

INTERNATIONAL STANDARD



Fibre optic interconnecting devices and passive components – Performance standard –

Part 121-3: Simplex and duplex cords with single-mode fibre and cylindrical ferrule connectors for category U – Uncontrolled environment



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00



IEC 61753-121-3

Edition 1.0 2010-04

INTERNATIONAL STANDARD



Fibre optic interconnecting devices and passive components – Performance standard –

Part 121-3: Simplex and duplex cords with single-mode fibre and cylindrical ferrule connectors for category U – Uncontrolled environment

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

S

ICS 33.180.20

ISBN 978-2-88910-563-2

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	8
4 Description	8
4.1 General.....	8
4.2 Optical fibres	9
4.3 Cable design and construction.....	9
4.4 Optical connectors	9
4.4.1 Mechanical connectivity.....	9
4.4.2 Optical performance requirements	9
4.4.3 Connector set performance requirements	9
4.5 Cable bend radius	9
4.6 Identification.....	9
5 Tests	9
5.1 General.....	9
5.2 Measuring wavelengths	9
5.3 Test specimen	10
6 Test procedure	10
6.1 General.....	10
6.2 Visual examination	10
6.3 Fibre optic connector end face	10
6.4 Optical performance requirements.....	11
6.5 Climatic performance requirements	13
6.6 Mechanical performance requirements	14
7 Test report.....	16
Annex A (normative) Sample size and product sourcing requirements	17
Annex B (normative) Visual examination of outer cable sheath movement	18
Annex C (normative) Change of temperature	19
Annex D (normative) Static side load	20
Annex E (normative) Flexing strain relief of fibre optic devices	21
Bibliography.....	22
Figure B.1 – Initial marking of the cable sheath.....	18
Figure B.2 – Final visual examination	18
Figure C.1 – Change of temperature test configuration	19
Figure D.1 – Test apparatus for transmission with applied side load	20
Figure E.1 – Flexing test apparatus	21
Table 1 – Wavelengths for attenuation and return loss measurements	9
Table 2 – Visual examination requirements.....	10
Table 3 – End face requirements	11
Table 4 – Optical performance requirements.....	12
Table 5 – Climatic performance requirements	13

Table 6 – Mechanical performance requirements	14
Table A.1 – Sample size requirements	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 121-3: Simplex and duplex cords with single-mode fibre and cylindrical ferrule connectors for category U – Uncontrolled environment

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61753-121-3 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

The text of this standard is based on the following documents:

FDIS	Report on voting
86B/2989/FDIS	86B/3025/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61753 series, published under the general title *Fibre optic interconnecting devices and passive components – Performance standard*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 121-3: Simplex and duplex cords with single-mode fibre and cylindrical ferrule connectors for category U – Uncontrolled environment

1 Scope

This part of IEC 61753 specifies the test requirements for finished cable assemblies for use as patchcords, work area cords and equipment cords for applications in a uncontrolled (U) environment according to IEC 61753-1, where the connectors already comply with the Category U requirements of IEC 61753-1. The assemblies consist of simplex or duplex fibre optic cable terminated at each end of the cable with non-angled (PC) or angled (APC) polished single-mode fibre optic connectors with cylindrical ferrules. The wavelength of operation is between 1 260 nm¹ and 1 625 nm.

The relevant requirements for mechanical and optical connectivity systems are covered by mechanical and optical interface standards IEC 61754 series and IEC 61755 series respectively. The relevant requirements for connector sets are covered by IEC 61753 series. The relevant requirements for cable are covered by IEC 60794-2-50.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*

IEC 60794-2-50, *Optical fibre cables – Part 2-50: Indoor optical fibre cables – Family specification for simplex and duplex cables for use in patchcords*

IEC 61300 series, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre/cable retention*

IEC 61300-2-5, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-5: Tests – Torsion*

¹ Low wavelength limit depends on maximum cabled fibre cut-off wavelength specification.

IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-22: Tests – Change of temperature*

IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Static side load for connectors*

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Active monitoring of changes in attenuation and return loss*

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

IEC 61300-3-15, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-15: Examinations and measurements – Dome eccentricity of a convex polished ferrule endface*

IEC 61300-3-16, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-16: Examinations and measurements – Endface radius of spherically polished ferrules*

IEC 61300-3-17, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-17: Examinations and measurements – Endface angle of angle-polished ferrules*

IEC 61300-3-22, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-22: Examinations and measurements – Ferrule compression force*

IEC 61300-3-23, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-23: Examination and measurements – Fibre position relative to ferrule endface*

IEC 61300-3-34, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-34: Examinations and measurements – Attenuation of random mated connectors*

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedure – Part 3-35: Examinations and measurements – Fibre optic connector endface visual and automated inspection*

IEC 61753 series, *Fibre optic interconnecting devices and passive components – Performance standard*

IEC 61753-1, *Fibre optic interconnecting devices and passive components – Performance standard – Part 1: General and guidance for performance standards*

IEC 61754 series, *Fibre optic connector interfaces*

IEC 61755 series, *Fibre optic connector optical interfaces*

IEC 61755-2-1, *Fibre optic connector optical interfaces – Part 2-1: Optical interface standard single mode non-angled physically contacting fibres*

IEC 61755-2-2, *Fibre optic connector optical interfaces – Part 2-2: Optical interface standard single mode angled physically contacting fibres*

IEC/TR 61931, *Fibre optic – Terminology*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC/TR 61931 and the following apply.

3.1

change in attenuation

defined as peak to peak variation

3.2

connector set

complete assembly of components (plug-adaptor-plug) required to provide demountable coupling between two or more optical fibres

3.3

cord

general term for terminated cable assembly, whatever the expected use is

Examples :equipment cord, work area cord or patchcord.

3.4

equipment cord

cord connecting equipment to a distributor

3.5

patchcord

cord used within cross-connect implementations at distributors

3.6

terminated cable assembly

product defined as a fibre optic cable terminated with any passive fibre optic component on both ends

3.7

work area cord

cord connecting the telecommunications outlet to the terminal equipment

4 Description

4.1 General

Patchcords, work area cords and equipment cords (called cords in subsequent text) defined according to this specification are terminated cable assemblies with optical connectors. The cord comprises cable and terminated fibre optic connectors on each end.

The length, unless otherwise specified, is defined as between the end faces of the connectors.

4.2 Optical fibres

Optical fibres meeting the requirements of IEC 60793-2-50 for single-mode fibres (SM) B1.1, B1.3 and B6_a shall be used.

4.3 Cable design and construction

Cable used for the cords shall conform to the requirements of IEC 60794-2-50.

4.4 Optical connectors

4.4.1 Mechanical connectivity

The dimensional interface requirements in IEC 61754 series shall be met.

4.4.2 Optical performance requirements

The functionality of the connections according to this specification is based upon physical contact. All the connectors shall conform to the standard performance grade as defined in IEC 61755 series. Considered attenuation grades are B, C and D. Considered return loss grades are 1, 2 and 3.

4.4.3 Connector set performance requirements

Connector set shall conform to the requirements described in IEC 61753 series.

4.5 Cable bend radius

Care shall be taken to observe the minimum bend radius of the cable.

4.6 Identification

The connectors shall be identifiable as to type of fibre, type of connector, connector end face (PC or angled-PC), polarity (for duplex cords), connection grade or other type of identification required for administration.

5 Tests

5.1 General

All tests and measurements have been selected from the IEC 61300 series for connectors and from the cable test procedure outlined in IEC 60794-1-2. Additional requirements to certain tests are given in Annexes C, D and E

5.2 Measuring wavelengths

Unless otherwise specified in the individual test details all attenuation measurements are made at the wavelengths given in Table 1:

Table 1 – Wavelengths for attenuation and return loss measurements

Fibre type	Single-mode		
Centre wavelength (nm)	1310	1550	1625

Return loss measurements shall be performed at the wavelengths specified in the individual tests.

5.3 Test specimen

For this specification, a specimen is defined as a terminated cable assembly with optical connectors according to the IEC 61754 series at all ends of the cord. All specimens shall be marked according to identification requirements.

The sample size and product sourcing requirements are defined in Annex A.

The length of the test specimen shall be 3,0 m to 5,0 m with a tolerance of $\pm 0,5$ m.

6 Test procedure

6.1 General

No deviation from the specified test method is allowed.

Unless otherwise specified, all tests shall be carried out at ambient temperature as specified in IEC 61300-1.

6.2 Visual examination

A visual examination shall be carried out on all specimens before and after all mechanical and climatic tests (see Table 2). The outer cable sheath shall be marked at the end of the connector boot during the initial visual examination (see Annex B).

Table 2 – Visual examination requirements

No.	Test	Requirement	Details	
1	Visual examination	No visible defects of cable or connectors	Method: Examination:	IEC 61300-3-1 Product shall be visually checked without magnification

6.3 Fibre optic connector end face

The performance of the fibre optic connection depends on characteristics of the end faces of both connectors (see Table 3).

Table 3 – End face requirements

No.	Test	Requirement	Details	
2	End face geometry	IEC 61755 series	Method:	IEC 61300-3-15, Apex offset IEC 61300-3-16, Polishing radius IEC 61300-3-17, Endface angle of angle-polished ferrules IEC 61300-3-23, Fibre position
3	Fibre optic cylindrical connector end face visual inspection	IEC 61755-2-1 IEC 61755-2-2	Method: Examination:	IEC 61300-3-35 Scratches, defects, debris
4	Ferrule compression force NOTE This test is applicable to the connectors with spring loaded ferrule.	IEC 61754 series: for the connectorized buffered fibre IEC 60794-2-50: additional requirements for the ruggedized fibre	Method: Examination:	IEC 61300-3-22 Movement length, compression force

6.4 Optical performance requirements

Optical performance requirements for attenuation and return loss are given in the following Table 4. These requirements in the Table 4 are related to connections between the same fibre types.

Table 4 – Optical performance requirements

No.	Test	Requirement	Details
5	Attenuation	<p>Grade D: $\leq 0,5$ dB mean $\leq 1,0$ dB for 97 %</p> <p>Grade C: $\leq 0,25$ dB mean $\leq 0,5$ dB for 97 %</p> <p>Grade B: $\leq 0,12$ dB mean $\leq 0,25$ dB for 97 %</p>	<p>Method: IEC 61300-3-34, Method 2</p> <p>Source type: LED/LD</p> <p>Peak wavelength: (1 310 \pm 30) nm (1 550 \pm 30) nm (1 625 \pm 30) nm</p> <p>Source stability: $\pm 0,01$ dB over 1 h</p> <p>Detector linearity: Within $\pm 0,01$ dB over the dynamic range to be measured</p> <p>Launch fibre length: > 2 m. Only the fundamental mode shall propagate at the connector interface to be tested and at the detector</p> <p>Pre-conditioning procedure: Clean plug and adaptor according to manufacturer's instructions</p>
6	Return loss	<p>Grade 1: ≥ 60 dB</p> <p>Grade 2: ≥ 45 dB</p> <p>Grade 3: ≥ 35 dB</p>	<p>Method: IEC 61300-3-6, Method 1</p> <p>Wavelengths: (1 310 \pm 30) nm (1 550 \pm 30) nm (1 625 \pm 30) nm</p> <p>Source stability: $\pm 0,01$ dB over the measuring period</p> <p>Detector linearity: $\pm 0,1$ dB over the dynamic range to be measured</p> <p>Launch fibre length: > 2 m. Only the fundamental mode shall propagate at the connector interface to be tested and at the detector</p> <p>Directional coupler type: 50 / 50 fused</p> <p>Directivity: > 65 dB</p> <p>Pre-conditioning procedure: Clean plug and adaptor according to the manufacturer's instructions</p>

NOTE 1 Patchcord attenuation is corresponding to the loss of two connections.

NOTE 2 The requirements for return loss are valid only for one connection.

6.5 Climatic performance requirements

Table 5 – Climatic performance requirements

No.	Test	Requirement	Details	
7	Change of temperature	<p>Change in attenuation during the test</p> <p>at $(1\ 310 \pm 30)$ nm $\leq 0,40$ dB</p> <p>at $(1\ 625 \pm 30)$ nm $\leq 1,0$ dB</p> <p>Change in attenuation before and after the test is</p> <p>$(1\ 310 \pm 30)$ nm $\leq 0,20$ dB</p> <p>at $(1\ 625 \pm 30)$ nm $\leq 0,40$ dB</p> <p>Initial and final attenuation shall be \leq specified for the grade</p> <p>Return loss shall satisfy the requirements for the specified grade</p> <p>Final visual examination: see Annex B</p>	<p>Method: IEC 61300-2-22, see Annex C</p> <p>Low temperature: $-25\ ^\circ\text{C}$</p> <p>High temperature: $70\ ^\circ\text{C}$</p> <p>Duration at temperature extreme: 1 h</p> <p>Rate of change of temperature: $1\ ^\circ\text{C}/\text{min.}$</p> <p>Number of cycles: 12</p> <p>Specimen optically functioning: Yes</p> <p>Measurements required: Measuring procedure IEC 61300-3-3. Measurements before, during (continuous) and after the test</p> <p>Sampling rate: max. interval 10 min</p> <p>Attenuation: According to Table 4</p> <p>Return loss: According to Table 4</p> <p>Pre-conditioning procedure: 2 h at normal ambient conditions. Clean plug and adaptor according to manufacturer's instructions</p> <p>Recovery Procedure: 2 h at normal ambient conditions. Connection shall not be unmated</p>	

6.6 Mechanical performance requirements

Table 6 – Mechanical performance requirements

No.	Test	Requirement	Details
8	Fibre/Cable retention	<p>Change in attenuation during the test</p> <p>at $(1\,310 \pm 30)$ nm $\leq 0,20$ dB</p> <p>at $(1\,625 \pm 30)$ nm $\leq 0,50$ dB</p> <p>Change in attenuation before and after the test is</p> <p>at $(1\,310 \pm 30)$ nm and $(1\,625 \pm 30)$ nm $\leq 0,20$ dB</p> <p>Initial and final attenuation shall be \leq specified for the grade</p> <p>Return loss shall satisfy the requirements for the specified grade</p> <p>Final visual examination: see Annex B</p>	<p>Method: IEC 61300-2-4</p> <p>Tensile force: $100\text{ N} \pm 5\text{ N}$ at 5 N/s for reinforced cables $> 2\text{ mm}$</p> <p>$70\text{ N} \pm 5\text{ N}$ at 5 N/s for reinforced cables $\leq 2\text{ mm}$</p> <p>Point of application of the load: $0,3\text{ m}$ from plug</p> <p>The connector shall be rigidly mounted such that the load is applied to the fibre/cable retention mechanism and not to the coupling mechanism</p> <p>Duration of maximum load: 2 min</p> <p>Specimen optically functioning: Yes</p> <p>Measurements required: Measuring procedure IEC 61300-3-3 Measurements before, during (continuous) and after the test</p> <p>Sampling rate: Continuously</p> <p>Attenuation: According to Table 4</p> <p>Return loss: According to Table 4</p> <p>Pre-conditioning procedure: Clean plug and adaptor according to manufacturer's instructions</p>
9	Torsion	<p>Change in attenuation during the test</p> <p>at $(1\,310 \pm 30)$ nm $\leq 0,20$ dB,</p> <p>at $(1\,625 \pm 30)$ nm $\leq 0,50$ dB.</p> <p>Change in attenuation before and after the test is</p> <p>at $(1\,310 \pm 30)$ nm and $(1\,625 \pm 30)$ nm $\leq 0,20$ dB</p> <p>Initial and final attenuation shall be \leq specified for the grade</p> <p>Return loss shall satisfy the requirements for the specified grade</p> <p>Final visual examination: see Annex B</p>	<p>Method: IEC 61300-2-5</p> <p>Magnitude and rate of application of the torsional load: 15 N at 1 N/s</p> <p>Duration of application of the load: $25\text{ cycles} \pm 180^\circ$ (not to exceed cable specification)</p> <p>Point of application of the load: $0,2\text{ m}$ from rear of plug body</p> <p>Specimen optically functioning: Yes</p> <p>Measurements required: Measuring procedure IEC 61300-3-3. Measurements before, during (continuous) and after the test</p> <p>Sampling rate: $10\text{ measurements per second}$</p> <p>Attenuation: According to Table 4</p> <p>Return loss: According to Table 4</p> <p>Pre-conditioning procedure: Clean plug and adaptor according to manufacturer's instructions</p> <p>Recovery procedure: 5 min recovery period</p>

Table 6 (continued)

No.	Test	Requirement	Details	
10	Static side load	<p>Change in attenuation during the test</p> <p>at (1 310 ± 30) nm ≤ 0,20 dB</p> <p>at (1 625 ± 30) nm ≤ 0,50 dB</p> <p>Change in attenuation before and after the test is</p> <p>at (1 310 ± 30) nm and (1 625 ± 30) nm</p> <p>≤ 0,20 dB</p> <p>Initial and final attenuation shall be ≤ specified for the grade</p> <p>Return loss shall satisfy the requirements for the specified grade</p> <p>Final visual examination: see Annex B</p>	<p>Method:</p> <p>Magnitude of the load (90° to plug axis):</p> <p>Point of application of the load:</p> <p>Method of mounting:</p> <p>Duration of load:</p> <p>Specimen optically functioning:</p> <p>Measurements required:</p> <p>Sampling rate:</p> <p>Attenuation:</p> <p>Return loss:</p> <p>Pre-conditioning procedure:</p>	<p>IEC 61300-2-42, see Annex D</p> <p>1 N</p> <p>0,2 m from rear of plug in two mutually perpendicular directions</p> <p>An adaptor shall be mounted rigidly to the mounting fixture</p> <p>1 h</p> <p>Yes</p> <p>Measuring procedure IEC 61300-3-3. Measurements before, during (continuous) and after the test</p> <p>Continuously</p> <p>According to Table 4</p> <p>According to Table 4</p> <p>Clean plug and adaptor according to manufacturer's instructions</p>
11	Flexing strain relief of fibre optic devices	<p>Change in attenuation during the test</p> <p>at (1 310 ± 30) nm ≤ 0,20 dB,</p> <p>at (1 550 ± 30) nm ≤ 0,30 dB</p> <p>at (1 625 ± 30) nm ≤ 0,50 dB</p> <p>Change in attenuation before and after the test is</p> <p>at (1 310 ± 30) nm, (1 550 ± 30) nm and (1 625 ± 30) nm</p> <p>≤ 0,20 dB</p> <p>Initial and final attenuation shall be ≤ specified for the grade</p> <p>Return loss shall satisfy the requirements for the specified grade</p> <p>Final visual examination: see Annex B</p>	<p>Method:</p> <p>Magnitude of the load:</p> <p>Point of application of the load:</p> <p>Method of mounting:</p> <p>Cycle:</p> <p>Number of cycles:</p> <p>Cycling rate:</p> <p>Specimen optically functioning:</p> <p>Measurements required:</p> <p>Attenuation:</p> <p>Return loss:</p> <p>Pre-conditioning procedure:</p>	<p>IEC 61300-2-44, see annex E</p> <p>5 N</p> <p>0,2 m from rear of connector</p> <p>An adaptor shall be mounted rigidly to the mounting fixture</p> <p>0° to –90° to 0° to +90° to 0°</p> <p>100</p> <p>20 cycles/min</p> <p>Yes</p> <p>Measuring procedure IEC 61300-3-3. Measurements before, during (continuous) and after the test</p> <p>According to Table 4</p> <p>According to Table 4</p> <p>Clean plug and adaptor according to manufacturer's instructions</p>

7 Test report

A fully documented test report and supporting data shall be prepared and shall be available for inspection as evidence that the tests described in this specification have been carried out in accordance with this specification.

Annex A (normative)

Sample size and product sourcing requirements

Sample size for the cords shall be as indicated in the following Table A.1.

Table A.1 – Sample size requirements

No.	Test	Simplex	Duplex
1	Visual examination	15	10
2	End face geometry	15	10
3	Fibre optic cylindrical connector end face visual inspection	15	10
4	Ferrule compression force	15	10
5	Attenuation	15	10
6	Return loss	15	10
7	Change of temperature	6	3
8	Fibre/cable retention	6	3
9	Torsion	6	3
10	Static side load	6	3
11	Flexing strain relief of fibre optic devices	6	3

The above tests are not intended to be performed in any particular sequence or grouping. They are intended to be performed individually; however, products from previous tests may be used if desired.

Annex B (normative)

Visual examination of outer cable sheath movement

B.1 Scope

This visual examination shall be made to ensure that the captivation or attachment of a cable sheath to a connector will withstand all climatic and mechanical tests required in this specification.

B.2 Preparation of the specimen and initial visual examination

Preparation shall be made after initial visual examination (before all subsequent tests). Mark the outer cable sheath at the end of the connector boot at both ends of the cable assembly as indicated in Figure B.1. The marks are required to identify movement of the cable sheath caused by the mechanical stresses during subsequent tests.

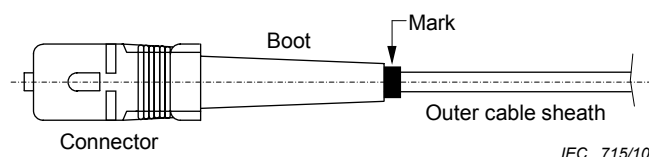


Figure B.1 – Initial marking of the cable sheath

NOTE If the connector has a shrink-tube as part of the boot as, for example in some types of LC connectors, the mark should be made on the outer cable sheath right at the end of the shrink-tube.

B.3 Final visual examination of outer cable sheath movement

Final visual examination shall be made after all tests have been finished. The outer sheath movement is visible through the movements of the marks at the outer cable sheath (see Figure B.2).

Requirements:

The allowed movement of the outer cable sheath relative to the connector boots (at least of its fixing point e.g. sheath crimp, shrink-tube or gluing) shall be 1 mm maximum at any connector.

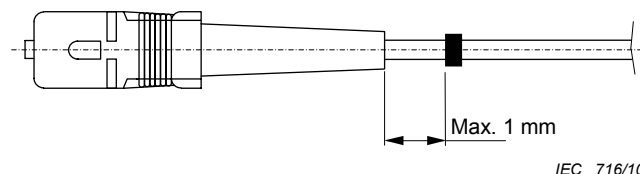


Figure B.2 – Final visual examination

NOTE The SC connector in the Figures B.1 and B.2 is assumed as an example.

B.4 Torsion test

At the end of the climatic and mechanical tests a torsion test shall be made according to test no. 9 with 5 cycles. This is to verify that the sheath did not move.

Annex C (normative)

Change of temperature

The additional requirements for the change of temperature test (see configuration in Figure C.1) shall be as follows:

- The whole length of the patchcord together with both connections shall be within the climatic chamber.
- The cable coils shall be free, without any cable reel, and supported horizontally in the climatic chamber. The winding radius shall be larger than 150 mm.

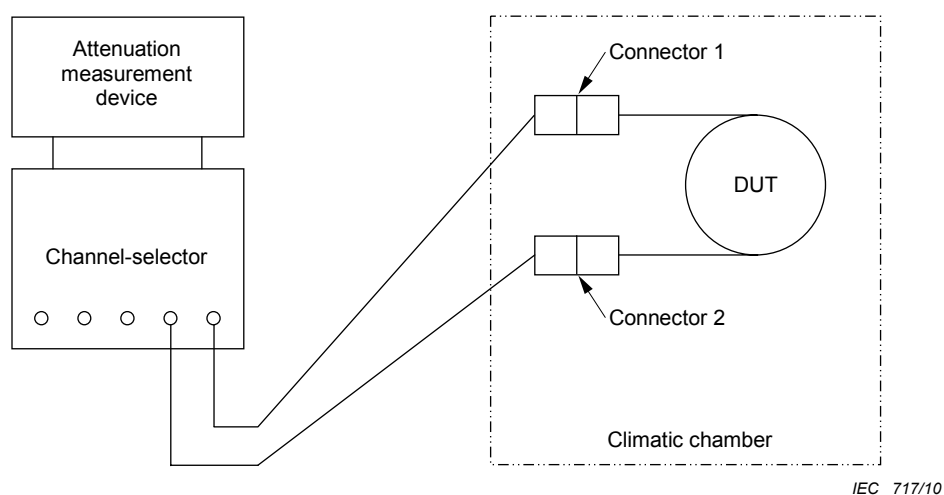


Figure C.1 – Change of temperature test configuration

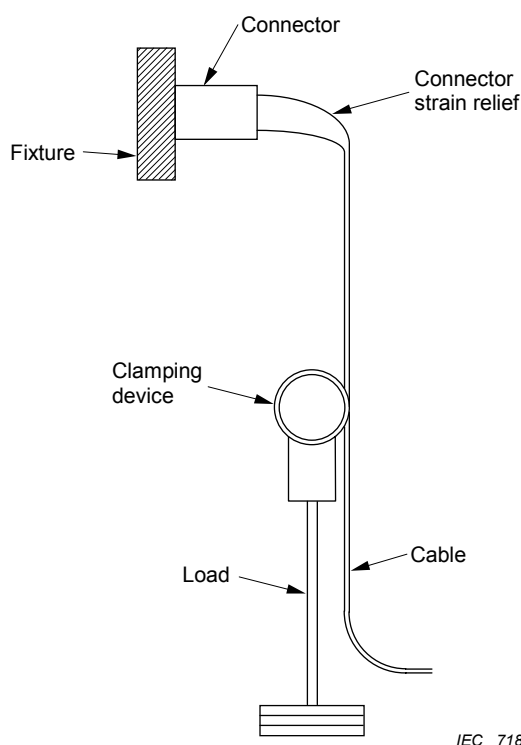
Annex D (normative)

Static side load

The purpose of this test is to determine the influence of a side load applied to a cord assembled with connector strain relief.

Fibre optic cords shall withstand side loads during optical transmission without degradation of the optical performance. Figure D.1 shows in a more realistic manner the deformation of the connector strain relief.

Other necessary details are given in IEC 61300-2-42.



NOTE The load should be applied after the connector/cord has been horizontally fixed in the fixture.

Figure D.1 – Test apparatus for transmission with applied side load

Annex E (normative)

Flexing strain relief of fibre optic devices

The purpose of this test is to ensure that the captivation or attachment of a cable to a fibre optic connector will withstand a flexing in one plane under tensile load of the sort likely to be applied during normal use.

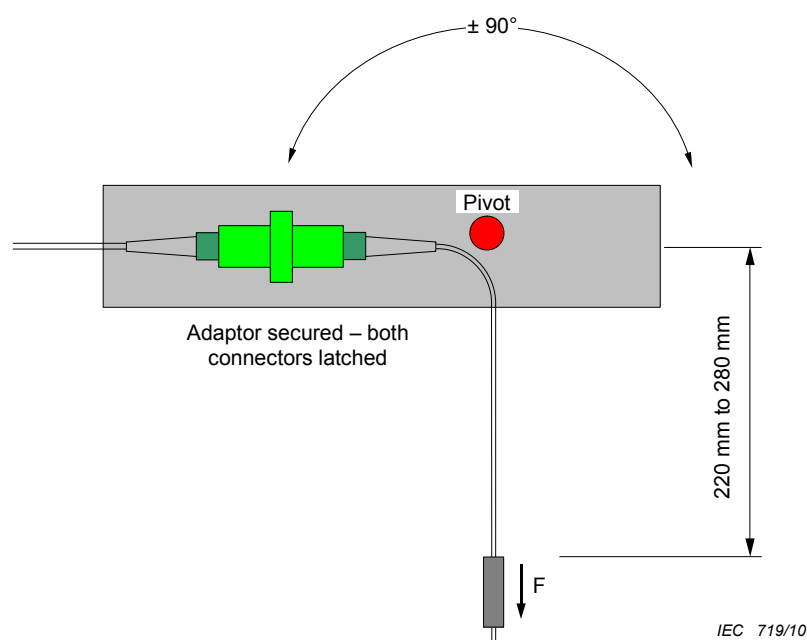


Figure E.1 – Flexing test apparatus

Fibre optic cords shall withstand flex loads without degradation of the mechanical and functional performance. Details and Figure E.1 are modified from IEC 61300-2-44. Details are given in Table 6, test no. 11.

Bibliography

IEC 60794-2, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

IEC 61300-3-28, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-28: Examinations and measurements – Transient loss*

IEC 61756-1, *Fibre optic interconnecting devices and passive components – Interface standard for fibre management systems – Part 1: General and guidance*

IS 11801, *Information technology – Generic cabling for customer premises*

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3, rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

Tel: + 41 22 919 02 11
Fax: + 41 22 919 03 00
info@iec.ch
www.iec.ch