

INTERNATIONAL STANDARD

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





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 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 It also gives information on projects, withdrawn and replaced publications.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 61300-2-5

Edition 3.0 2009-01

INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

J

ICS 33.180.20

ISBN 2-8318-1022-9

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 General description	5
4 Apparatus.....	5
4.1 General.....	5
4.2 Mounting fixture	6
4.3 Cable clamp	6
4.4 Weights.....	6
4.5 Optical source and detector.....	7
5 Procedure	7
5.1 Preparation of specimens	7
5.2 Pre-conditioning	7
5.3 Mount the device under test	7
5.4 Measure the attenuation.....	7
5.5 Apply cable load.....	7
5.6 Measure the attenuation.....	7
5.7 Twist the cable	7
5.8 Test pressure	7
5.9 Monitoring attenuation.....	8
5.10 Final measurements and examinations.....	8
6 Severity.....	8
7 Details to be specified	9
Figure 1 – Component or device test set-up.....	6
Figure 2 – Closure test set-up.....	6
Table 1 – Severity levels.....	8

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING
DEVICES AND PASSIVE COMPONENTS –
BASIC TEST AND MEASUREMENT PROCEDURES –****Part 2-5: Tests – Torsion**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 61300-2-5 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition, published in 2002 and constitutes a technical revision. Specific technical changes from the previous edition are as follows:

- the title was changed;
- the procedure was reconsidered;
- the figure of closure test set-up was added;
- the severity of the test was reconsidered according to the component.

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

FDIS	Report on voting
86B/2774/FDIS	86B/2806/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 61300 series, published under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-5: Tests – Torsion

1 Scope

The purpose of this part of IEC 61300 is to determine the ability of the cable attachment element of the device under test to withstand torsional loads, while under tension, as might be experienced during installation and normal service. The scope of the test also includes those elements designed for ribbon cables.

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

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 61300-3-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-4: Examinations and measurements – Attenuation*

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

3 General description

The cable-to-device interface, while under a specified tension, is subjected to a torsional load or twisting action to determine the effects of this action on the physical and optical properties of the device.

4 Apparatus

4.1 General

The test apparatus shall be capable of applying simultaneously both tension and a torsional load or twisting action to the cable-to-device interface. Figures 1 and 2 show the basic parts of a test apparatus for component and closure test set-ups, respectively.

4.2 Mounting fixture

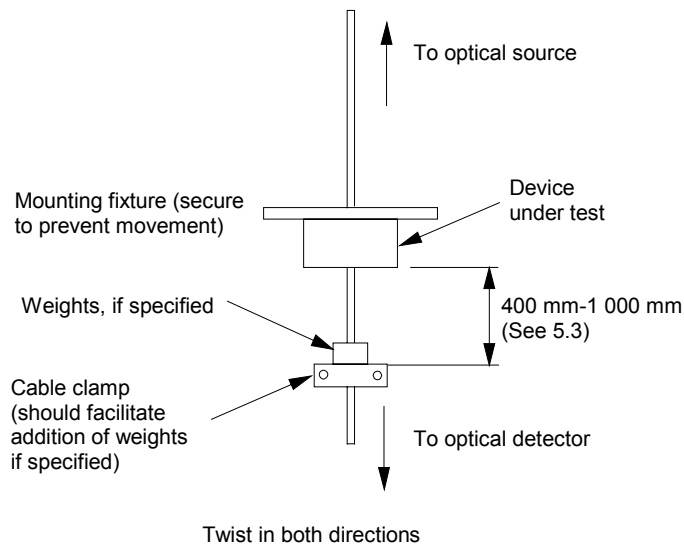
Use a fixture to rigidly mount the device under test and hold it in proper alignment throughout the test. The fixture shall allow the device under test to be connected to an optical source and detector for monitoring attenuation.

4.3 Cable clamp

The cable clamp is the point at which the torsional load is applied. The cable clamp shall be capable of grasping and securing the cable so that it does not turn or slip in the holder when loads are applied. The clamp shall not crush the optical fibres or cause a change in the attenuation. The cable clamp may consist of a mandrel around which several turns of cable are wrapped and secured.

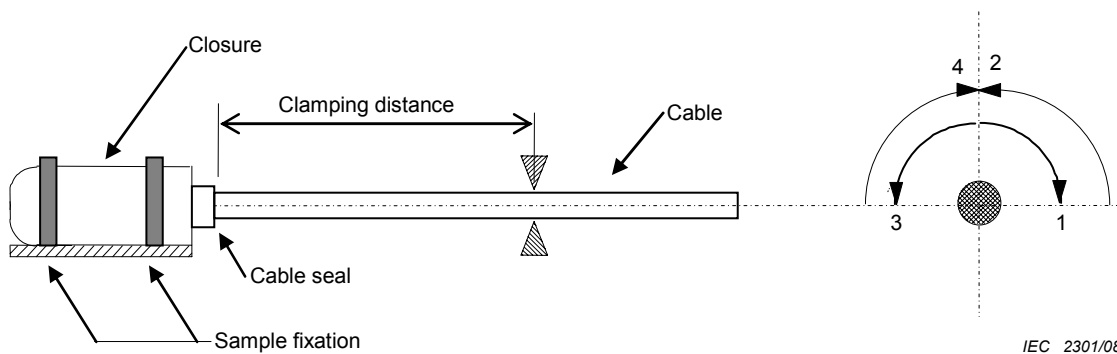
4.4 Weights

Weights or another mechanism for applying a tensile load to the cable clamp are required. Values of recommended loads are given in Table 1.



IEC 2300/08

Figure 1 – Component or device test set-up



IEC 2301/08

Figure 2 – Closure test set-up

4.5 Optical source and detector

The optical source and detector used to measure changes in attenuation shall comply with that specified in IEC 61300-3-4.

5 Procedure

5.1 Preparation of specimens

Prepare the specimens according to the manufacturer's instructions or as specified in the relevant specification. The device under test shall be terminated onto a sufficient length of fibre cable to facilitate interfacing with the optical source and detector.

5.2 Pre-conditioning

Pre-condition the device under test for 2 h at the standard test conditions specified in IEC 61300-1, unless otherwise specified in the relevant specification. Measure and record the attenuation of the device under test.

5.3 Mount the device under test

The body of the specimen shall be rigidly mounted to a holding plate which is secured in a fixed position (see Figure 1). The clamp to which the load can be applied shall be fastened to the cable in such a manner that the optical fibre or cable is not crushed. The top of the cable clamp shall be 400 mm from the end of the strain relief, if used (see Figure 1). For cable diameters larger than 25 mm, the top of the cable clamp shall be 1 000 mm from the end of the strain relief. If there is no strain relief, the end of the specimen nearest the cable clamp shall be the reference.

5.4 Measure the attenuation

Re-measure the attenuation to ensure that the fixturing and cable clamping have not affected the cable's attenuation.

5.5 Apply cable load

Gradually apply the tensile load, as recommended in Table 1 or as specified in the relevant specification, to the cable clamping fixture, being careful to avoid any sudden jerking or straining of the cable.

5.6 Measure the attenuation

After the load is applied, re-measure the attenuation of the specimen. This value shall be recorded and used as a reference to determine the effects of the twisting motion.

5.7 Twist the cable

Apply a twisting motion to the cable-clamping device, being careful to control the vertical and horizontal motion of the load. One twist cycle shall consist of a twist angle (as indicated in Table 1 or in the relevant specification) in one direction, a return to the original position, a twist angle (as indicated in Table 1 or in the relevant specification) in the opposite direction and a final return to the original position. Repeat the twist cycle as many times as specified in Table 1, or in the relevant specification.

5.8 Test pressure

For Category S closures, use a test pressure: 40 kPa \pm 2 kPa over-pressure at test temperature. For products used in pressurized networks, all testing should be carried out at 98,0 kPa \pm 9,8 kPa over-pressure instead of 40 kPa over-pressure.

5.9 Monitoring attenuation

The attenuation of the specimen shall be monitored during the test, as described in IEC 61300-3-3, unless otherwise specified in the relevant specification. Any deviation in the device attenuation from that measured in IEC 61300-3-6 shall be considered attributable to the cable/device interface, fibre-to-fibre interfaces or fibre-to-source/detector interfaces in the device.

NOTE If there are unacceptable changes in attenuation and it is questionable whether the cable itself may be at fault, a control test to determine cable contribution shall be performed in the same manner using a piece of cable and two cable clamps.

5.10 Final measurements and examinations

After completion of the cable twist cycling, remove all fixtures and make a final attenuation measurement to ensure that there is no permanent damage to the device under test. The results of the final measurement shall be within the limit established in the relevant specification.

Remove the device from the mounting fixture and, unless otherwise specified, visually examine the specimens in accordance with IEC 61300-3-1. Check for evidence of any degradation in the specimen. This may include, for example:

- broken, loose or damaged parts or accessories;
- breaking or damage to the cable jacket, seals, strain relief, or fibres;
- displaced, bent, broken or chipped parts;
- scratching of any interface areas.

6 Severity

The severity of the test is dependent upon the tensile load applied, the number of twists per cycle (twist angle) and the number of twist cycles. The severity shall be specified in the relevant specification. Recommended values of the test parameters are given in Table 1.

Table 1 – Severity levels

Component	Recommended load N	Twist angle (1 cycle - °)	Number of cycles
CAT U and CAT E connectors with coated fibre	2,0	180	25
CAT U and CAT E connectors with reinforced cable	15,0	180	25
CAT U and CAT E passive components with coated fibre	2,0	180	10
CAT U and CAT E passive components with reinforced cable	5,0	180	10
CAT O passive components with coated fibre	2,0	180	10
CAT O passive components with reinforced cable	5,0	180	10
CAT O connectors with 250 µm coated fibre	4,9	540	10
CAT O connectors with 900 µm coated fibre	7,4	540	10
CAT O connectors with reinforced cable	13,3	900	10
CAT C, CAT A, CAT G and CAT S closures	50,0	90	5

7 Details to be specified

The following details, as applicable, shall be given in the relevant specification:

- Tensile load applied to the cable
 - Acceptable change in attenuation
 - Clamping distance (for closures)
 - Twist angle
 - Number of cycles
 - Sealing performance measurements (for closures)
 - Deviations from the test procedure
 - Additional pass/fail criteria
-

LICENSED TO MECON Limited. - RANCHI/BANGALORE
FOR INTERNAL USE AT THIS LOCATION ONLY, SUPPLIED BY BOOK SUPPLY BUREAU.

LICENSED TO MECON Limited. - RANCHI/BANGALORE
FOR INTERNAL USE AT THIS LOCATION ONLY, SUPPLIED BY BOOK SUPPLY BUREAU.

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