SLOVENSKI STANDARD

SIST EN ISO 14125:1999

01-maj-1999

Z vlakni ojačeni kompozitni polimerni materiali – Določevanje upogibnih lastnosti (ISO 14125:1998)

Fibre-reinforced plastic composites - Determination of flexural properties (ISO 14125:1998)

Faserverstärkte Kunststoffe - Bestimmung der Biegeeigenschaften (ISO 14125:1998)

Composites plastiques renforcés de fibres - Détermination des propriétés de flexion (ISO 14125:1998)

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English version

Fibre-reinforced plastic composites - Determination of flexural properties (ISO 14125:1998)

Composites plastiques renforcés de fibres - Détermination des propriétés de flexion (ISO 14125:1998)

This European Standard was approved by CEN on 15 February 1998.

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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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

The text of the International Standard ISO 14125:1998 has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

This European Standard supersedes EN 63:1977.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech_Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 14125:1998 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 14125

First edition
1998-03-01

Fibre-reinforced plastic composites — Determination of flexural properties

Composites plastiques renforcés de fibres — Détermination des propriétés de flexion

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 14125 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres.*

Annexes A and B form an integral part of this International Standard.

Introduction

This standard is based on ISO 178 but deals with fibre-reinforced plastic composites. As such it retains the test conditions relevant for glass-fibre-reinforced systems. The test conditions are extended from ISO 178 to include both three-point (Method A) and four-point (Method B) loading geometries, and to include conditions for composites based on newer fibres such as carbon and aramid fibres.

Other source documents consulted include ASTM D 790 (four-point loading), prEN 2562 (test conditions), CRAG 200 and JIS K 7074 (use of shims for four-point loading, figure 6). The overall specimen length for four-point loading is the same as for three-point loading.

The scope of ISO 178 will be revised and limited to unreinforced and filled plastics.

EN 63:1977, *Glass-reinforced plastics — Determination of flexural properties — Three-point test*, will be withdrawn.

Fibre-reinforced plastic composites — Determination of flexural properties

1 Scope

1.1 This International Standard specifies a method for determining the flexural properties of fibre-reinforced plastic composites under three-point (Method A) and four-point (Method B) loading. Standard test specimens are defined but parameters included for alternative specimen sizes for use where appropriate. A range of test speeds is included.

1.2 The method is not suitable for the determination of design parameters, but may be used for screening materials, or as a quality-control test.

NOTE – For example, the flexural modulus is only an appropriate value of the tensile Young's modulus of elasticity as the test is not for the additional deflection due to the shear stress which leads to a lower value of the flexural modulus but uses test span/specimen thickness ratios that minimise this effect. Differences between tensile and flexural properties are also caused by the material structure/lay-up.

1.3 The method is suitable for fibre-reinforced thermoplastic and thermosetting plastic composites.

Unreinforced and particle-filled plastics and plastics reinforced with short (i.e. less than 1 mm length) fibres are covered by ISO 178.

1.4 The method is performed using specimens which may be moulded to the chosen dimensions, machined from the central portion of the standard multi-purpose test specimen (see ISO 3167) or machined from semi-finished or finished products such as mouldings or laminates.

1.5 The method specifies preferred dimensions for the specimen. Tests which are carried out on specimens of other dimensions, or on specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the speed of testing and the conditioning of the specimens can influence the results. For materials which are not homogeneous through the section, or above the linear-elastic response region, the result applies only to the thickness and structure tested. Consequently, when comparative data are required, these factors must be carefully controlled and recorded.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possiblitiy of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 178	1993	*Plastics - Determination of flexural properties.*
ISO 291	1997	*Plastics - Standard atmospheres for conditioning and testing.*
ISO 293	1986	*Plastics - Compression moulding test specimens of thermoplastic materials.*
ISO 294-1	1996	*Plastics - Injection moulding of test specimens of thermoplastic materials - Part 1: General principles, and moulding of multipurpose and bar test specimens.*
ISO 295	1991	*Plastics - Compression moulding of test specimens of thermosetting materials.*
ISO 1268	1974	*Plastics - Preparation of glass fibre reinforced, resin bonded, low-pressure laminated plates or panels for test purposes* (under revision).
ISO 2602	1980	*Statistical interpretation of test results - Estimation of the mean - Confidence interval.*
ISO 2818	1994	*Plastics - Preparation of test specimens by machining.*
ISO 3167	1993	*Plastics - Multipurpose test specimens.*
ISO 5893	1993	*Rubber and plastics test equipment - Tensile, flexural and compression types (constant rate of traverse) - Description.*

3 Principle

The test specimen, supported as a beam, is deflected at a constant rate until the specimen fractures or until the deformation reaches some pre-determined value. During this procedure, the force applied to the specimen and the deflection are measured.

The method is used to investigate the flexural behaviour of the test specimens and for determining the flexural strength, flexural modulus and other aspects of the flexural stress/strain relationship under the conditions defined. It applies to a freely supported beam, loaded in three- or four-point flexure. The test geometry is chosen to limit shear deformation and to avoid an interlaminar shear failure.

NOTE – The four-point loading geometry provides a constant bending moment between the central loading members. The compressive contact stresses due to the two central loading members are lower in comparison with the stresses induced under the single loading member of the three-point test. The four-point geometry is chosen so that the centre span equals one-third of the outer span. The distance between the outer support points is the same as in the equivalent three-point loading case, therefore the same specimen can be used.

4 Definitions

For the purpose of this International Standard, the following definitions apply:

4.1 speed of testing, v

The rate of relative movement between the supports and the loading member(s), expressed in millimetres per minute (mm/min).

4.2 flexural stress, σ_f

The nominal stress in the outer surface of the test specimen at mid-span. It is calculated according to the relationship given in clause 10, equation (3) or (8), and is expressed in megapascals (MPa).

4.3 flexural stress at break (rupture), σ_{fB}

The flexural stress at break (or rupture) of the test specimen (see figure 1, curves A and B). It is expressed in megapascals (MPa).

4.4 flexural strength, σ_{fM}

The flexural stress sustained by the test specimen at the maximum load (see figure 1) for acceptable failure modes (see subclause 9.9 and figure 6). It is expressed in megapascals (MPa).

4.5 deflection, s

The distance through which the top or bottom surface of the test specimen at mid-span has deflected during flexure from its original position. It is expressed in millimetres (mm).

4.6 deflection at break, s_B

The deflection at break of the test specimen (see figure 1, curves A and B). It is expressed in millimetres (mm).

4.7 deflection at flexural strength, s_M

The deflection at the load equal to the flexural strength (4.4) (see figure 1, curves A and B). It is expressed in millimetres (mm).

4.8 flexural strain, ε_f

The nominal fractional change in length of an element in the outer surface of the test specimen at mid-span. It is used for calculating the flexural modulus (4.9) and is expressed as a dimensionless ratio.