Optical fibres - Part 1-31: Measurement methods and test procedures - Tensile strength

EESTI STANDARDIKESKUS
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EESTI STANDARDI EESSÕNA	NATIONAL FOREWORD
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Optical fibres - Part 1-31: Measurement methods and test procedures - Tensile strength
(IEC 60793-1-31:2010)

Fibres optiques -
Partie 1-31 : Méthodes de mesure et procédures d'essai -
Résistance à la traction
(CEI 60793-1-31:2010)

Lichtwellenleiter -
Teil 1-31: Messmethoden und Prüfverfahren -
Zugfestigkeit
(IEC 60793-1-31:2010)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 86A/1285/CDV, future edition 2 of IEC 60793-1-31, prepared by SC 86A, Fibres and cables, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60793-1-31 on 2010-09-01.

This European Standard supersedes EN 60793-1-31:2002.

The main change with respect to the previous edition is the addition of comprehensive details, such as examples of fibre clamping as given in Annexes A, B and C.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2011-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60793-1-31:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61649 NOTE Harmonized as EN 61649.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60793-1-20	-	Optical fibres - Part 1-20: Measurement methods and test procedures - Fibre geometry	EN 60793-1-20	-
IEC 60793-1-21	-	Optical fibres - Part 1-21: Measurement methods and test procedures - Coating geometry	EN 60793-1-21	-

CONTENTS

INTRODUCTION

Failure stress distributions can be used to predict fibre reliability in different conditions. IEC/TR 62048 shows mathematically how this can be done. To complete a given reliability projection, the tests used to characterize a distribution shall be controlled for the following:

- Population of fibre, e.g., coating, manufacturing period, diameter
- Gauge length, i.e., length of section that is tested
- Stress or strain rates
- Testing environment
- Preconditioning or aging treatments
- Sample size

This method measures the strength of optical fibre at a specified constant strain rate. It is a destructive test, and is not a substitute for prooftesting.

This method is used for those *typical* optical fibres for which the median fracture stress is greater than 3,1 GPa (450 kpsi) in 0,5 m gauge lengths at the highest specified strain rate of 25 %/min. For fibres with lower median fracture stress, the conditions herein have not demonstrated sufficient precision.

Typical testing is conducted on “short lengths”, up to 1 m, or on “long lengths”, from 10 m to 20 m with sample size ranging from 15 to 30.

The test environment and any preconditioning or aging is critical to the outcome of this test. There is no agreed upon model for extrapolating the results for one environment to another environment. For failure stress at a given stress or strain rate, however, as the relative humidity increases, failure stress decreases. Both increases and decreases in the measured strength distribution parameters have been observed as the result of preconditioning at elevated temperature and humidity for even a day or two.

This test is based on the theory of fracture mechanics of brittle materials and on the power-law description of flaw growth (see IEC TR 62048). Although other theories have been described elsewhere, the fracture mechanics/power-law theory is the most generally accepted.

A typical population consists of fibre that has not been deliberately damaged or environmentally aged. A typical fibre has a nominal diameter of 125 µm, with a 250 µm or less nominal diameter acrylate coating. Default conditions are given for such typical populations. Atypical populations might include alternative coatings, environmentally aged fibre, or deliberately damaged or abraded fibre. Guidance for atypical populations is also provided.

OPTICAL FIBRES –

Part 1-31: Measurement methods and test procedures – Tensile strength

1 Scope

This part of IEC 60793 provides values of the tensile strength of optical fibre samples and establishes uniform requirements for the mechanical characteristic – tensile strength. The method tests individual lengths of uncabled and unbundled glass optical fibre. Sections of fibre are broken with controlled increasing stress or strain that is uniform over the entire fibre length and cross section. The stress or strain is increased at a nominally constant rate until breakage occurs.

The distribution of the tensile strength values of a given fibre strongly depends on the sample length, loading velocity and environmental conditions. The test can be used for inspection where statistical data on fibre strength is required. Results are reported by means of statistical quality control distribution. Normally the test is carried out after temperature and humidity conditioning of the sample. However, in some cases, it may be sufficient to measure the values at ambient temperature and humidity conditions

This method is applicable to types A1, A2, A3, B and C optical fibres.

Warning – This test involves stretching sections of optical fibre until breakage occurs. Upon breakage, glass fragments can be distributed in the test area. Protective screens are recommended. Safety glasses should be worn at all times in the testing area.

2 Normative references

The following referenced documents are indispensable for the application of this document.

For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60793-1-20, *Optical fibres – Part 1-20: Measurement methods and test procedures – Fibre geometry*

IEC 60793-1-21, *Optical fibres – Part 1-21: Measurement methods and test procedures – Coating geometry*

3 Apparatus

3.1 General

This clause prescribes the fundamental requirements of the equipment used for dynamic strength testing. There are many configurations that can meet these requirements. Some examples are presented in Annex A. The choice of a specific configuration will depend on such factors as:

- gauge length of a specimen
- stress or strain rate range
- environmental conditions
- strength of the specimens.