IEC 61300-3-33

Edition 3.0 2022-01

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 pin gauges

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

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CONTENTS

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IEC 61300-3-33 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 2012. This edition constitutes a technical revision.

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

a) harmonize "gauge pin" to "pin gauge";

b) update test apparatus in Figure 1;

c) change of clause structure;

d) specified pin gauge requirements in Table 1.

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

Draft	Report on voting
86B/4559/FDIS	86B/4583/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.

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.

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/standardsdev/publications.

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

- 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- withdrawn,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 pin gauges

1 Scope

This part of IEC 61300 describes the procedure to measure the withdrawal force between the pin gauge and the resilient alignment sleeve. This measurement procedure is applicable to single-fibre cylindrical ferrule optical connectors.

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 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

3.1
resilient alignment sleeve
split sleeve in zirconia or metal material that align in its bore the ferrules of connector

4 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 shall 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 shall account for the spread that is inherent in the mechanism being measured (see Annex B).

5 Apparatus

5.1 General

The test apparatus shall be such that only two forces are applied to the moving pin gauge: the force withdrawing the pin, and the frictional force between the pin gauge and the sleeve. The force to extract the pin gauge shall be in the axis of the resilient sleeve bore (pins external diameter). An example of test apparatus is shown in Figure 1, which is applied force to the end of one of the pin gauges and to the edge of the sleeve.

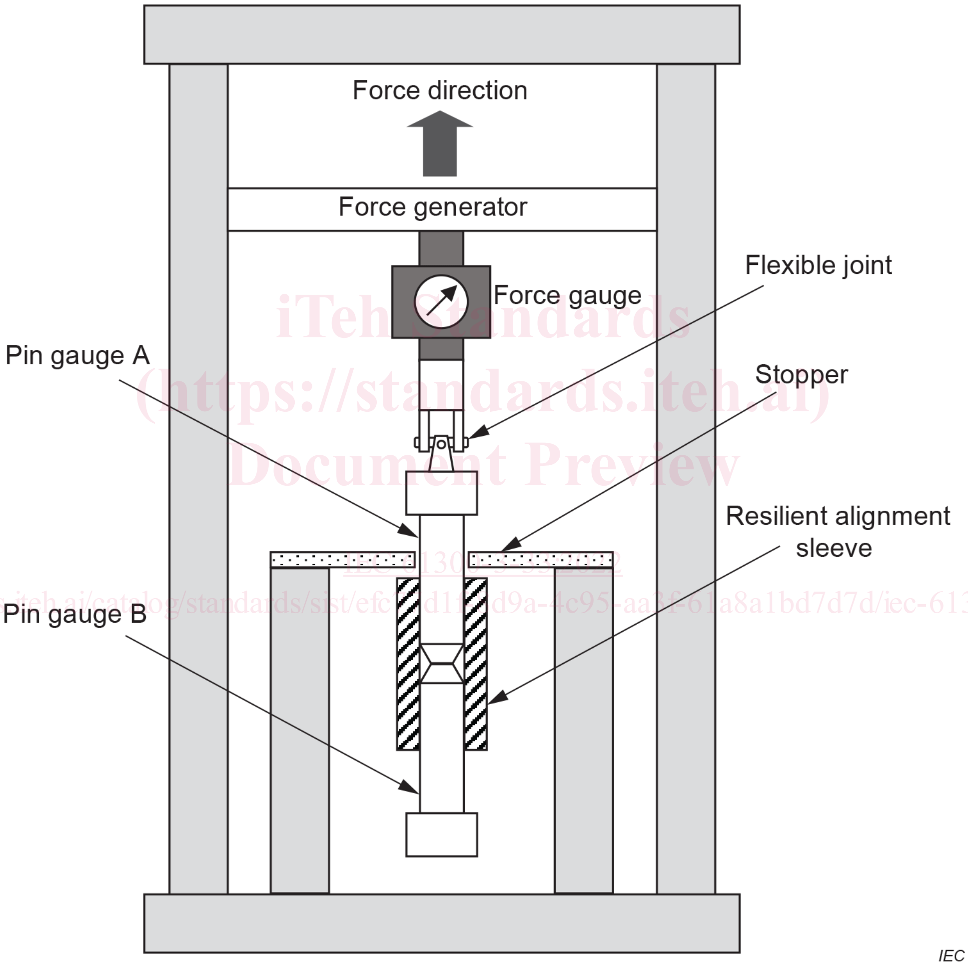

Figure 1 – Example of test apparatus

5.2 Pin gauges

The pin gauges shall be made of zirconia ceramics. The pin gauge assembly consists of the pin gauge and a fixture for the application of load. The pin gauge specifications shall meet the relevant connector interface standard according to IEC 61754 (all parts). Unless otherwise specified in the relevant documents, the minimum requirements of pin gauge for commonly used resilient alignment sleeve are shown in Table 1.

Table 1 – Minimum requirements of pin gauge

Items	For 1,25 mm	For 2,5 mm
Material	Zirconia	Zirconia
Diameter [mm]	1,249 ± 0,000 2	2,499 ± 0,000 5
Surface roughness (Ra) [mm]	0,000 2	0,000 2
Length [mm]	4,2	7,5
Edge shape	Break sharp edges	Break sharp edges

5.3 Stopper

The stopper shall have a slit to prevent movement of the resilient alignment sleeve during the load application. The stopper material shall have a stiffness greater than or equal to that of the resilient alignment sleeve material. The width of the stopper slit shall be larger than the outer diameter of the pin gauge but smaller than the outer diameter of the resilient alignment sleeve.

NOTE Stiffness includes material properties and geometries.

5.4 Force generator

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

5.5 Force gauge

A force gauge having the specified measurement uncertainty shall be used to measure the axial force applied to the specimen.

5.6 Flexible joints

The force applied to the pin gauge shall be along the axis of the resilient alignment sleeve in order to avoid bending load and resilient alignment split sleeve opening. The flexible joints or swivel joints should be used to apply such forces at the end of at least one pin.

6 Procedure

6.1 General

Effort should be taken during the test to avoid any contamination of the sleeves or gauges. Unless otherwise specified, the test shall be performed at the standard atmospheric conditions specified in IEC 61300-1.

6.2 Preconditioning

Prior to testing, each resilient alignment sleeve and pin gauge shall be cleaned by wiping, using for example lint-free wipes and swabs. The cleaning action shall consist of thorough rubbing or scrubbing. Moistened wipes should be avoided. If wet cleaning is necessary, using a solvent such as alcohol to remove stuck on contamination, the resilient alignment sleeve and/or pin gauges shall be preconditioned to ensure the solvent is sufficiently removed. The post wet cleaned resilient alignment sleeves and/or ping gauges shall be preconditioned at 40 °C for 0,5 h minimum. After this preconditioning, the resilient alignment sleeves and/or pin gauges shall be allowed to rest at standard atmospheric conditions for a minimum of 0,5 h before the test is performed. After wet cleaning, dry wiping should remove solvent residue (see also IEC TR 62627-01).

Solvents and cleaning agents should be choosed in the observance of safety rules.

6.3 Testing

a) Insert the two pin gauges into either side of the resilient alignment sleeve until they touch at the centre of the sleeve. The interface between the two pin gauges shall be located within 10 % of the length of the sleeve from the centre of the sleeve itself.

b) Securely mount pin gauge A to the test fixture. Make sure the stopper is located between pin gauge A and the edge of the resilient alignment sleeve. During the test, the resilient alignment sleeve shall be free to move in the radial direction.

c) To compensate for the weight of the test fixture, the indicator on the force gauge shall be adjusted to zero.

d) Force shall be applied at a continuous rate (see Annex A). The maximum force applied to the pin gauge shall be recorded during extraction of the first third part of the whole length of the pin gauge inserted into the sleeve.

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

f) 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.

7 Details to be specified and reported

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

– pin gauge characteristics (dimensions and surface roughness);
– resilient alignment sleeve characteristics;
– maximum allowable ferrule withdrawal force;
– pre-conditioning procedure;
– environmental test conditions (temperature and humidity);
– configuration of the component under test;
– sampling plan;
– number of times the test is performed on each component;
– procedures for analysis of the data;
– acceptance/failure criteria;
– any deviations from measuring procedure;
– peak error calculated;
– measurement uncertainty.

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;

V is the velocity of the crosshead;

R_c is the capture rate of the force gauge.

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. The capture rate of the force gauge is calculated by number of events during test divided by testing time.