AMP-TWIST Series Jacks for Class E_A systems

1. SCOPE

1.1 Content

This specification covers performance, tests and quality requirements for AMP NETCONNECT*, **AMP-TWIST* Series Jacks** for Class E_A System, used to provide an 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 terminal for terminating both shielded and unshielded twisted pair communications cable. Jacks will accommodate:

Solid conductor cable range (AWG)	**Stranded** conductor cable range (AWG)	Max. **conductor insulation** diameter	**Cable diameter** range
22-24	24-26	1.60 mm	5.0- 9.0 mm

1.2 Qualification

When tests are performed on subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using 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 Documents.

Document	AMP-TWIST TIE 6S SL Jack	AMP-TWIST 6S SL Jack	AMP-TWIST E_AS SL Jack
Product Spec.	108-93044		
Instruction sheet	411-93018	411-93007 & 411-93014	411-93024
Customer drawing	C-1711895 C-1711919	C-1711160 / C-1711342 C-1711295 / C-1711343	C-2153000 C-2153001
Related Part Number	1711895-2 / 1711919-2	1711160-2 / 1711342-2 1711295-2 / 1711343-2	2153000-1 / 2153001-1
Qualification Test report	501-93032	501-93032	501-93032

Other applicable documents:

- 109-197: AMP Test Specification vs. EIA and IEC Test Methods.
- 230-702: Supplier requirements for elimination of hazardous substances.

Rev. B: Correcting PN on 2.1 table. 3.7 test requirements: Clarifying electrical requirement for Insulation resistance and adding Transfer Impedance and Coupling test.

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2.2 Industrial Standards

Standard	Title description
ISO/IEC 11801. Ed. 2.0 Amd. 2 April 2009	*Information Technology - Generic Cabling for Customer Premises.*
ANSI/TIA-568-B.2-10. April 2008	Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling.
DIN IEC 60512 (all parts)	*Basic testing procedures and measuring methods for electromechanical components for electronic equipment. Test Specifications as indicated in Fig. 1*
DIN IEC 60068	*Basic environmental testing procedures. Test Spec. as indicated in Fig.1.*
ISO / IEC 60603-7-1 First Edition. 2002-01	*Detail Specification for 8-way, shielded free and fixed connectors with common mating features, with assessed quality*
IEC 61935-1	*Generic cabling systems- Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801. Part 1: Installed cabling.*

2.3 Other documents:

- *UL and CSA certificate (January, 22nd, 2009): UL Report/File E81956. PN's related: 1711160-2, 1711342-2, 1711295-2 and 1711343-2.*

3. REQUIREMENTS

3.1 Design and Construction

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

3.2 Materials

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

3.3 Wire range

A. Conductor range (Ø mm): 0.51 - 0.65
B. Solid conductor range: 24 - 22 AWG
C. Stranded conductor range: 24 - 26 AWG
D. Insulation range (Ø mm): 0.80 - 1.60
E. Cable diameter range (Ø mm): 5.0 - 9.0

3.4 Ratings

A. Voltage: 150 Vac max.
B. Current: Signal application only (0.75 A)
C. Temperature: -40 to 70ºC

3.5 Tooling

Connector has to be terminated with SL Series Jack tool PN 1725150-3 (tool kit).

3.6 Performance and Test Description

Product is designed to meet 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
Examination of product	Meets requirements of product drawing	Visual, dimensional and functional per applicable quality inspection plan
ELECTRICAL		
Input-output Resistance	ISO/IEC 11801. 2nd Ed. 200 mΩ maximum initial and final.	IEC 60512-2, Test 2a. Measure Jacks mated to a Patch Cord. See figure 6.
Shield resistance	ISO/IEC 11801. 2nd Ed. 100 mΩ maximum initial and final.	IEC 60512-2, Test 2a. Measure Jacks mated to a Patch Cord. See figure 6.
Input-output Resistance unbalance	ISO/IEC 11801. 2nd Ed. 50 mΩ maximum initial and final.	IEC 60512-2-1 Test 2a. Measure Jacks mated to a Patch Cord.
Current carrying capacity	ISO/IEC 11801. 2nd Ed. 0.75 A	IEC 60512-3, Test 5b See Figure 5.
Insulation resistance	IEC 60603-7 500 MΩ	IEC 60512-3, Test 3a Method C. 100 V d.c
Voltage proof	ISO/IEC 11801. 2nd Ed. 1 minute hold with no breakdown or flashover. 1 000 Vdc or ac peak. 1 500 Vdc or ac peak.	IEC 60512-2, test 4a Contact / contact. (1000 V peak). Mated connectors. All contacts to Shield. Mated connectors. (1500 V peak)
Wire map	Continuity and short circuit Wire map configuration as per T568B	Any device which ensures quality
Shield continuity	Shield continuity	Any device which ensures quality.
TRANSMISSION		
	Class E_A Permanent Link (See note C)	
Return Loss	Class E_A Permanent Link Return Loss requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.11 See Figure 3
Insertion Loss	Class E_A Permanent Link Insertion Loss requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.5 See Figure 3
NEXT Loss	Class E_A Permanent Link NEXT requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.7 See Figure 3
PS NEXT Loss	Class E_A Permanent Link PS NEXT requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	(PS NEXT is computed from NEXT Loss values). See Figure 3
ACR-N	Class E_A Permanent Link ACR-N requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.8 See Figure 3
PS ACR-N	Class E_A Permanent Link PS ACR-N requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	(PS ACR-N is computed from ACR-N values) See Figure 3
FEXT Loss	(There are no requirements for FEXT Loss)	IEC 61935-1, Paragraph 4.9 See Figure 3

ACR-F	Class E_A Permanent Link ACR-F requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.10 See Figure 3
PS ACR-F	Class E_A Permanent Link PS ACR-F requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	(PS ACR-F is computed from ACR-F values) See Figure 3
Propagation delay	Class E_A Permanent Link Prop Delay requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.6 See Figure 3
Delay Skew	Class E_A Permanent Link Delay Skew requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 61935-1, Paragraph 4.6 See Figure 3
Transfer Impedance	Requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	IEC 60603-7-1. Mated connectors, terminate with each cable construction intended to be allowed for these connectors.
Coupling Attenuation	Requirements according to Amend. 2 to ISO/IEC 11801 2nd Ed.	EN 50289-1-15
MECHANICAL		
Vibration, Jack-plug interface and IDC-wire interface	No discontinuities of 1 microsecond maximum. Shall remain mated and show no evidence of physical damage. See note.	IEC 60512-6-4. Subject mated plug and terminate jack to frequency range of 10 to 55 Hz with displacement amplitude of 0.35 mm. Sweep cycles per direction shall be 5 in each direction of axis which are mutually perpendicular planes.
Durability, Jack-plug interface	See note.	IEC 60512-9-1. Mate and un-mate plug and jack interface with latch inoperative for 750 cycles at a maximum rate of 500 (automatic) or 300 (manual) cycles per hour.
Plug insertion force, Jack-plug interface	40 Nw maximum, (shielded)	IEC 60512-13-1. Measure force required to mate plug and jack with latch depressed at a maximum rate of 25 mm/min.
Plug withdrawal force, Jack-plug interface	40 Nw maximum, (shielded)	IEC 60512-13-1. Measure force required to unmate plug and jack with latch depressed at a maximum rate of 25 mm/min.
Plug retention in jack, Jack-plug interface	Plug shall not dislodge from jack, and shall maintain electrical continuity.	IEC 60512-8, test 15f. Apply an axial load of 90 N to the cable which is terminated to the plug, at a rate of 25 mm/min with plug mated in jack and latch engaged. Maintain load for 5 seconds.
Termination tensile strength, vertical, IDC-wire interface	Wire Size (AWG) — Nw Minimum 22 Solid — 6’8 23 Solid — 4’5 24 Solid — 4’5 24 Stranded — 6’8 26 Stranded — 8’5	IEC 60512-8, test 15f. Determine slot tensile strength. Apply an axial load of 90 N to the cable which is terminated, at a rate of 25 mm/min. See figure 7.

Durability repeated, IDC-wire interface	See note	TIA/EIA 568-B-2. Terminate and re-terminate IDC's on jack 4 times with 22 AWG solid wire and last time with AWG 26 Stranded.
Panel housing retention	90 Nw minimum	AMP-Spec. 109-49. (Source AMP Spec.108-1389). Measure panel retention force at a rate of 12'5 mm/min., using nominal panel cut-out dimensions as specified in appropriate Tyco Electronics customer drawing.
Front/rear housing retention	90 Nw minimum	Measure front/rear housing retention once the jack is assembled (with no cables). See figure 8.
ENVIRONMENTAL		
Thermal shock. Jack-plug interface and IDC-wire interface	See note	IEC 60068-2-14 Subject mated plug and terminated jack to 100 cycles between -40º and 70ºC. Duration exposure shall be 30 minutes
Humidity-temperature cycling. Jack-plug interface and IDC-wire interface	See note	IEC 60068-2-38 Subject mated plug and terminated jack to 21 cycles (cycle time 24 hours) between 25º and 65ºC at 93% RH with a -10ºC sub-cycle shock.
Humidity, steady state. Jack-plug interface and IDC-wire interface	See note	IEC 60512-11-12 Subject mated plug and terminated jack to 55ºC and 95% RH for 10 days.
Stress relaxation, (dry heat). Jack-plug interface and IDC-wire interface	See note	IEC 60068-2-2, Test method Ba. Subject mated plug and terminated jack to 70º C for 500 hours. (Half samples connected to 0.5 A and other samples not connected).
Flowing mixed gas corrosion. Jack-plug interface and IDC-wire interface	See Note	IEC 60068-2-60 Test Method C. Test Conditions: SO_2 0,5 ppm (Volume) H_2S 0,1 ppm (Volume) T= (25 ± 2)ºC HR= (75 ± 3) % Test time: 4 days.

Figure 1 (end)

NOTE *Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests as specified in Test Sequence in Figure 2.*

3.8. Product Qualification and Re-qualification Test Sequence.

	Test Group (a)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Test Sequence (b)												
Examination of product	1,9	1,9	1,11	1,3	1,7	1,5	1,7	1,5	1,3	1,14	1,4	1,3	1,3
ELECTRICAL													
Input-output Resistance	2,8	2,8	2,10		2,6		2,6						
Shield Contact resistance	3,7	3,7	3,9		3,5		3,5						
Input-output Resistance unbalance	4,6												
Current carrying capacity									2				
Insulation resistance			4,8										
Voltage proof								2,4					
Wire map & Shield Continuity										2			
MECHANICAL													
Vibration, Jack-plug interface and IDC-wire interface			5										
Durability, Jack-plug interface							4						
Plug insertion force, Jack-plug interface						2							
Plug withdrawal force, Jack-plug interface						3							
Plug retention in jack, Jack-plug interface						4							
Termination tensile strength, vertical, IDC-wire interface				2									
Durability repeated, IDC-wire interface		4											
Panel housing retention												2	
Front/Rear housing retention													2
ENVIRONMENTAL													
Thermal shock, IDC-wire interface		5	6										
Humidity-temperature cycling, IDC- wire interface		6	7										
Humidity, steady state, jack-plug interface								3					
Stress relaxation, (dry heat), IDC-wire interface	5												
Flowing mixed gas corrosion, jack-plug interface					4								
TRANSMISSION (**See note c**)													
Return Loss										3			
Insertion Loss										4			
NEXT										5			
PS NEXT Loss										6			
ACR-N										7			
PS ACR-N										8			
FEXT										9			
ACR-F										10			
PS ACR-F										11			
Propagation Delay										12			

Delay Skew										13			
Transfer Impedance											2		
Coupling Attenuation											3		

NOTE

(a) *See paragraph 4.1.A.*

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

(c) *Transmission parameters: Checked as Class E_A 2-Connectors Permanent Link Configuration.*

Figure 2

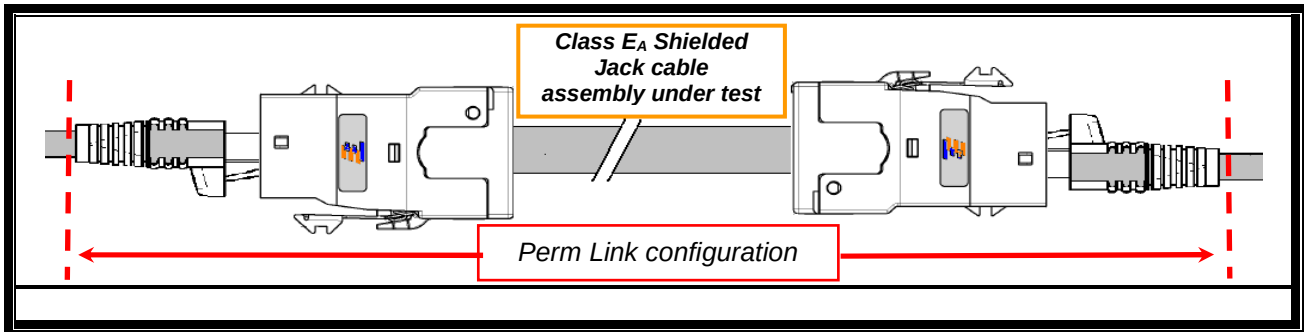

Figure 3
Test set up – Permanent Link configuration

Minimum number of samples required per each test group to be terminated with adequate cable.

Test group	AWG 22 / Solid	AWG 23 / Solid	AWG 24 / Solid	AWG 24 / Stranded	AWG 26 / Stranded
1	1	-	3	5	5
2	5	-	-	-	-
3	3	-	3	3	3
4	5	-	-	-	5
5	5	-	-	-	5
6	5	-	-	-	-
7	5	-	-	-	-
8	4	-	4	4	4
9	-	-	1	-	3
10	4 *(a)*	8	4 *(a)*	8 *(a)*	4*(a)*
11	-	3	-	-	3 *(a)*
12	-	-	-	-	-
13	-	-	-	-	-

Figure 4

NOTE

(a) *Optional cable for this test. It depends on requester input and cable availability.*

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Samples (Jacks) shall be prepared in accordance with applicable Instruction Sheets (Refer to Tyco Electronics documents, see paragraph 2.1) and shall be selected at random from current production. All test groups shall each consist of a minimum of 5 samples. Shielded Patch Cords PN 959385-X or equivalent shall be delivered with the samples to be tested. As a reference, take in consideration fig. 4.

B. Test Sequence

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

4.2. Re-qualification Testing

If changes significantly affecting form, fit or functions are made to the product or manufacturing process, product assurance shall coordinate re-qualification 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 in verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test set-up or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before re-submittal.

4.4. Quality Conformance Inspection

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

Figures related to above tests:

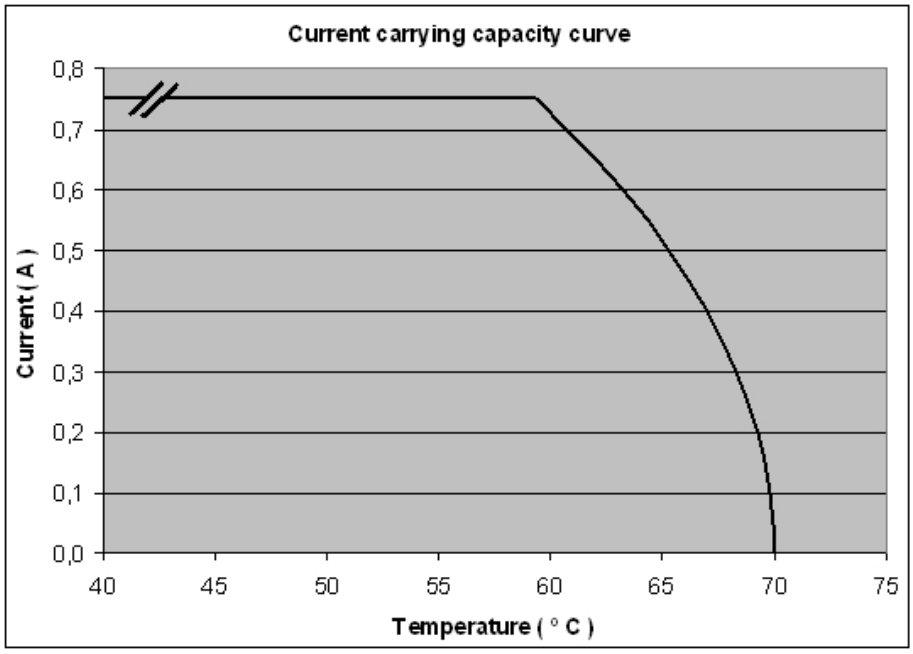

Figure 5
Current-carrying capacity

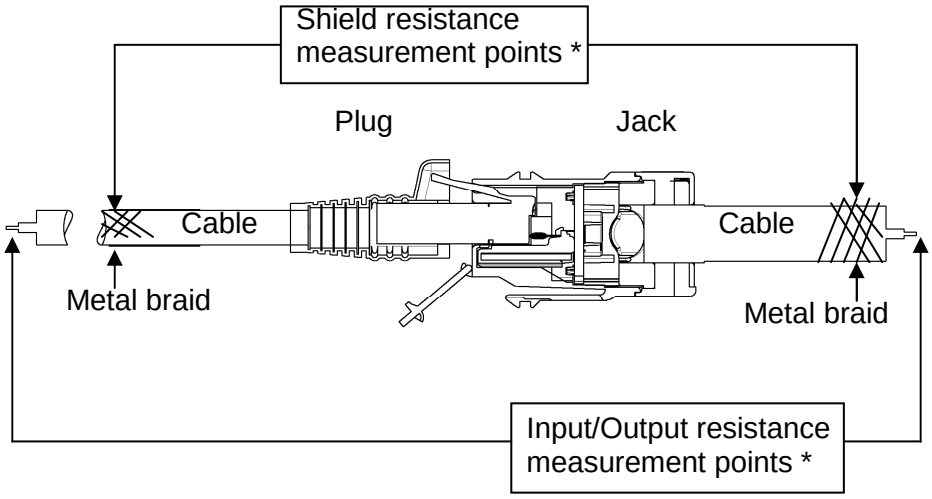

Figure 6
Input/Output and shield resistance measurement points as shown

- Resistance due to wire lengths and cable shielding shall be subtracted from all readings.

NOTE

Termination resistance of this assembly consists of plug to jack contact resistance plus printed circuit board trace plus IDC terminal to discrete wire contact resistance. PCB trace length varies with each jack position, therefore, significant variations in termination resistance readings can be expected within each jack assembly.

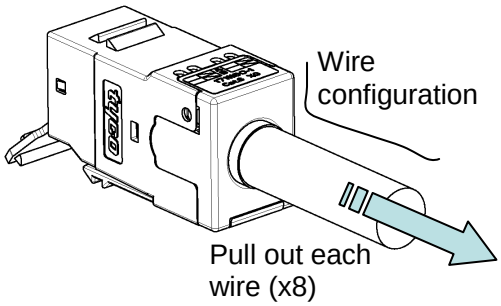

Figure 7
Termination Tensile Strength Vertical Pull

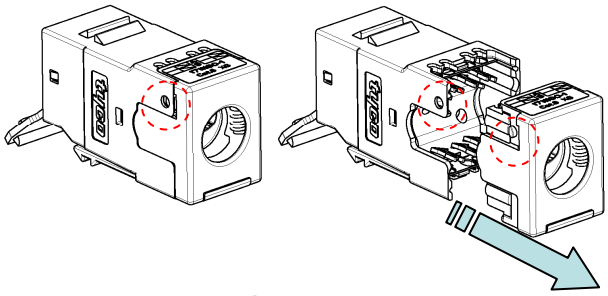

Figure 8
Front/Rear Housing retention