

**AMP-TWIST 7AS SL SYSTEM (JACK AND PLUG)**

**1. SCOPE**

**1.1 Content**

This specification covers performance, tests and quality requirements for AMP NETCONNECT\* **AMP-TWIST\* 7AS SL Jack & Plug** 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 & Plugs incorporate IDC terminal for terminating both shielded and unshielded twisted pair communications cable. Jack and 4 Pairs Plug will accommodate 22 to 24 AWG solid conductors, 4 Pairs Plug will also accommodate 24-26 AWG stranded conductors and 2 Pairs Plug will accommodate 26 AWG stranded cable only. For all the products the maximum conductor insulation diameter is 1.60 mm and the cable diameter range is: 5.7-9.0 mm (Jack and 4 Pairs Plug) and 3.6x5.6 mm oval cable for the 2 Pair plug.

**1.2 Qualification**

When tests are performed on subject product line, procedures specified in Figure 2 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 Tyco Electronics Documents.**

	<b>AMP-TWIST 7AS SL Jack</b>	<b>AMP-TWIST 7AS SL 4 Pairs Plug</b>	<b>AMP-TWIST 7AS SL 2 Pairs Plug</b>
Instruction sheet	411-93013	411-93015	411-93017
Design Objectives	108-93019	108-93019	108-93019
Customer drawing	C-1711441, C-1711437	C-1711498, C-1711556	C-1711575
Qualification Test report	501-93022	501-93022	501- 93022

**Fig. 1**

Other applicable documents:

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

## 2.2 Industrial Standards

- A. ISO/IEC 11801. Ed.2.2: *Generic Cabling for Customer Premises.*
- B. DIN IEC 60512: *Basic testing procedures and measuring methods for Electromechanical components for electronic equipment. Test Specifications as indicated in Fig. 2*
- C. DIN IEC 60068: *Basic environmental testing procedures. Test Spec. as indicated in Fig.2.*
- D. ISO / IEC 61076-3-104: *Detail Specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 1000 MHz.*
- E. EIA-364: *Electrical Connector/Socket test Procedures Including Environmental Classifications.*

## 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 for Jack, 4 Pairs Plug and 2 Pairs Plug.

- A. Conductor range ( $\emptyset$  mm): 0.51 - 0.65
- B. Solid conductor range: 24 - 22 (AWG) for Jack and 4 Pairs Plug.
- C. Stranded conductor range: 24 - 26 (AWG) for 4 Pairs Plug; 26 (AWG) for 2 Pairs Plug
- D. Insulation range ( $\emptyset$  mm): 0.8 - 1.60
- E. Cable diameter range ( $\emptyset$  mm): 5.7 - 9.0 for Jack/4 Pairs Plug; 3.6x5.6 cable for 2 Pairs Plug

### 3.4 Ratings

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

### 3.5 Tooling

Connector has to be terminated with tooling as described in the Instruction Sheet.

### 3.6 Performance and Test Description

Product is designed to meet electrical, mechanical and environmental performance requirements specified in Figure 2. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

### 3.7. Test Requirements and Procedures Summary

All figures related with test procedures are included in Annex A of this document.

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. 2 <sup>nd</sup> Ed. 200 mΩ maximum initial and final.	IEC 60512-2, Test 2a. Mated connectors. See figure 7.
Contact resistance	ISO/IEC 11801. 2 <sup>nd</sup> Ed. - 20 mΩ maximum (initial) and change from initial.	IEC 60512-2, Test 2a. Mated connectors. See figure 7.
Shield resistance	ISO/IEC 11801. 2 <sup>nd</sup> Ed. - 20 mΩ maximum (initial) and change from initial. - 20 mΩ maximum (initial) and 200 mΩ change from initial for 2 pair plug only.	IEC 60512-2, Test 2a. Mated connectors. See figure 7.
Input-output Resistance unbalance	ISO/IEC 11801. 2 <sup>nd</sup> Ed. 50 mΩ maximum initial and final.	IEC 60512-2-1 Test 2a. Mated connectors.
Current carrying capacity	ISO/IEC 11801. 2 <sup>nd</sup> Ed. 0.75 A	IEC 60512-3, Test 5b All contacts, connected in series.
Insulation resistance	ISO/IEC 11801. 2 <sup>nd</sup> Ed. 500 MΩ min.	IEC 60512-2, Test 3a Method A, 100 V d.c Mated connectors
Voltage proof	ISO/IEC 11801. 2 <sup>nd</sup> Ed. 1 minute hold with no breakdown or flashover. 1 414 Vdc or ac peak. 1 500 Vdc or ac peak.	IEC 60512-2, test 4a Contact / contact. (1414 V peak). Mated connectors. All contacts to Shield. Mated connectors. (1500 V peak)
Surge test	ITU-T K.20. Contact/contact Unexposed environments. Mated connectors test 1, 2 and 3	Test 1,2 –Withstand per ITU-T K.20, Clause 7, criterion A. Test 3 – No fire hazard per ITU-T K.20, Clause 7, criterion B.

### TRANSMISSION

#### **Cat 7a Connecting Hardware requirements -AMP-TWIST 7<sub>A</sub>S SL jack and plug connector components-**

Insertion Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	IEC 60512-25-2 Mated connectors (tested up to 2.0 GHz)
Return Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	IEC 60512-25-5 Mated connectors (tested up to 2.0 GHz)
NEXT Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	IEC 60512-25-1 Mated connectors (tested up to 2.0 GHz)
PS NEXT Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	It is calculated from previous NEXT values (tested up to 2.0 GHz)
FEXT (Far-end Crosstalk) Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	IEC 60512-25-1 Mated connectors (tested up to 2.0 GHz)
PS FEXT Loss	IEC 61076-3-104. Requirements extrapolated up to 1.2 GHz	It is calculated from previous FEXT values (tested up to 2.0 GHz)
TCL (Transverse conversion Loss)	IEC 61076-3-104.	IEC 61076-3-104 Annex J Mated connectors

TCTL (Transverse conversion Transfer Loss)	IEC 61076-3-104.	IEC 61076-3-104 Annex J Mated connectors
Transfer Impedance	IEC 61076-3-104.	IEC 60512-23-3 or IEC 61076-3-104 Annex I (Triaxial tube method) Mated connectors. (Tested up to 100 MHz).
Alien NEXT Loss		IEC 60512-25-9 Mated connectors (Tested up to 2.0 GHz)
PS Alien NEXT Loss	Amd. 2 to ISO 11801.	It is calculated from previous Alien NEXT values
Alien FEXT Loss		IEC 60512-25-9 Mated connectors (Tested up to 2.0 GHz)
PS Alien FEXT Loss	Amd. 2 to ISO 11801.	It is calculated from previous Alien FEXT values

### MECHANICAL

Vibration, Jack-plug interface and IDC-wire interface	No discontinuities of 10 microsecond maximum. Shall remain mated and show no evidence of physical damage. See note.	IEC 60068-2-6. Subject mated plug and terminate jack to frequency range of 10 to 55 Hz with displacement amplitude of 0.75 mm. Sweep cycles per direction shall be 20 in each direction of axis which are mutually perpendicular planes. Duration: 1h 45 min each axis.
Durability, Jack-plug interface	IEC 61076-3-104 See note.	IEC 60512, test 9a. Mate and unmate plug and jack interface with latch inoperative for 750 cycles at a maximum speed of 10 mm/s with a resting time of 5 s. minimum (unmated).
Plug insertion force, Jack-plug interface	IEC 61076-3-104 20 N maximum, (shielded)	IEC 60512, test 13b. Measure force required to mate plug and jack with latch depressed at a maximum rate of 10 mm/s.
Plug withdrawal force, Jack-plug interface	IEC 61076-3-104 20 N maximum, (shielded)	IEC 60512, test 13b Measure force required to unmate plug and jack with latch depressed at a maximum rate of 10 mm/s.
Plug retention in jack, Jack-plug interface. (Effectiveness of connector coupling device)	Plug shall not dislodge from jack, and shall maintain electrical continuity.	IEC 60512-8, test 15f. Mated connectors. All types: 50N for 60 seconds minimum $\pm$ 5 seconds.
Locking device mechanical operations	IEC 61076-3-104. Annex B. 1500 cycles.	IEC 60512-9-1. Max. speed: 20 cycles per minute.

### ENVIRONMENTAL

Thermal shock. Jack-plug interface and IDC-wire interface	IEC 61076-3-104 See note	IEC 60068-2-14 Subject mated plug and terminated jack to 100 cycles between -40° and 70°C. Duration exposure shall be 30 minutes.
Humidity-temperature cycling. Jack-plug interface and IDC-wire interface	IEC 61076-3-104 See note	IEC 60068-2-38 Subject mated plug and terminated jack to 21 cycles (cycle time 24 hours) between 25° and 65°C at 93% RH with a -10°C sub-cycle shock.

Stress relaxation, (dry heat). Jack-plug interface and IDC-wire interface	IEC 61076-3-104 See note	IEC 60068-2-2, Test method Ba. Subject mated plug and terminated jack to 70° 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	IEC 61076-3-104 See Note	IEC 60068-2-60 Test Method C. Test Conditions: SO <sub>2</sub> 0,5 ppm (Volume) H <sub>2</sub> S 0,1 ppm (Volume) T= (25 ± 2)°C HR= (75 ± 3) % Test time: 4 days.

**NOTE**

**Figure 2 (end)**

**NOTE**

*Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests as specified in Test Sequence in Figure 3.*

**3.8. Product Qualification and Re-qualification Test Sequence:**

	Test Group (a)							
	1 AP	2 BP	3 CP	4 DP	5 EP	6FP	7	8
	Test Sequence (b)							
Examination of product	1,14,21	1,16	1,10	1,9	1,12	1,8	1,3	1,3
<b>ELECTRICAL</b>								
Input-output Resistance					10			
Contact resistance	2,11,16	2,9,12	2,8	2,10	2	2		
Shield Contact resistance	3,12,17	3,10,13	3,9	3,11	3	3		
Input-output Resistance unbalance					11			
Insulation resistance	4,10	4,14	4,7	4,7		4,7		
Voltage proof	5,13,22	5,15	5	5,8		5		
Current carrying capacity								2
Surge test						6		
<b>MECHANICAL</b>								
Vibration, Jack-plug interface and IDC-wire interface			6					
Durability, Jack-plug interface		7,11						
Plug insertion force, Jack-plug interface	6,18							
Plug withdrawal force, Jack-plug interface	7,19							
Plug retention in jack, Jack-plug interface	8,20							
Locking device mechanical operations (Plugs only)*		6*						
<b>ENVIRONMENTAL</b>								
Thermal shock cycling	9							
Humidity-temperature cycling	15							
Stress relaxation, (dry heat)				6				
Flowing mixed gas corrosion, jack-plug interface		8						
<b>TRANSMISSION</b>								
Attenuation (Insertion Loss)					4			
Return Loss					5			
NEXT					6			
FEXT (Far End Cross Talk)					7			
TCL (Transverse conversion Loss)					8			
TCTL (Transverse conversion Transfer Loss)					9			
Transfer Impedance							2	

**NOTE**

- (a) See paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.

**Figure 3**

Jack 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
1	3	-	3
2	3	-	-
3	3	-	3
4	3	-	3
5	3	3	-
6	3	-	3
7	2	-	-
8	2	-	-

Figure 4

4 Pair Plug minimum number of samples required per each test group to be terminated with adequate cable.

Test group	AWG 22 /Solid	AWG 24 /Solid	AWG 24 /Stranded	AWG 26 /Stranded
1	3	3	3	3
2	3	-	-	-
3	3	3	3	3
4	3	3	3	3
5	3	3	3	3
6	3	3	3	3
7	2	-	-	-
8	2	-	-	-

Figure 5

2 Pair Plug minimum number of samples required per each test group to be terminated with adequate cable.

Test group	AWG 26 /Stranded
1	5
2	5
3	5
4	5
5	3
6	3
7	2
8	2

Figure 6

#### **4. QUALITY ASSURANCE PROVISIONS**

##### **4.1. Qualification Testing**

###### **A. Sample Selection**

Samples (Jacks and Plugs) 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 related in figure 4, figure 5 and figure 6.

###### **B. Test Sequence**

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

##### **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 2. 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.

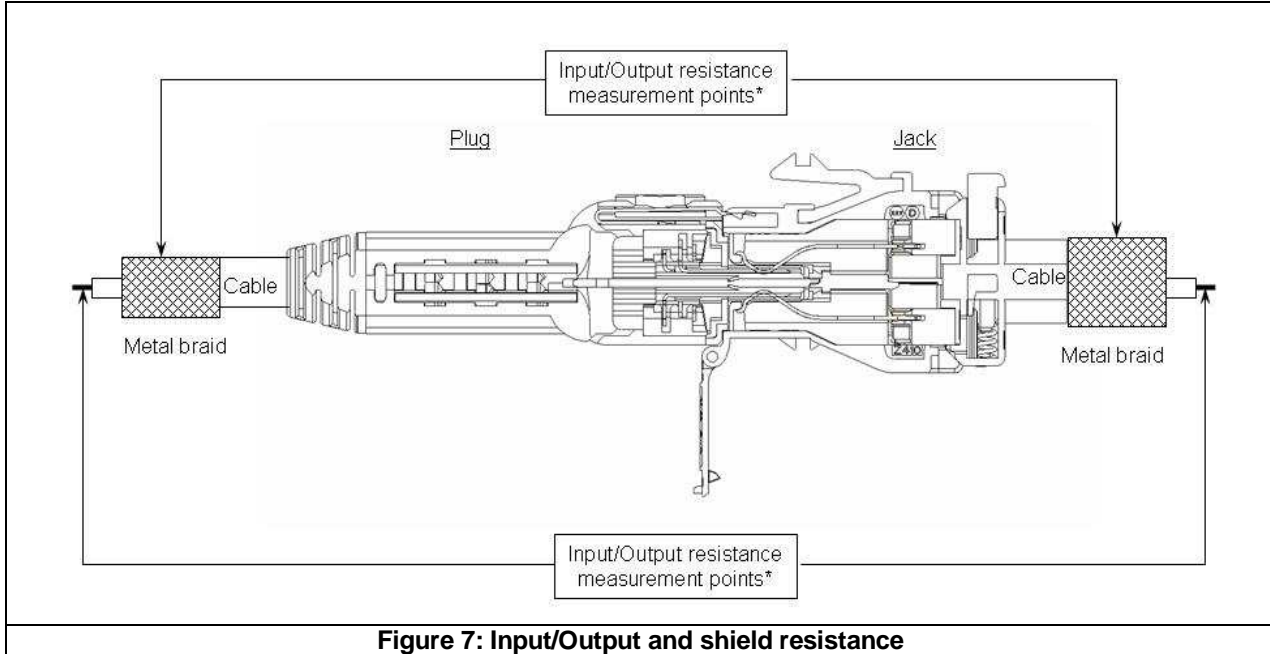
##### **4.4. Quality Conformance Inspection**

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.



*Annex A: Figures related to test procedures*

**A.3 Input/Output and shield resistance. Measurement points as shown. Schematic view**



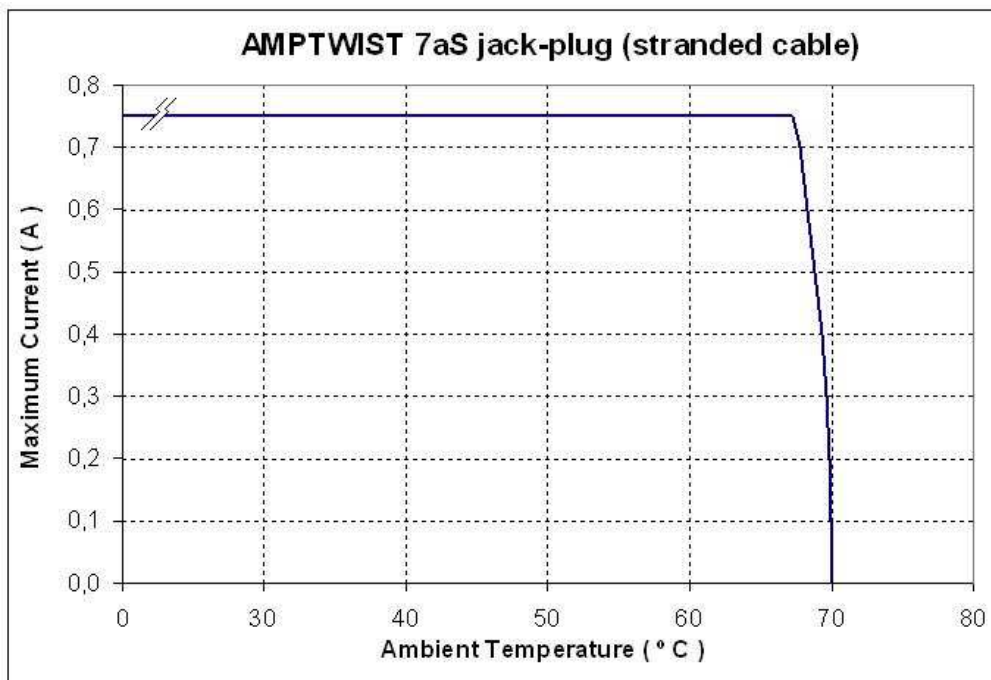
**Figure 7: Input/Output and shield resistance**

\* 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 IDC terminal to discrete wire contact resistance.

**A.4 Current Carrying capacity. Connector de-rating curve.**



**Figure 8: Connector de-rating curve.**