IEC 61300-3-33

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 3-33: Examinations and measurements – Withdrawal force from a resilient alignment sleeve using gauge pins

Dispositifs d'interconnexion et composants passifs fibroniques – Méthodes fondamentales d'essais et de mesures –
Partie 3-33: Examens et mesures – Force d'extraction d'un manchon d'alignement élastique, avec utilisation de broches calibrées

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3-33: Examinations and measurements – Withdrawal force from a resilient alignment sleeve using gauge pins

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International Standard IEC 61300-3-33 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This bilingual version (2019-08) corresponds to the monolingual English version, published in 2012-02.

This second edition cancels and replaces the first edition published in 1999. It constitutes a technical revision. The changes with respect to the previous edition are to reconsider the entire document according to the updated IEC rules and to add a gauge and a solvent into Clause 4, and to add a general subclause and cleaning procedure into Clause 6.

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

CDV	Report on voting
86B/3221/CDV	86B/3289/RVC

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

The French version of this standard has not been voted upon.

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

A list of all the parts in the IEC 61300 series, 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 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- withdrawn,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.

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

Part 3-33: Examinations and measurements – Withdrawal force from a resilient alignment sleeve using gauge pins

1 Scope

This part of IEC 61300 describes the procedure to measure the withdrawal force between the ferrule (gauge pin) of the plug connector and the resilient alignment sleeve of the adapter. The gauge pin should have the same shape (chamfer) like the normal ferrules described in the optical interface, see IEC 61755-3 series and IEC 61754 series. This measurement procedure is applicable to single-fibre cylindrical ferrule optical connectors.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61754 (all parts), *Fibre optic connector interfaces*

IEC 61755-3 (all parts), *Fibre optic connector optical interfaces*

IEC/TR 62627-01, *Fibre optic interconnecting devices and passive components – Part 01: Fibre optic connector cleaning methods*

3 General description

The contact force between the mating ferrules in a fibre optic connector is the difference between the breakaway friction force and the spring force of the connector. To maintain contact, the breakaway friction force must remain below the spring force.

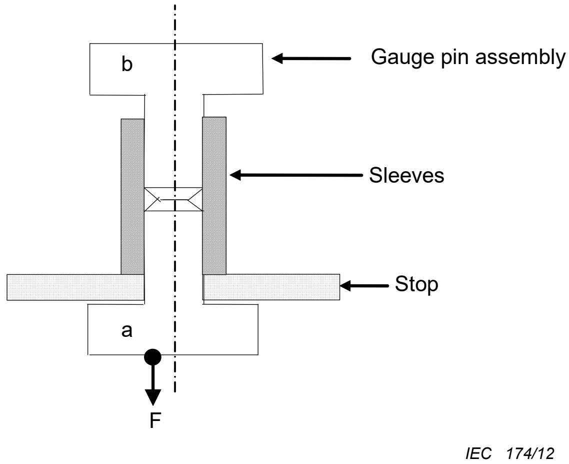
The ferrule withdrawal force is the highest force (breakaway force) required to remove one of the ferrules from the sleeve of a fibre optic connector.

The mechanics of friction result in significant variations in the measurement of breakaway friction force. The criteria to be applied to the results of these measurements must account for the spread that is inherent in the mechanism being measured (see Annex B).

4 Apparatus

4.1 General

The specimen is a resilient sleeve of a connector set. The measurement is made with two gauge pins inserted so that they meet at the centre of the sleeve. Force is applied to the end of one of the gauge pins as shown in Figure 1.



Key

a, b Gauge pin

F Withdrawal force

Figure 1 – Test unit with applied force on the gauge pin

4.2 Test unit

A force is applied to the gauge pin with a force generator that applies a continuously increasing force and is equipped with a force gauge to record the peak force that occurs at breakaway (see Annex A).

The test unit is a sleeve with two gauge pins inserted so as to touch at the centre of the sleeve. The interface between the two gauge pins shall be located within 10 % of the length of the sleeve from the centre of the sleeve itself.

4.3 Gauge pins

The gauge pins may be solid pins or connector ferrules that meet the gauge pin requirements. The gauge pin assembly consists of the gauge pin and a fixture for the application of load.

The gauge pin is generally produced to the maximum material size of the resilient feature. The gauge pin shall be defined in the relevant specification. The definition shall include dimensions, material, surface hardness, roughness for the area of the gauge in contact with the resilient member and cylindricity.

The requirements for the gauge pin are as follows:

a) diameters of the gauge pins shall be as specified in the relevant specification;

b) the diameter of the two gauge pins used in a given test shall be within 0,5 µm of each other;

c) the lengths of each gauge pin shall be sufficient to allow it to extend half-way into the sleeve and have enough left protruding out of the sleeve to allow for the attachment of a fixture or force generator;

d) the end of the gauge pin that is inserted shall have a nominal 45 ° chamfer to a depth of 0,1mm (breaking the edge of the gauge pin).

e) the following normative values shall be used where the parameters are not defined in the relevant specification:
   - zirconia ceramics shall be the material used;
   - surface finish (Ra) and roundness shall be within 0,2 µm and 0,5 µm, respectively.

4.4 Solvent

Prior to testing, each resilient alignment sleeve and gauge pin shall be cleaned by wiping, using for example lint-free wipes and swabs. The cleaning action shall consist of thorough rubbing or scrubbing. Moistening wipes should be avoided. If moistening is necessary, following cleaning, resilient alignment sleeve and gauge pins are preconditioned at 40 °C for 0,5 h and then returned to room temperature for at least 0,5 h.

As solvent it is recommended to use IPA (isopropyl alcohol), see also IEC/TR 62627-01.

It is recommended to choose solvents and cleaning agents in the observance of safety rules.

5 Test set up

Force is applied to the end of one of the gauge pins and to the edge of the sleeve as shown in Figure 1.

The test fixture shall be such that only two forces are applied to the moving gauge pin: the force withdrawing the pin, and the frictional force between the gauge pin and the sleeve.

The force on the pin should be applied along the axis of the sleeve, as shown in Figure 1.

The linkage through which force is applied to the gauge pin assemblies shall not apply a bending load. Either swivel joints or flexible members are recommended when a load is applied to the gauge pin assemblies.

The sleeves shall be reversed for a second set of measurements.

6 Procedure

6.1 General

The measurement is made using a force generator. Force is applied to one gauge pin, in order to extract it while the other gauge pin remains in place. During the test the resilient sleeve shall be free to move in radial direction.

6.2 Testing

Effort should be taken during the test to avoid any contamination of the sleeves or gauges. To compensate for the weight of the test fixture, the indicator on the force gauge shall be adjusted to zero.

Force is to be applied at a continuous rate (see Annex A).

The maximum force applied to the gauge pin shall be recorded during extraction of the first third part of the whole length of the gauge pin inserted into the sleeve.

Unless otherwise specified, an equal number of measurements shall be made from each end of the sleeve.

7 Calculation or interpretation of results

Unless otherwise specified, the set of data from the end of the sleeve with the higher values of withdrawal force shall be used to characterize the sleeve.

Sampling plans and the analysis of the results should be specified in the relevant specification.

See Annex B for estimates of the repeatability and reproducibility of ferrule withdrawal force measurements.

8 Details to be specified

The relevant specification shall specify the following details:

– gauge characteristics (dimensions, roundness and cylindricity of gauge pins and rings, material hardness and surface roughness at the bearing surfaces);
– maximum allowable gauge retention force;
– pre-conditioning procedure;
– recovery procedure;
– acceptance/failure criteria;
– number of times the test is performed on each component;
– configuration of the component under test;
– any deviations from measuring procedure;
– sampling plan;
– procedures for analysis of the data.

Annex A
(normative)

Loading velocity

The rate at which force applied to the test unit shall be increased is limited by the response or the capture rate of the force gauge. With a mechanically driven instrument, the rate at which force increases is a function of both the velocity of the cross-head and the stiffness of the linkage between the cross-head and the test unit.

Loading rates of approximately 100 mm/min are generally considered acceptable for mechanically driven instruments. The following equation may be used to evaluate peak error:

$$E = \frac{KV}{R_c}$$

where,

K is the system stiffness $\left\{\frac{\text{force}}{\text{distance}}\right\}$;

V is the velocity of the crosshead $\left\{\frac{\text{distance}}{\text{time}}\right\}$;

R_c is the capture rate of the force gauge $\left\{\frac{\text{events}}{\text{time}}\right\}$.

System stiffness is the ratio of the increase in force on the test unit divided by the change in position of the cross-head. If the system is very stiff, a compliant link may be added between the cross-head and the test unit to decrease stiffness.