
CAT 6 UNSHIELDED PATCH CORDS

1. SCOPE

1.1 Content

This specification describes performance and material requirements and tests procedures for NETCONNECT Cat 6 unshielded patch cord assemblies used to connect building wiring for data and voice networking systems.

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 or any Tyco Electronics (TE) documents listed below, the product drawing and TE documents shall take precedence. In the event of conflict between the requirements of this specification and the industrial standards, this specification shall take precedence.

2.1 Tyco Electronics Documents

A. Relevant customer drawing

B. 230-702: Design for environment standard – ‘Supplier Requirements for the Elimination of Hazardous Substances’

C. 108-93018: Product Specification - ‘Copper LAN cable’

2.2 Industrial Standards:

A. ISO / IEC 11801: Generic Cabling for Customer Premises

B. EN 50173: Information Technology; Generic Cabling Systems

C. ANSI/TIA/EIA 568-B.2-1: Commercial Building Telecommunications Cabling Standard

D. IEC 61935-2: Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801. Patch cords and work area cords. Test Specifications as indicated in Fig. 1.

E. IEC 60512-4-1: Electromechanical Components for Electronic Equipment; Basic Testing procedures and measuring methods. Test 4a: Voltage Proof.

F. IEC 60603-7-4 Connectors for electronic equipment. Detail specification for 8-way, unshielded, free & fixed connectors, for data transmission with frequencies up to 250 MHz.

G. IEC 60603-7-5 Connectors for electronic equipment. Detail specification for 8-way, shielded, free & fixed connectors, for data transmission with frequencies up to 250 MHz.

DR	DATE	APVD	DATE
M. Maqueda**/J. Gatnau**	23/Nov/06	J.Sanabra**	23/Nov/06

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- H. IEC 60332-1-2 Tests on electrical and optical fibre under fire conditions.
- I. IEC 60754-1 Test on gases evolved during combustion of materials from cables. Determination of the amount of halogen acid gas.
- J. IEC 60754-2 Test on gases evolved during combustion of materials from cables. Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables.
- K. IEC 61034-2 Measurement of smoke density of cables burning under defined conditions.

3. REQUIREMENTS

3.1 Design and Construction

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

3.2 Materials

Materials shall be in accordance to Tyco Electronics requirements about environmental-related substances as per Tyco Electronics specification 230-702.

The material of the cable jacket is identified on the customer drawing and shall comply with the standards mentioned in underneath table (extracted from Product Specification 108-93018 'Copper LAN cable'):

Jacket material	Fire rating	Toxicity	Acid gas	Smoke density
PVC	IEC 60332-1-2	-	-	-
LSZH	IEC 60332-1-2	IEC 60754-1	IEC 60754-2	IEC 61034-2

3.3 Ratings

Operating Temperature: -20 to 60°C

3.4 Packaging

Each assembly shall be supplied in a clear bag.

3.5 Bending radius

The minimum bending radius is 8x outside diameter during installation and 4x the outside diameter after installation.

3.6 Performance Requirements and Test Procedures

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.

Test Description	Requirement	Test Procedure
<i>VISUAL</i>		
Examination of product.	Meets requirements of product drawing.	Visual inspection criteria as defined in IEC 61935-2, Paragraph 5.1.
<i>ELECTRICAL</i>		
Wire map	Continuity and short circuit Wire map configuration according to product drawing	Any device which ensures quality
AMPTRAC connection (ninth conductor) (only applicable for AMPTRAC versions)	Continuity and short circuit (between pogo pin and plug shield)	Any device which ensures quality. (See figure 2 as information)
Voltage proof (only applicable for AMPTRAC versions)	1 minute hold with no breakdown or flashover	IEC 60512-4-1 1500 volts AC peak voltage to be applied between pogo pin and plug shield. Maximum leakage current 5 mA
<i>TRANSMISSION</i> (See Figure 3 for transmission tests in Channel set up)		
Return Loss	Class E Channel Return Loss requirements according to ISO/IEC 11801	IEC 61935-1, Paragraph 4.9
Insertion Loss	Class E Channel Insertion Loss requirements according to ISO/IEC 11801	IEC 61935-1, Paragraph 4.1
NEXT Loss	Class E Channel NEXT requirements according to ISO/IEC 11801	IEC 61935-1, Paragraph 4.6
PS NEXT Loss	Class E Channel PS NEXT requirements according to ISO/IEC 11801	(PS NEXT is computed from NEXT Loss values)
ACR	Class E Channel ACR requirements according to ISO/IEC 11801	(ACR is computed from NEXT and Insertion Loss values)
PS ACR	Class E Channel PS ACR requirements according to ISO/IEC 11801	(PS ACR is computed from ACR values)
FEXT Loss	(There are no requirements for FEXT Loss)	IEC 61935-1, Paragraph 4.7
ELFEXT	Class E Channel ELFEXT requirements according to ISO/IEC 11801	(ELFEXT is computed from FEXT and Insertion Loss values)
PS ELFEXT	Class E Channel PSELFEXT requirements according to ISO/IEC 11801	(PS ELFEXT is computed from ELFEXT values)
Propagation delay	Class E Channel Prop Delay requirements according to ISO/IEC 11801	IEC 61935-1, Paragraph 4.5
Delay Skew	Class E Channel Delay Skew requirements according to ISO/IEC 11801	IEC 61935-1, Paragraph 4.5
<i>MECHANICAL</i>		
Crimping Height	Relevant IEC 60603-7-X standard	Indicator with needle-point probes or equivalent. It shall be measured at the front of the contact.
Tensile Strength	Force applied: 50 N according to the standard Duration: 5 seconds	IEC 61935-2, Paragraph 6.2. (See figure 4 as information)
Torsion Force (specified by Tyco Electronics)	Force applied: 10 N x cm Duration: 5 seconds Maximum Rotation angle 45°	(See figure 5 as information)
NOTE	<i>See Test Sequence in paragraph 4.2 Figure 6</i>	

Figure 1: Requirements and test procedures for Cat 6 unshielded patch cords

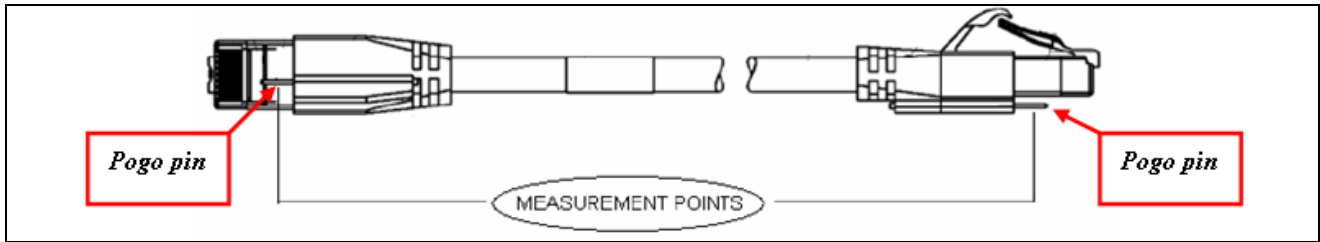


Figure 2: AMPTRAC connection continuity and shortcircuit test procedure

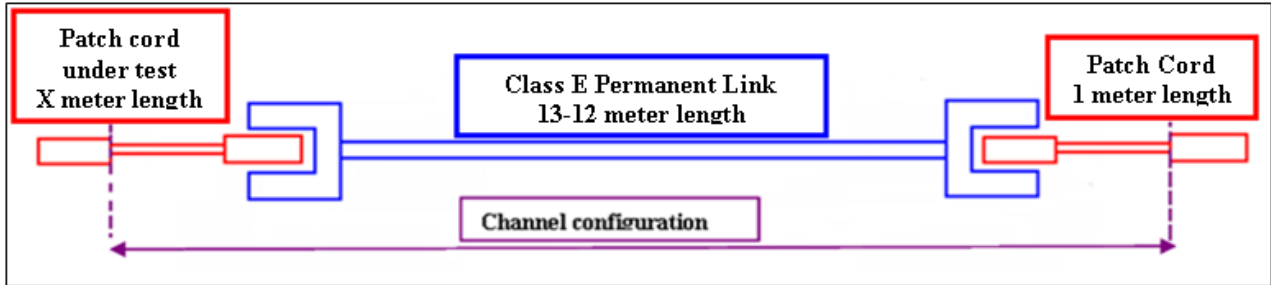


Figure 3: Channel set up

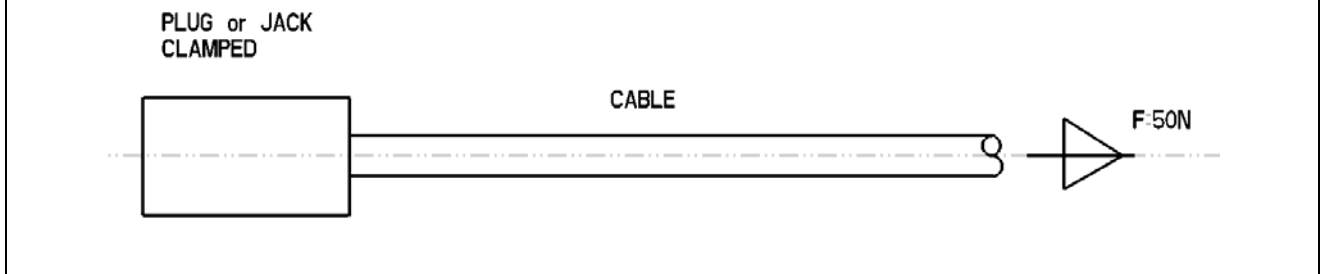


Figure 4: Tensile strength test procedure

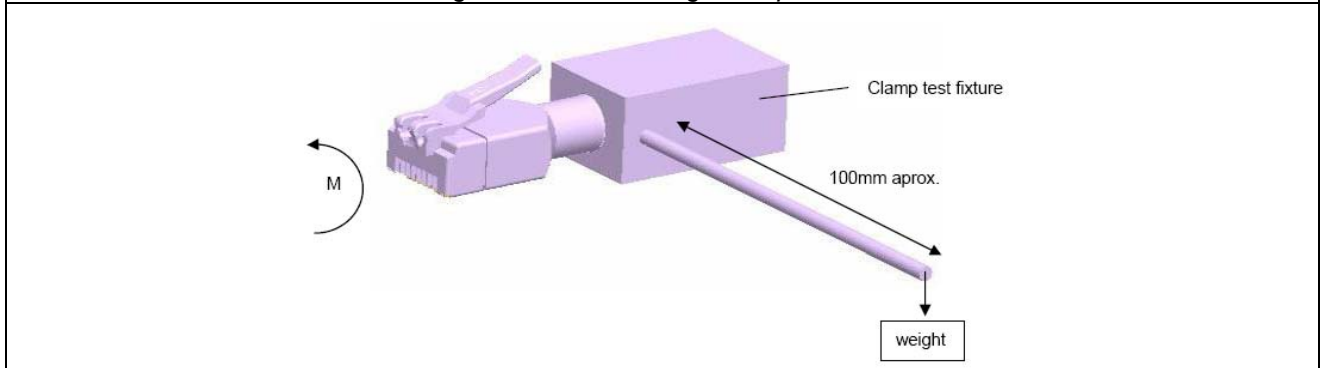


Figure 5: Torsion force test procedure

4. PRODUCT QUALIFICATION AND REQUALIFICATION TEST SEQUENCE

4.1 Sample Selection

Samples shall be selected at random from current production. For qualification purpose, all test groups shall consist of a minimum of 5 samples per relevant length per product family.

4.2 Test sequence

Test Sequence		
	Standard version	AMPTRAC version
Examination of product	1, 17	1, 19
Wire Map	3	3
AMPTRAC connection: Continuity and shortcircuit (only for AMPTRAC versions)	-	4, 20
Voltage Proof (only for AMPTRAC versions)	-	5, 21
Return Loss	4, 18	6, 22
Insertion Loss	5, 19	7, 23
NEXT	6, 20	8, 24
PS NEXT Loss	7, 21	9, 25
ACR	8, 22	10, 26
PS ACR	9, 23	11, 27
FEXT	10, 24	12, 28
ELFEXT	11, 25	13, 29
PS ELFEXT	12, 26	14, 30
Propagation Delay	13, 27	15, 31
Delay Skew	14, 28	16, 32
Crimping Height	2	2
Tensile Strength	15	17
Torsion Force	16	18

Figure 6: Test sequence

4.1 Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, requalification testing shall be initiated, consisting of all or part of the original testing sequence as determined by Tyco Electronics.

5. QUALITY ASSURANCE PROVISIONS

Quality provisions are based upon the philosophy of TQM (Total Quality Management) with a system approved to EN ISO 9001 by Lloyds Register Quality Assurance.

5.1 Responsibility for quality

Unless otherwise stated in the purchase order, it shall be the supplier's responsibility to assure qualification and lot conformance to this specification. The supplier may utilize his own or other testing and inspection facilities acceptable to the buyer.

5.2 Qualification conformance

For the purposes of internal qualification, the program shall consist of examinations and tests to determine conformance with the requirements of this specification. It shall be performed once, on introduction of the product. Subsequent design changes shall be partially or fully re-qualified depending upon their area of impact in the context of product functionality. Regular requalification testing shall be performed as defined by the Quality Department.

5.3 Manufacturing follow-up

Tyco Electronics products target Six Sigma levels of performance by the integration of capable processes from the development throughout the entire supply chain. The goal is to reduce variability to achieve zero defects for products and services. Systems used are based on preventive and statistical techniques during development and manufacturing. This also includes suppliers of materials, components or systems. Dedicated procedures for supplier selection, development and follow-up are implemented to ensure conformance to TQM and specification requirements.

Best demonstrated practices are identified and implemented throughout the company, with a continuing challenge to identify opportunities for innovation and improvement.