

AMP-TWIST Series Jacks for Class E_A systems

1. INTRODUCTION

1.1 Purpose

Qualification testing on AMP-TWIST* Series Jacks for Class E_A Systems, to determine its conformance to the requirements of TE Connectivity Product Specification 108-93044, Rev. A.

1.2 Scope

This report covers the mechanical, electrical, environmental and transmission performance of the AMP-TWIST Series Jacks for Class E_A Systems manufactured by TE Connectivity (PN's 1711160-x, 1711342-x, 1711919-2, 1711895-2, 1711295-2, 1711343-2, 2153000-1 and 2153001-1).

The testing was performed between May 12th, 2005 and December 15th, 2010.

1.3 Conclusion

Tested AMP-TWIST Series Jacks for Class E_A Systems meet the mechanical, electrical, environmental and transmission performance requirements of TE Connectivity Product Specification 108-93044, Rev. A.

1.4 Product Description

The AMP-TWIST Series Jacks for Class E_A Systems are 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.

1.5 Test Samples

Tested samples were randomly selected from pre-production and normal current production lots. Following part numbers (PN) and wire sizes were used as representative AMP-TWIST Series Jacks for Class E_A Systems for tests:

Test Group (a)	Qty	PN	Wire size (AWG)
1	14	1711160-1 (b) 1711342-1 (b)	22, 24 (solid), 24, 26 (stranded)
2	5		26 (stranded)
3	12		22, 24 (solid), 24, 26 (stranded)
4	10		22 (solid), 26 (stranded)
5	10		22 (solid), 26 (stranded)
6	5		22 (solid)
7	5		22 (solid)
8	16		22, 24 (solid), 24, 26 (stranded)
9	4		26 (stranded)
10	8	1711919-2; 1711895-2	23 (solid)
11	6	1711919-2	23 (solid)
12	4	1711160-1 (b)	-
13	5	1711342-1 (b)	-

(a) Test Group sequence on next page.

(b) Tests groups from 1 to 9, 12 and 13 have been already tested as reported in Qualification Test Report 501-93016.

1.6 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, IDC-wire interface					4								

	Test Group (a)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Test Sequence (b)												
TRANSMISSION (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		

- (a) Test groups from 1 to 9, 12 and 13 PN's 1711160-x and 1711342-x.
Test group 10 PN's 1711919-2; 1711895-2.
Test group 11 PN 1711919-2.
- (b) Numbers indicate sequence in which tests are performed
- (c) Transmission parameters: Checked as Class E_A 2-Connectors Permanent Link Configuration.

1.7 Measurement Equipment Used

Lab. Code	Equipment
E1-053	Micro-ohmmeter
C0-041	Temperature Measurer
E1-028	Megaohmmeter
E2-057	Dielectric Strength machine
E0-257	Hand Held Tester Fluke DTX-1800
E1-007	Frequencimeter
E2-039	Digital Oscilloscope
F0-014	Tensile strength machine
C1-015	Oven
C1-044	Climatic chamber
C1-011	Climatic chamber
C1-015	Oven
Tyco Electronics Netherlands B.V.	Flowing Mixed gas Corrosion Chamber
E0-058	HP8753D Vector network analyzer
E0-054	HP8751A Vector network analyzer
E0-259	Agilent E5071C ENA Vector network analyzer

Tests have been performed at standard conditions: T: 21°C ± 5°C / HR: 50% ± 10% with the exceptions detailed in the test descriptions.

2. SUMMARY OF TESTING

2.1 Examination of product – All groups

All samples submitted for testing were selected from pre-serie production with definitive tooling and normal current production batch. They were inspected and accepted by the Quality Assurance Department.

2.2 Input / Output resistance – Groups 1, 2, 3, 5, 7

Input / Output resistance measured values were less than 80 mΩ. (Specified: 200 mΩ max.)

2.3 Shield contact resistance – Groups 1, 2, 3, 5, 7

Input / Output resistance measured values were less than 70 mΩ. (Specified: 100 mΩ max.)

2.4 Input / Output resistance unbalance – Group 1

Input / Output resistance measured values were less than 45 mΩ. (Specified: 50 mΩ max.)

2.5 Current Carrying capacity – Group 9

Maximum allowed environmental temperature allowed at rated current 60°C

2.6 Insulation resistance – Group 3

Insulation resistance measured values were higher than $3 \times 10^9 \Omega$. (Specified: $> 1 \times 10^8 \Omega$)

2.7 Dielectric withstanding voltage – Group 8

No dielectric breakdown or flashover occurred during the test.

2.8 Wire Map and Shield Continuity - Group 10

All samples ensure continuity and shield continuity

2.9 Vibration, jack plug interface and IDC-wire interface – Group 3

No electrical discontinuities have been produced during vibration test.

2.10 Durability, jack-plug interface- Group 7

No physical damage occurred to the samples after durability. Final I-O resistance included in 2.2 results.

2.11 Plug insertion force, jack-plug interface – Group 6

Mating force values were less than 15N (Specified: 40N max.)

2.12 Plug withdrawal force, jack-plug interface – Group 6

Unmating force values were less than 10N (Specified: 40N max.)

2.13 Plug retention in jack, jack-plug interface – Group 6

Plug retention force values between jack-plug are higher than 90 N. (Specified: >90N)

2.14 Termination tensile strength, vertical, IDC-wire interface – Group 4

Termination tensile strength values are higher than 10N (22 AWG conductor) and 13N (26 AWG conductor). (Specified: 6,8N for 22AWG conductor, 8.5N for 26 AWG conductor).

2.15 Panel Housing retention– Group 12

Panel housing retention forces are higher than 220N (Specified: 90N min.)

2.16 Front/Rear housing retention– Group 13

Front housing retention forces are higher than 110N (Specified: 90N min.)

2.17 Thermal shock, IDC-wire interface– Groups 2, 3

No physical damage occurred to the samples after thermal shock.

2.18 Humidity-temperature cycling, IDC-wire interface– Group 2, 3

No physical damage occurred to the samples after Humidity-temperature cycling.

2.19 Humidity, steady state, jack-plug interface– Group 8

No physical damage occurred to the samples after Humidity, steady state.

2.20 Stress relaxation, (dry heat), IDC-wire interface – Group 1

No physical damage occurred to the samples after Stress relaxation test.

2.21 Corrosion test, jack-plug interface – Group 5

No physical damage occurred to the samples after corrosion test. Final Input / Output resistance measurements included in 2.2 results.

2.22 Transmission Tests – Return Loss (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.23 Transmission Tests – Insertion Loss (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.24 Transmission Tests – NEXT Loss (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.25 Transmission Tests – PSNEXT Loss (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.26 Transmission Tests – ACR-N (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.27 Transmission Tests – PS ACR-N (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.28 Transmission Tests – ACR-F (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.29 Transmission Tests – PS ACR-F (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.30 Transmission Tests – Propagation Delay (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.31 Transmission Tests – Delay Skew (Class E_A Permanent Link) – Test Group 10.

Samples tested meet the requirements of Transmission tests for Class E_A Permanent Link according to Amd. 2 to ISO/IEC 11801 Ed. 2.

2.32 Transmission Tests – Transfer Impedance – Test Group 11.

Samples tested meet the requirements of Transfer Impedance according to Amd.2 to ISO/IEC 11801 Ed. 2.

2.33 Transmission Tests – Coupling Attenuation – Test Group 11.

Samples tested meet the requirements of Coupling Attenuation according to Amd.2 to ISO/IEC 11801 Ed.

3. TESTS METHODS

3.1 Examination of product (Reference Standard: IEC 60512, test 1a, 1b)

Product drawings and inspections plans were used to examine the samples. They were examined visually and functionally.

3.2 Input / Output and shield resistance (Reference Standard: IEC 60512-2, test 2a)

Input / Output resistance measurements at low level current were made using four terminal technique as shown in the next figure.

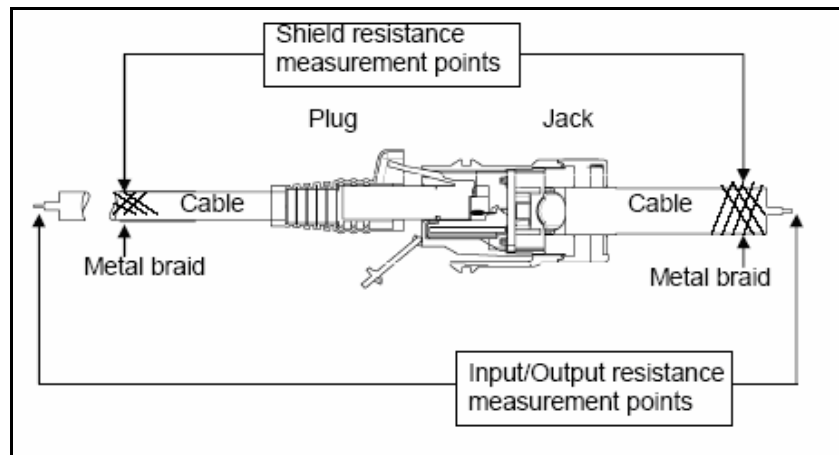


Figure 1

3.3 Input/ Output resistance unbalance (Reference Standard: IEC 60512-2-1, test 2a)

Difference between maximum and minimum Input / Output resistance.

3.4 Current carrying capacity (Reference Standard: IEC 60512-3, test 5b).

The contact temperature at several current steps was measured. The maximum allowed temperature minus the measured temperature increase was plotted vs. current.

3.5 Insulation resistance (Reference Standard: IEC 60512 test 3a, Method C)

100Vdc during 1 minute applied between adjacent contacts.

3.6 Dielectric Withstanding voltage (Reference Standard: IEC 60512 test 4a)

A 1000 Vac peak voltage was applied between adjacent contacts during 60s and 1500 Vac peak between contact and test panel. Maximum leakage current: 5 mA.

3.7 Wire Map and Shield Continuity

Wire Map and Shield Continuity has been tested using Hand Held Tester Fluke DTX-1800 together with DTX-PLA002 Cat6_A/ClassE_A Permanent Link Adapters.

3.8 Vibration, jack plug and IDC-wire interface (Reference Standard: IEC 60512-6-4)

Frequency range 10-55Hz. Displacement amplitude 0,35mm. Sweep cycles 5 per direction (each of 3 linear axis).

3.9 Durability, jack-plug interface (Reference Standard: IEC 60512-9-1)

Mate and un-mate plug and jack with latch inoperative for 750 cycles total at a maximum rate of 500 (automatic) or 300 (manual) cycles per hour.

3.10 Plug insertion force, jack-plug interface (Reference Standard: IEC 60512-13-1)

Measure force required to mate plug and jack with latch depressed at a maximum rate of 25mm/min.

3.11 Plug withdrawal force, jack-plug interface (Reference Standard: IEC 60512-13-1)

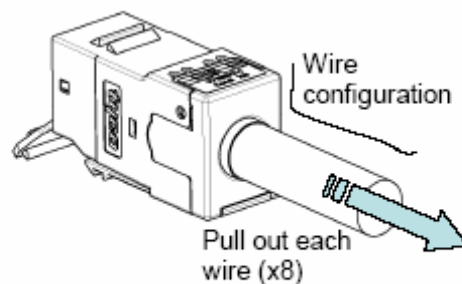
Measure force required to unmate plug and jack with latch depressed at a maximum rate of 25mm/min.

3.12 Plug retention in jack, jack-plug interface (Reference Standard: IEC 60512-8 test 15f)

Apply axial load of 90 N to the cable which is terminated to the plug, at a rate of 25mm/min, with plug mated in jack and latch engaged. Maintain load for 5 seconds.

3.13 Termination tensile strength, vertical, IDC-wire interface (Ref. Standard IEC 60512 test 15f)

Determine slot tensile strength. Apply an axial load of 90N to the cable which is terminated, at a rate of 25mm/min. Pull perpendicular to terminated wire.



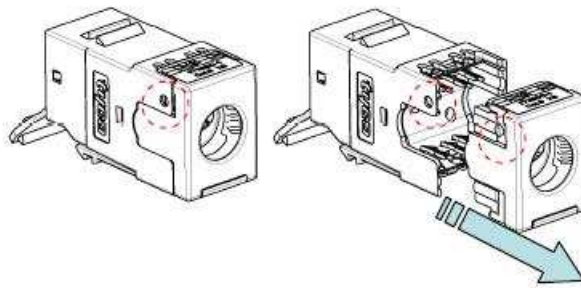
Termination tensile strength vertical pull

3.14 Panel Housing retention (Product Specification 108-1389)

Panel retention force at a rate of 12.5mm/min., using nominal panel cut-out dimensions as specified in appropriate TE Connectivity customer drawing.

3.15 Front/Rear housing retention

Measure front/rear housing retention once the jack is assembled (without conductors).



Front/Rear Housing retention

3.16 Thermal shock, IDC-wire interface (Ref. standard IEC 60068-2-14)

Samples mated plug and terminated jack to 100 cycles between -40°C and 70°C. Duration exposure = 30 minutes.

3.17 Humidity-temperature cycling, IDC-wire interface (Ref. Standard: IEC 60068-2-38)

21 cycles between 25 and 65°C at (93± 3) % RH with cold sub-cycle shock of -10°C. Cycle time 24 hours.

3.18 Humidity, steady state, jack-plug interface. (Ref. Standard: IEC 60512-11-12)

10 cycles at 55°C and 95% RH. Cycle Time 24 hours.

3.19 Stress relaxation, (dry heat), IDC-wire interface (Ref. standard: IEC 60068-2-2)

Samples were placed into an oven at 70°C for 500 hours. (Half samples connected to 0.5A and other samples not connected)

3.20 Corrosion test, jack-plug interface (Ref. Standard: IEC 60068- 2-60).

SO₂ = 0.5 ppm (volume)

H₂S = 0.1 ppm (volume)

T = 25 ± 2°C; HR = 75% ± 3%

Test Time: 4 days

3.21 Transmission parameters

A whole transmission test has been done using HP8753D network analyzer and Hand Held Tester Fluke DTX-1800 together with DTX-PLA002 Cat6_A/ClassE_A Permanent Link Adapters.

3.22 Transfer Impedance

The Transfer Impedance was measured using a HP8751A network analyzer and a triaxial tube.

3.23 Coupling Attenuation

The Coupling Attenuation was measured using Agilent E5071C ENA network analyzer, 4 hybrid couplers, an absorbing clamp and a decoupling clamp.