IEC 61300-2-6

Edition 3.0 2023-11
REDLINE VERSION

INTERNATIONAL STANDARD

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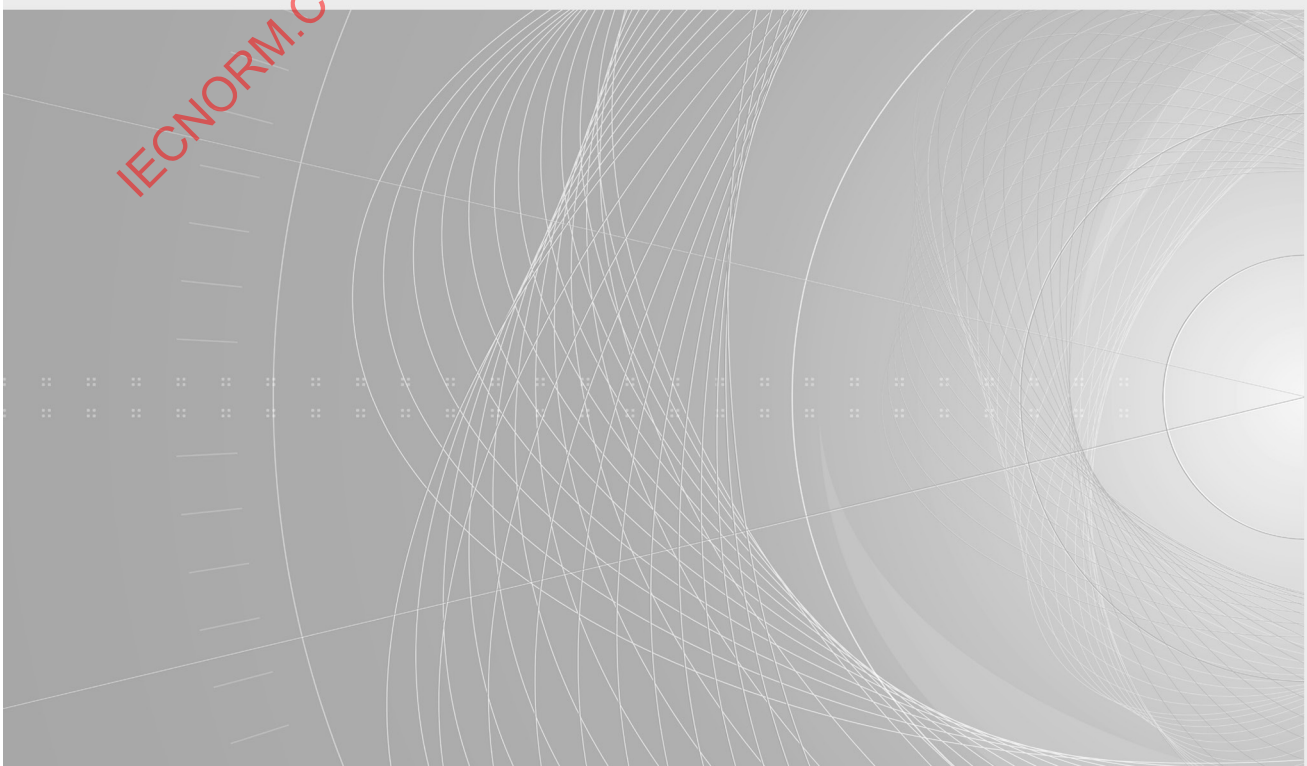
Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 2-6: Tests – Tensile strength of coupling mechanism



IEC 61300-2-6:2023-11 RLV(en)

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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-6: Tests – Tensile strength of coupling mechanism

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61300-2-6:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61300-2-6 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) addition of normative references;

b) modification of the details to be specified;

c) addition of optical monitoring.

The text of this International Standard is based on the following documents:

Draft	Report on voting
86B/4808/FDIS	86B/4825/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

Part 2-6: Tests – Tensile strength of coupling mechanism

1 Scope

This part of IEC 61300 describes a test to ensure the coupling mechanism of a connector set or connector and device combination withstands the axial loads likely to be applied during normal service, and that the optical performance remains within the given specifications during this test.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 and 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 change in attenuation and return loss*

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

~~3 General~~

~~A tensile load is smoothly applied to a mated connector set or connector and device combination in a direction that will separate the components. The load is normally applied between the connector plug and the adapter or between the connector plug and the device being tested.~~

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61300-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

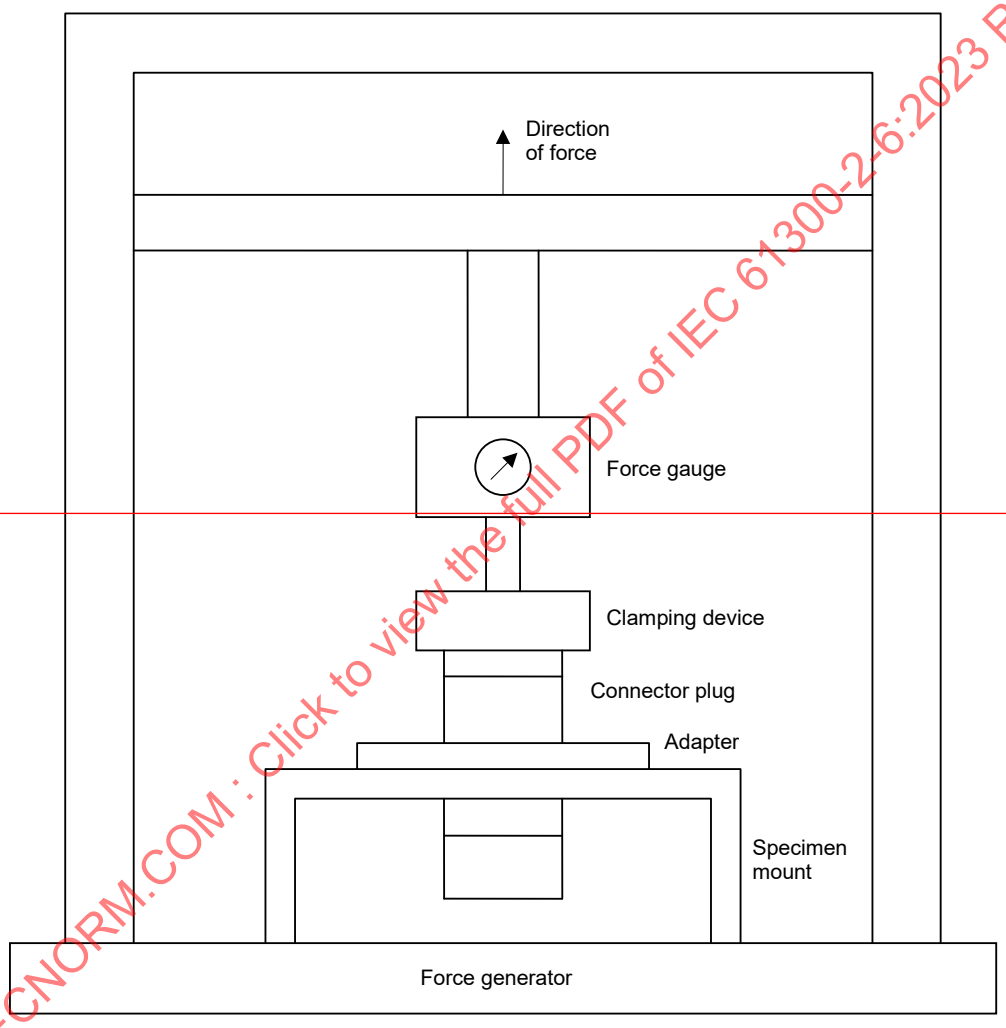
- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Apparatus

4.1 General

The test apparatus shall be capable of applying an axial load ~~between a connector plug or coupling mechanism and an adapter or device~~ in a direction that separates the components. The tensile load is smoothly applied to the device under test (DUT) that consists of a mated connector pair or connector and device combination.

An example of a test apparatus is shown in Figure 1. Some or all the following apparatus components are required.



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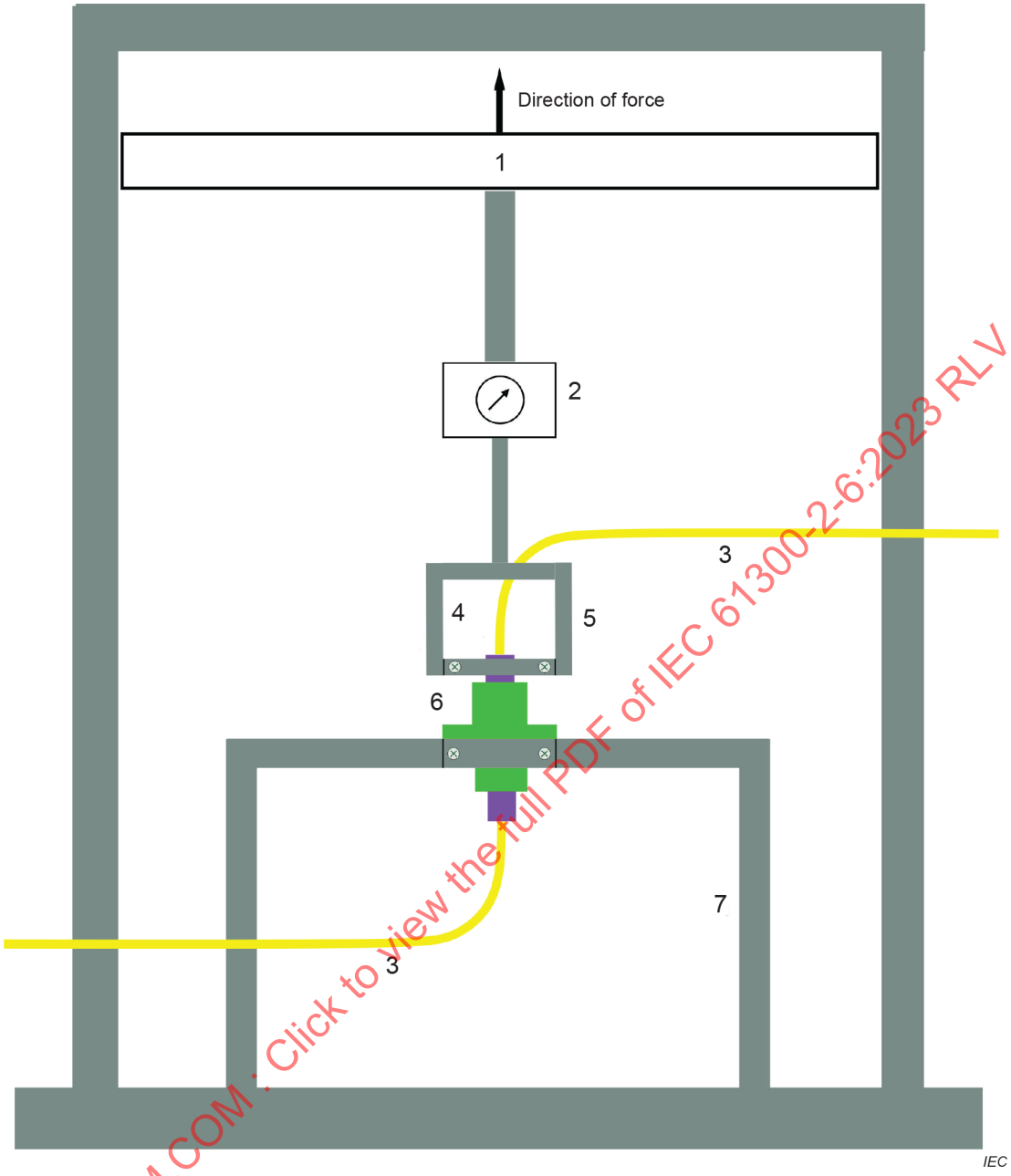

Key

1 force generator
2 force gauge
3 monitoring optical cable
4 connector plug
5 clamping device
6 adaptor or connector receptacles
7 DUT mount

Figure 1 – Example of test apparatus

4.2 Force generator

The force generator ~~may~~ shall be ~~any device or apparatus~~ capable of smoothly applying the specified force at the specified rate.

4.3 Force gauge

A force gauge ~~of specified accuracy~~ shall be used to measure the axial force applied to the DUT.

4.4 Clamping device

A suitable clamping device shall be used to ~~couple~~ transmit the force from the force generator to the connector plug or coupling mechanism. ~~Care shall be taken~~ Ensure that, in the design and use of the clamping device ~~to ensure that~~, it does not apply compressive forces which ~~might~~ can influence the mechanical performance of the connector plug or coupling mechanism, and allows mating the connectors for optical monitoring. For connector types with a de-latching mechanism (e.g. SC, MPO) a particular design shall be used in order to clamp the inner part of these connectors as the axial load cannot be applied directly to the outer body which de-latches the connector plug. Alternatively, a mandrel wrap on the cable may be used. However, the mandrel wrap shall be of sufficient diameter to not cause additional attenuation. If a mandrel wrap on the cable is used, the cable shall be reinforced cable. The distance between the rearmost point of the cable fixing component of the DUT and the centre point of the mandrel shall be between 200 mm and 300 mm. If a failure occurs while utilizing the alternate mandrel wrap method, the failure should be investigated to ensure the failure was due to the latching mechanism.

~~**4.5 Specimen mount**~~

~~Mount the specimen according to normal mounting procedures.~~

~~**4.6 Torque wrench**~~

~~A torque wrench may be required to assemble screw type connectors in accordance with the manufacturer's instructions.~~

4.5 DUT mount

The mounting feature shall provide rigid fixing of the DUT and give enough clearance for plug connection. The bend radius of the associated monitoring optical fibre cables shall be large enough to avoid compromising the optical results.

5 Procedure

5.1 General

Mount the DUT according to normal mounting procedures. A tensile load is smoothly applied to a mated connector set or connector and device combination in a direction that will act to separate the components. The load is applied between the connector plug through the clamping device and the adaptor or the device being tested.

Unless otherwise specified, the test shall be performed at the standard atmospheric conditions specified in IEC 61300-1.

5.2 Preconditioning

~~Unless otherwise specified, pre-condition each prepared specimen for 2 h at the standard test conditions specified in IEC 61300-1.~~

Precondition all parts of each DUT for minimum 2 h at the standard atmospheric conditions.

5.3 Prepare ~~specimens~~ DUT

~~Mate~~ Assemble all parts of the ~~specimens~~ DUT according to the manufacturer's instructions. For screw type couplings, ~~use~~ a torque wrench may be used to ensure that the couplings are tightened to the proper torque value.

5.4 Initial visual examinations and measurements

~~Complete initial examinations and measurements on the specimen shall be made as required by the relevant specification. Visual examination shall be done according to IEC 61300-3-1.~~

Visually examine each DUT and its components in accordance with IEC 61300-3-1.

Measure the initial optical performance of each DUT as required by the relevant specification.

5.5 Mount DUT

Securely mount one part of the DUT, ~~usually~~ the adaptor with connector ~~adapter, switch, attenuator, etc.~~ plug or the device with connector receptacle to the stationary portion of the test fixture. ~~Fix~~ Mount the other part of the DUT, usually the connector plug or coupling mechanism, to the movable portion of the force generator attached clamping device or the mandrel.

Make sure the monitoring optical fibre cables connected for optical monitoring do not interfere with the test equipment and do not present bending or tension that can influence the results of the active optical monitoring.

Start the monitoring of the optical performance according to IEC 61300-3-3 and make a measurement of the optical performance before applying the load.

5.6 Apply load

Smoothly apply the tensile load, as recommended in Table 1 ~~or the specified rate, up to the specified value and specified duration~~. Meanwhile, take the optical measurements at the interval and wavelengths required by the relevant IEC 61753 performance standard.

After the load is applied for the specified duration, remove the tensile load from the DUT.

5.7 Recovery

Allow the DUT to remain under standard atmospheric conditions for at least 1 min, as defined in IEC 61300-1 unless otherwise specified in the relevant IEC 61753 performance standard.

5.8 Final examination and measurements

~~Remove the tensile load from the specimen and the specimen from the test mounting. Unless otherwise specified, visually examine the specimen and its component parts in accordance with IEC 61300-3-1. Check for evidence of cracking, permanent deformation or other damage which might impair its function, and against any other pass/fail criteria specified in the relevant specification.~~

After the change of the optical performance according to IEC 61300-3-3 is measured and the tensile load is removed, stop the monitoring of the optical performance.

Remove the DUT from the DUT mount. Measure the final optical performance as required by the relevant IEC 61753 performance standard.

Visually examine each DUT and its component parts in accordance with IEC 61300-3-1. Check for evidence of cracking, permanent deformation or other damage which might impair its

function or impact performance. Complete other final examinations on the DUT as required by the relevant IEC 61753 performance standard.

6 Severity

The severity of the test is dependent upon the magnitude of the tensile load and, to a lesser extent, the rate of application and duration of the load. ~~The magnitude, rate of application and duration of the load shall be given in the relevant specification. Recommended values of the test parameters are given in Table 1.~~ Table 1 shows the specified test severities in relation to the performance categories. It is recommended to verify the test severities with the relevant IEC 61753 performance standards and IEC 62005 reliability documents for the normative values.

Table 1 – Recommended severity values

Category [a]	Tensile load N	Rate of application N/s	Duration s
C, C^{HD}, OP, OP^{HD}, OP^{+}, OP^{+HD}	40 ± 1	2	60
I, I^{HD}	60 ± 1	2	60
~~U,~~ E	40 ± 1	2	120
[a] Categories are defined in IEC 61753-1.			

7 Details to be specified and reported

The following details, as applicable, shall be specified in the specification and reported in the test report:

- ~~magnitude and rate of application of the tensile load;~~
- ~~fibre type and length;~~
- ~~pre-conditioning procedure;~~
- ~~recovery procedure;~~
- ~~optically functioning or non-functioning;~~
- ~~initial examinations and measurements and performance requirements;~~
- ~~examinations and measurements during test and performance requirements, if required;~~
- ~~final examinations and measurements and performance requirements;~~
- tensile load and rate of application;
- duration of load application;
- coupling torque prior to testing, if necessary;
- optical measurement method~~, if necessary~~;
- optical measurement interval during the test;
- measurement wavelength(s);
- optical performance requirements during and after the test;
- additional pass/fail criteria;
- any deviation from this procedure.

Bibliography

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

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IEC 61300-2-6

Edition 3.0 2023-11

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Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-6: Tests – Tensile strength of coupling mechanism

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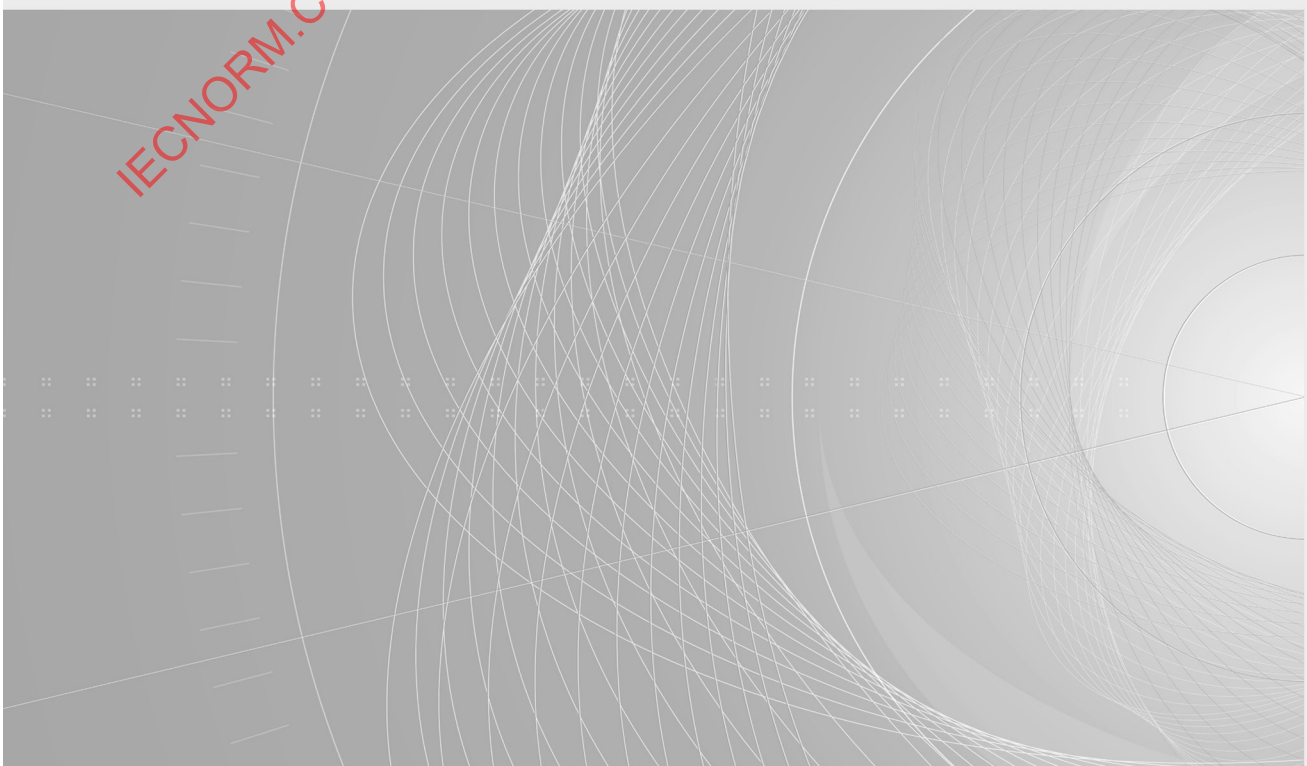

IEC 61300-2-6:2023-11(en-fr)

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Part 2-6: Tests – Tensile strength of coupling mechanism

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

Part 2-6: Tests – Tensile strength of coupling mechanism

1 Scope

This part of IEC 61300 describes a test to ensure the coupling mechanism of a connector set or connector and device combination withstands the axial loads likely to be applied during normal service, and that the optical performance remains within the given specifications during this test.

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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 change in attenuation and return loss*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61300-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

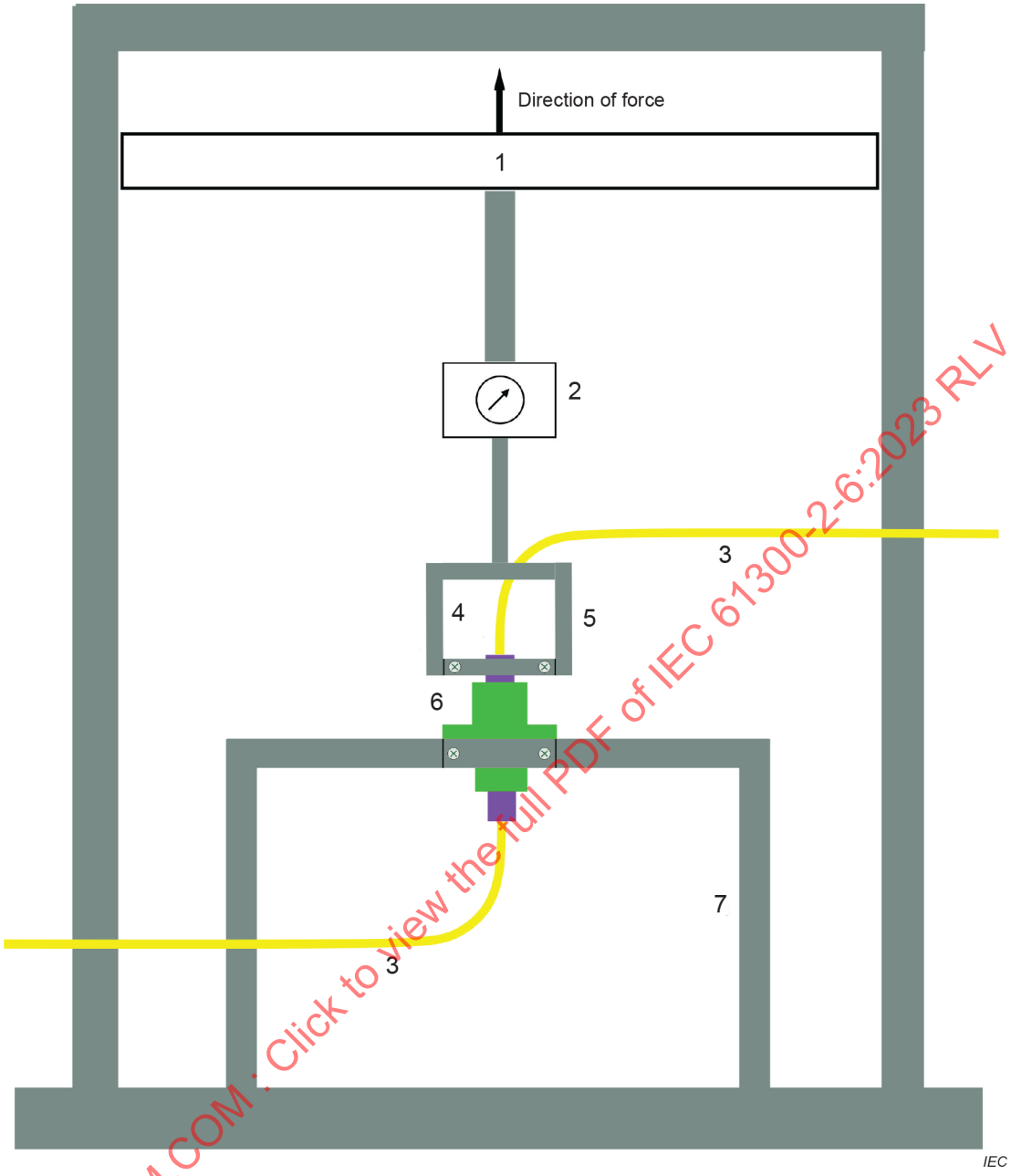
- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Apparatus

4.1 General

The test apparatus shall be capable of applying an axial load in a direction that separates the components. The tensile load is smoothly applied to the device under test (DUT) that consists of a mated connector pair or connector and device combination.

An example of a test apparatus is shown in Figure 1. Some or all the following apparatus components are required.



Key

1 force generator
2 force gauge
3 monitoring optical cable
4 connector plug
5 clamping device
6 adaptor or connector receptacles
7 DUT mount

Figure 1 – Example of test apparatus

4.2 Force generator

The force generator shall be capable of smoothly applying the specified force at the specified rate.

4.3 Force gauge

A force gauge shall be used to measure the axial force applied to the DUT.

4.4 Clamping device

A suitable clamping device shall be used to transmit the force from the force generator to the connector plug or coupling mechanism. Ensure that, in the design and use of the clamping device, it does not apply compressive forces which can influence the mechanical performance of the connector plug or coupling mechanism, and allows mating the connectors for optical monitoring. For connector types with a de-latching mechanism (e.g. SC, MPO) a particular design shall be used in order to clamp the inner part of these connectors as the axial load cannot be applied directly to the outer body which de-latches the connector plug. Alternatively, a mandrel wrap on the cable may be used. However, the mandrel wrap shall be of sufficient diameter to not cause additional attenuation. If a mandrel wrap on the cable is used, the cable shall be reinforced cable. The distance between the rearmost point of the cable fixing component of the DUT and the centre point of the mandrel shall be between 200 mm and 300 mm. If a failure occurs while utilizing the alternate mandrel wrap method, the failure should be investigated to ensure the failure was due to the latching mechanism.

4.5 DUT mount

The mounting feature shall provide rigid fixing of the DUT and give enough clearance for plug connection. The bend radius of the associated monitoring optical fibre cables shall be large enough to avoid compromising the optical results.

5 Procedure

5.1 General

Mount the DUT according to normal mounting procedures. A tensile load is smoothly applied to a mated connector set or connector and device combination in a direction that will act to separate the components. The load is applied between the connector plug through the clamping device and the adaptor or the device being tested.

Unless otherwise specified, the test shall be performed at the standard atmospheric conditions specified in IEC 61300-1.

5.2 Preconditioning

Precondition all parts of each DUT for minimum 2 h at the standard atmospheric conditions.

5.3 Prepare DUT

Assemble all parts of the DUT according to the manufacturer's instructions. For screw type couplings, a torque wrench may be used to ensure that the couplings are tightened to the proper torque value.

5.4 Initial visual examinations and measurements

Visually examine each DUT and its components in accordance with IEC 61300-3-1.

Measure the initial optical performance of each DUT as required by the relevant specification.

5.5 Mount DUT

Securely mount one part of the DUT, the adaptor with connector plug or the device with connector receptacle to the stationary portion of the test fixture. Mount the other part of the

DUT, usually the connector plug or coupling mechanism, to the movable portion of the force generator attached clamping device or the mandrel.

Make sure the monitoring optical fibre cables connected for optical monitoring do not interfere with the test equipment and do not present bending or tension that can influence the results of the active optical monitoring.

Start the monitoring of the optical performance according to IEC 61300-3-3 and make a measurement of the optical performance before applying the load.

5.6 Apply load

Smoothly apply the tensile load, as recommended in Table 1. Meanwhile, take the optical measurements at the interval and wavelengths required by the relevant IEC 61753 performance standard.

After the load is applied for the specified duration, remove the tensile load from the DUT.

5.7 Recovery

Allow the DUT to remain under standard atmospheric conditions for at least 1 min, as defined in IEC 61300-1, unless otherwise specified in the relevant IEC 61753 performance standard.

5.8 Final examination and measurements

After the change of the optical performance according to IEC 61300-3-3 is measured and the tensile load is removed, stop the monitoring of the optical performance.

Remove the DUT from the DUT mount. Measure the final optical performance as required by the relevant IEC 61753 performance standard.

Visually examine each DUT and its component parts in accordance with IEC 61300-3-1. Check for evidence of cracking, permanent deformation or other damage which might impair its function or impact performance. Complete other final examinations on the DUT as required by the relevant IEC 61753 performance standard.

6 Severity

The severity of the test is dependent upon the magnitude of the tensile load and, to a lesser extent, the rate of application and duration of the load. Table 1 shows the specified test severities in relation to the performance categories. It is recommended to verify the test severities with the relevant IEC 61753 performance standards and IEC 62005 reliability documents for the normative values.

Table 1 – Recommended severity values

Category [a]	Tensile load N	Rate of application N/s	Duration s
C, C^{HD}, OP, OP^{HD}, OP^{+}, OP^{+HD}	40 ± 1	2	60
I, I^{HD}	60 ± 1	2	60
E	40 ± 1	2	120

[a] Categories are defined in IEC 61753-1.

7 Details to be specified and reported

The following details, as applicable, shall be specified in the specification and reported in the test report:

– tensile load and rate of application;
– duration of load application;
– coupling torque prior to testing, if necessary;
– optical measurement method;
– optical measurement interval during the test;
– measurement wavelength(s);
– optical performance requirements during and after the test;
– additional pass/fail criteria;
– any deviation from this procedure.

Bibliography

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

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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DISPOSITIFS D'INTERCONNEXION ET COMPOSANTS PASSIFS FIBRONIQUES – PROCÉDURES FONDAMENTALES D'ESSAIS ET DE MESURES –

Partie 2-6: Essais – Résistance à la traction du mécanisme de couplage

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L'IEC 61300-2-6 a été établie par le sous-comité 86B: Dispositifs d'interconnexion et composants passifs à fibres optiques, du comité d'études 86 de l'IEC: Fibres optiques. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2010. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout de références normatives;

b) modification des informations détaillées à spécifier;

c) ajout du suivi optique.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
86B/4808/FDIS	86B/4825/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC 61300, publiées sous le titre général: *Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

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DISPOSITIFS D'INTERCONNEXION ET COMPOSANTS PASSIFS FIBRONIQUES – PROCÉDURES FONDAMENTALES D'ESSAIS ET DE MESURES –

Partie 2-6: Essais – Résistance à la traction du mécanisme de couplage

1 Domaine d'application

La présente partie de l'IEC 61300 décrit un essai destiné à vérifier que le mécanisme de couplage d'un jeu de connecteurs ou d'une combinaison d'un connecteur et d'un dispositif résiste aux charges axiales susceptibles d'être appliquées dans des conditions normales de fonctionnement et que, pendant l'essai, les performances optiques restent dans les limites spécifiées.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61300-1, *Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures – Partie 1: Généralités et recommandations*

IEC 61300-3-1, *Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures – Partie 3-1: Examens et mesures – Examen visuel*

IEC 61300-3-3, *Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures – Partie 3-3: Examens et mesures – Contrôle actif des variations de l'affaiblissement et de l'affaiblissement de réflexion*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 61300-1 s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

4 Appareillage

4.1 Généralités

L'appareillage d'essai doit être capable d'appliquer une charge axiale dans une direction qui sépare les composants. La charge de traction est appliquée progressivement au dispositif en essai (DUT) qui est constitué d'une paire de connecteurs accouplés ou d'une combinaison associant un connecteur et un dispositif.