Fibre-reinforced plastic composites - Determination of the inplane shear modulus by the plate twist method

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 15310:2005 sisaldab Euroopa standardi EN ISO 15310:2005 ingliskeelset teksti. Käesolev dokument on jõustatud 29.09.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN ISO 15310:2005 consists of the English text of the European standard EN ISO 15310:2005. This document is endorsed on 29.09.2005 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This International Standard specifies a method for determining the in-plane shear modulus (G12) of fibrereinforced plastic composites using a standard plate specimen. When applied to isotropic materials, the shear modulus measured is independent of direction.	**Scope:** This International Standard specifies a method for determining the in-plane shear modulus (G12) of fibrereinforced plastic composites using a standard plate specimen. When applied to isotropic materials, the shear modulus measured is independent of direction.

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English Version

Fibre-reinforced plastic composites - Determination of the in-plane shear modulus by the plate twist method (ISO 15310:1999)

Composites plastiques renforcés de fibres - Détermination du module de cisaillement dans le plan par la méthode de torsion de plaque (ISO 15310:1999)

Faserverstärkte Kunststoffe - Bestimmung des Schermoduls nach dem Verfahren der drehbaren Platte (ISO 15310:1999)

This European Standard was approved by CEN on 7 July 2005.

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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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Foreword

The text of ISO 15310:1999 has been prepared by Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 15310:2005 by 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 January 2006, and conflicting national standards shall be withdrawn at the latest by January 2006.

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Endorsement notice

The text of ISO 15310:1999 has been approved by CEN as EN ISO 15310:2005 without any modifications.

INTERNATIONAL STANDARD

ISO 15310

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Fibre-reinforced plastic composites — Determination of the in-plane shear modulus by the plate twist method

Composites plastiques renforcés de fibres — Détermination du module de cisaillement dans le plan par la méthode de torsion de plaque

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15310 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

Annex A of this International Standard is for information only.

Fibre-reinforced plastic composites — Determination of the in-plane shear modulus by the plate twist method

1 Scope

1.1 This International Standard specifies a method for determining the in-plane shear modulus (G_{12}) of fibre-reinforced plastic composites using a standard plate specimen. When applied to isotropic materials, the shear modulus measured is independent of direction.

1.2 The method is used to determine the shear modulus of the test specimens but not to determine the shear strength. It applies to a plate supported on two points on one diagonal and loaded on the other diagonal by the simultaneous movement of two loading points attached to a cross-beam.

1.3 The method is suitable for use with fibre-reinforced plastic composites with both thermoset and thermoplastic matrices.

Due to the shear deformation being applied under flexural conditions, for laminated materials with different fibre formats and/or different orientations, the layers of material must be well distributed across the section so that it is approximately “homogeneous” in the through-thickness direction.

The principal material axes, if present, must be orientated normal to the plate edges (see 3.8).

NOTE This method can be applied to unreinforced polymers and other materials (e.g. metals, ceramics and metal- or ceramic-matrix composites).

For material fabricated using unidirectional plies, the shear modulus obtained using a multidirectional specimen (i.e. 0°/90°/$\pm$45°) is not the same as that obtained for unidirectional or cross-ply (0°/90°) material.

1.4 The method is performed using specimens which may be moulded to the chosen dimensions, machined from test plates or machined from flat areas of products.

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. Consequently, when comparative data are required, these factors must be carefully controlled and recorded.

NOTE The stress-strain response in shear is very non-linear at higher strain levels. This test method determines the modulus within a low strain region and is not applicable to higher strains.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 1268:1974[1)], *Plastics — Preparation of glass fibre reinforced, resin bonded, low-pressure laminated plates or panels for test purposes.*

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 5893:1993, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Description.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1
plate deflection
w
the distance over which the loading points move relative to the support points (see Figure 2), expressed in mm

NOTE The plate deflection is normally taken from the movement of the rigid cross-beam carrying the two loading points.

3.2
modulus of elasticity in shear
in-plane shear modulus
G_{12}
<isotropic materials> the shear modulus, expressed in GPa, in a direction other than that of the reinforcement, measured between plate deflections of 0,1h and 0,3h, where h is the plate thickness (see 3.7)

3.3
speed of testing
the rate of movement of the loading points relative to the support points, expressed in mm/min

3.4
span
S
the mean of the distance S_1 between the two support points and the distance S_2 between the two loading points (see Figure 3), expressed in mm

3.5
diagonal length
D
the distance between diametrically opposite corners of the plate, expressed in mm

It is calculated as follows:

$$D = \left(a'^2 + a''^2\right)^{\frac{1}{2}}$$

1) ISO 1268:1974 is under revision in nine parts covering a wide range of composite materials and fabrication processes (e.g. RTM, SMC, filament winding).