 Qualification Testing

A. Specimen Selection

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

Sample numbers: The number of samples required for each test group are defined in Table 4.

Note: for each test group or specific combination (e.g. cable type) within a test group, the default number of samples is 5.

Cable: Engineering discretion, customer drawings and product specifications shall be used to choose cables to qualify/requalify new products and design changes. Cables may be chosen with minimum and maximum conductor sizes, insulations sizes and jacket sizes commonly available in the industry.

B. Test Sequence

Product qualification shall be verified by testing specimens per test sequence defined in Table 3.

5.2 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.

5.3 Acceptance

Acceptance is based on verification that the product meets the requirements of Table 2. 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.

5.4 Quality Conformance Inspection

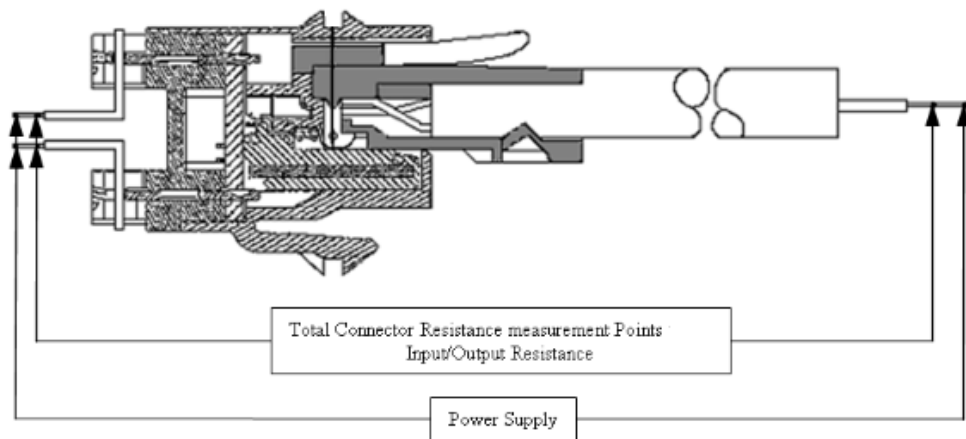
The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the application product drawing and this specification.

Group	No jacks required	Cable																	
		F/UTP						S/FTP											
		Solid Wire						Solid Wire						Stranded Wire					
		Cable diameter			AWG			Cable diameter			AWG			Cable diameter			AWG		
min	max	nom	min	max	nom	min	max	nom	min	max	nom	min	max	nom	min	max	nom		
A1	20	X	X				X	X	X				X						
A2	15											X	X				X	X	
B1	10									X				X				X	
B2	10			X			X			X				X					
B3	15			X			X			X				X				X	
B4	10			X			X			X				X					
B5	10			X			X			X				X					
B6	20	X	X				X	X	X					X					
B7	10			X			X			X				X					
B8	37 MIN (a)									X				X					
B9	10			X			X			X				X					
B 10	10			X			X			X				X					
C1	10			X			X			X				X					

(a) The number required for group B8 depends upon the amount of re-use of jacks in the various configurations. The minimum number given is based upon 28 for alien (Cat 6A only), 5 for hardware testing and 4 for channel/link tests.

Table 4

FIGURES RELATED TO TEST PROCEDURES



Resistance of Connector Assembly
(Example of RJ45 Jack/outlet and RJ45 plug)

Figure 1

6 Trade-marks

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