SLOVENSKI STANDARD
SIST EN ISO 10618:2004

01-oktober-2004

Nadomeġļ a:
SIST EN ISO 10618:2000

Ogljikova vlakna - Ugotavljanje nateznih lastnosti s smolo impregniranih prej (ISO 10618:2004)

Carbon fibre - Determination of tensile properties of resin-impregnated yarn (ISO 10618:2004)

Kohlenstofffasern - Bestimmung des Zugverhaltens von harzimprägnierten Garnen (ISO 10618:2004)

Fibres de carbone - Détermination des propriétés en traction sur fils imprégnés de résine (ISO 10618:2004)

Ta slovenski standard je istoveten z: **EN ISO 10618:2004**

ICS:

59.100.20	Ogljikovi materiali	Carbon materials

SIST EN ISO 10618:2004 **en,fr,de**

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EN ISO 10618

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ICS 59.100.20

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English version

Carbon fibre - Determination of tensile properties of resin-impregnated yarn (ISO 10618:2004)

Fibres de carbone - Détermination des propriétés en traction sur fils imprégnés de résine (ISO 10618:2004)

Kohlenstofffasern - Bestimmung des Zugverhaltens von harzimprägnierten Garnen (ISO 10618:2004)

This European Standard was approved by CEN on 14 August 2004.

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Foreword

This document (EN ISO 10618:2004) 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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

This document supersedes EN ISO 10618:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 10618:2004 has been approved by CEN as EN ISO 10618:2004 without any modifications.

INTERNATIONAL STANDARD

ISO 10618

Second edition
2004-08-15

Carbon fibre — Determination of tensile properties of resin-impregnated yarn

Fibres de carbone — Détermination des propriétés en traction sur fils imprégnés de résine

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 10618 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This second edition cancels and replaces the first edition (ISO 10618:1999), which has been technically revised.

Carbon fibre — Determination of tensile properties of resin-impregnated yarn

1 Scope

This International Standard specifies a method of test for the determination of the tensile strength, tensile modulus of elasticity and strain at maximum load of a resin-impregnated yarn specimen. The method is applicable to yarns (continuous and staple-fibre yarns) of carbon fibre for use as reinforcements in composite materials.

2 Normative references

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.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 1889, *Reinforcement yarns — Determination of linear density*

ISO 10119, *Carbon fibre — Determination of density*

ISO 10548, *Carbon fibre — Determination of size content*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 527-1 and the following apply.

3.1
cross-sectional area of carbon-fibre yarn
A_f
the linear density of the yarn divided by the density of the carbon fibre

NOTE It is expressed in square millimetres.

4 Symbols

The symbols used in this International Standard are as follows:

σ_f tensile strength, in megapascals;

F_f maximum tensile force, in newtons;

A_f cross-sectional area of yarn, in square millimetres;

ρ_f density of yarn, in grams per cubic centimetre;

T_{tf} linear density of yarn, in tex;

T_{ti} linear density of impregnated yarn, in tex;

E_f tensile modulus of elasticity, in gigapascals;

L_0 gauge length of extensometer, in millimetres;

ΔL variation in the length, in millimetres, corresponding to the variation in the force, in newtons;

ΔF variation in the force, in newtons, corresponding to the variation in the length, in millimetres.

5 Principle

A sample of yarn is uniformly impregnated with resin, then cured to provide test specimens. The specimens are loaded in tension at a constant speed by a suitable mechanical testing machine until failure.

The tensile strength, the tensile modulus of elasticity and the strain at maximum load are calculated from the force-extension relationship.

The tensile modulus is determined by dividing the variation in the stress by the corresponding variation in the strain between two defined points. For carbon-fibre yarns, the relation between stress and strain is not linear, hence a chord modulus must be defined. In method A, the modulus is defined between two strain levels and in method B it is defined between two load levels. The linear density and the size content have to be determined independently.

NOTE The precision of the values obtained is believed to be approximately the same for method A and for method B. However, for the generally non-linear stress-strain response common to carbon fibres, the mean modulus values from these two methods will be somewhat different and not necessarily statistically comparable. Method B, or other methods, may be used in the purchase specification or for quality assurance by agreement between customer and supplier.

6 Apparatus and materials

6.1 Resin

The impregnating resin shall be compatible with the yarn and its size. The viscosity of the resin or resin solution shall be such that sufficient resin pick-up is achieved to ensure uniform impregnation. The strain at failure of the cured resin shall be at least twice that of the fibre, preferably three times. In this respect, heat-curable epoxy-resin systems with a viscosity during impregnation of preferably less than 1 000 mPa·s are suitable (see Annex A for example) as is any formulation capable of giving test specimens that fulfill the requirements of this International Standard. The resin formulation, however, shall be specified in detail and shall be agreed upon between the fibre manufacturer and the user.

6.2 Impregnation apparatus

Test specimens can be prepared by any method which produces a uniformly impregnated, smooth specimen.

These methods include both single- and multiple-specimen preparation techniques. A multiple-specimen impregnation apparatus may consist of:

6.2.1 A holder for the sample yarn bobbin, with yarn-tensioning devices.

6.2.2 An impregnation bath, with temperature-control devices and impregnation rollers or yarn-tensioning bars.

6.2.3 A unit to remove excess resin from the impregnated yarn by passing it over rollers covered with fabric, paper or felt and/or through a die.

6.2.4 A frame to wind up the impregnated yarn, preferably made of wood or metal coated with rubber.

Examples of impregnation apparatus are given in Annex B.

6.3 Curing oven with temperature control

A fan circulation oven is preferable to ensure uniform curing of the resin.

6.4 Tensile-testing machine

6.4.1 Use a tensile-testing machine with a constant crosshead speed, equipped with force- and extension-recording devices. The accuracy of the force indication shall be better than 1 % of the recorded value. The specimen-gripping system shall ensure that the test specimen is aligned with the axis of the test machine.

6.4.2 The tensile-testing machine shall include an extensometer linked to a continuous-recording device which automatically records the extension within the gauge length of the extensometer as a function of the force on the test specimen. The extensometer should be sufficiently light to induce only negligible stresses in the test specimen.

The gauge length of the extensometer shall be at least 50 mm but preferably 100 mm. The gauge length shall be determined with a tolerance of ± 1 %.

The extensometer shall have a tolerance on deviation from linearity of not more than 0,1 % over the required extension-measurement range.

Examples of suitable extensometers are given in Annex D. Other strain-measuring instruments, such as optical or laser instruments, may be used, if suitable.

6.5 Balance

Use a balance readable to 0,1 g to weigh the test specimens to determine the linear density of the impregnated yarn.

6.6 Ruler

Use a graduated ruler or other measuring device at least 500 mm long and accurate to ± 1 mm.

7 Test specimens

7.1 Number of test specimens

Prepare sufficient test specimens to enable four determinations to be made. If any of the specimens fails within the grips or at the tabs, or because of damage caused by the extensometer, discard the result and carry out a repeat determination on a fresh test specimen.

7.2 Length of test specimens

For test specimens with tabs, the length of the test specimen between the tabs shall be either (150 ± 5) mm or (200 ± 5) mm. For test specimens without tabs, the total length of the test specimen shall be (250 ± 5) mm or (300 ± 5) mm (at least the extensometer gauge length plus twice the grip length).