SLOVENSKI STANDARD
kSIST FprEN 6031:2014

01-maj-2014

Aeronavtika - Z vlakni ojačeni polimerni materiali - Preskusna metoda - Ugotavljanje nateznih lastnosti (natezni preskus pri ±45°)

Aerospace series - Fibre reinforced plastics - Test method - Determination of in-plane shear properties (± 45° tensile test)

Luft- und Raumfahrt - Faserverstirkte Kunststoffe - Prüfverfahren - Bestimmung der Schubeigenschaften (± 45° Zugversuch)

Série aérospatiale - Matières plastiques renforcées de fibres - Méthode d'essai - Détermination des propriétés en cisaillement plan (traction il ± 45°)

Ta slovenski standard je istoveten z: **FprEN 6031**

ICS:

49.025.40	Guma in polimerni materiali	Rubber and plastics
83.120	Ojačani polimeri	Reinforced plastics

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EUROPEAN STANDARD

NORME EUROPÉENNE

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FINAL DRAFT
FprEN 6031

March 2014

ICS

English Version

Aerospace series - Fibre reinforced plastics - Test method - Determination of in-plane shear properties (± 45° tensile test)

Série aérospatiale - Matières plastiques renforcées de fibres - Méthode d'essai - Détermination des propriétés en cisaillement plan (traction il ± 45°)

Luft- und Raumfahrt - Faserverstirkte Kunststoffe - Prüfverfahren - Bestimmung der Schubeigenschaften (± 45° Zugversuch)

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Foreword

This document (FprEN 6031:2014) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This document is currently submitted to the Formal Vote.

1 Scope

This European Standard specifies the procedure for the determination of the in-plane shear strength and modulus of fibre composites. The procedure is based on the uni-axial tensile stress-strain response of a ± 45° laminate which is symmetrically laminated about the mid-plane.

This standard is applicable to composite laminates manufactured from unidirectional tape or woven fabric reinforcement.

This standard does not give any directions necessary to meet the health and safety requirements. It is the responsibility of the user of this standard to consult and establish appropriate health and safety precautions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2374, *Aerospace series — Glass fibre reinforced mouldings and sandwich composites — Production of test panels*

EN 2489, *Aerospace series — Fibre reinforced plastics — Determination of the action of test fluids*

EN 2565, *Aerospace series — Preparation of carbon fibre reinforced resin panels for test purposes* [1)]

EN 2743, *Aerospace series — Fibre reinforced plastics — Standard procedures for conditioning prior to testing unaged materials*

EN 2823, *Aerospace series — Fibre reinforced plastics — Test method for the determination of the effect of exposure to humid atmosphere on physical and mechanical characteristics* [1)]

3 Terms and definitions

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

3.1
tensil stress at a given moment during the test
longitudinal tensile load experienced by the test specimen at a particular moment during the test, divided by the initial unit cross sectional area within the gauge length

3.2
shear stress at a given moment during the test
the shear stress is defined as the in-plane shear stress with its principal direction under ± 45° with the direction in which the tension load is applied, and its magnitude is half of the tensile stress

3.3
shear strength
the shear strength is the maximum occurring shear stress during the test. For calculation see 9.1.

1) Published as ASD-STAN Prestandard at the date of publication of this standard. http://www.asd-stan.org/

3.4
tensile strain
variation in the longitudinal or transverse distance between points within the test specimen gauge length, produced by a tensile load and expressed with respect to the initial distance between the points (ε_0 is the longitudinal strain, its value is positive; ε_{90} is the transverse strain of a tensile specimen, its value is negative)

3.5
shear modulus
slope of the straight line in a shear stress/strain diagram through the points corresponding with two longitudinal strain limits. Unless otherwise defined these longitudinal strains are $(\varepsilon_0)_1 = 500 \times 10^{-6}$ and $(\varepsilon_0)_2 = 2\,500 \times 10^{-6}$ (see Figure 3). For calculation see 9.2.

4 Principle of the method

Through the use of relations derived from laminated plate theory, expressions are presented which allow the in-plane 0° shear stress-strain curve to be generated from a uniaxial tension test of a ± 45° laminate. Experimental test data from a tensile test are used for generating the shear strength and modulus.

5 Designation of the method

The designation of the used method shall be drawn up according to the following example.

Description block	**Identity block**
Fibre reinforced plastics, determination of in-plane shear properties (± 45° tensile test)	**EN6031**

Number of this standard

6 Apparatus

6.1 Tensile testing machine, accurate to within 1 %, in the load range used.

6.2 Flat face micrometer accurate to the nearest 0,01 mm.

6.3 Vernier caliper accurate to the nearest 0,1 mm.

6.4 This procedure requires load strain data in both the longitudinal and transverse directions. This is accomplished by instrumenting the specimen with longitudinal and transverse strain gauges (5 mm to 10 mm gauge length). The gauges, surface preparation, and bonding agents should be chosen to provide for optimal performance on the subject material, and suitable automatic strain recording equipment shall be employed.

If available, a bi-directional extensometer or a combination of longitudinal and a transverse extensometer can be used. The extensometers shall be accurate to within 1 % in the applied load range.

6.5 Temperature measuring equipment accurate to ± 0,2 °C at the applied test temperature.

6.6 Vacuum bag sealant material.

6.7 Timer/clock.

7 Test specimen

7.1 Test specimen description

The test specimen can consist of either unidirectional tape or woven fabric. Eight plies oriented at + 45° and – 45° to the longitudinal axis are applied: (+ 45, – 45, + 45, – 45) s. To avoid distortions and induced bending the lay-up shall be fully symmetrical.

See Figure 1 for dimensions and tolerances of test specimen.

7.2 Test specimen preparation

The specimens are cut out of plates. The coefficient of variation in thickness measurements shall be smaller than 2 % per plate.

The lay-up shall be alternatively at + 45° and – 45° and symmetrical (see 7.1). The accuracy of the orientation of the fibres shall be within ± 2,5°.

Carbon plates shall be produced according to EN 2565, glass plates in accordance with EN 2374. The process parameters such as bleeders, curing temperature and time, etc. shall be in accordance with the applicable technical specification.

All the specimens shall have a ± 45° lay-up with respect to the specimen axis. Precautions shall be taken to avoid notches, undercuts, rough or uneven surfaces after machining.

7.3 Strain gauges

If strain gauges (see 6.4) are applied for modulus determination, they shall be attached at the centre of the specimen in the longitudinal (0°) and in the transverse (90°) direction.

7.4 Tabs

The specimen shall have tabs (see Figure 1), either by using precured tabs made by two plies of fabric (lay-up ± 45°) or by co-bonding using a suitable prepreg system. The precured tabs shall be bonded on both specimen faces with an adhesive system that will meet the temperature and ageing requirements. Care should be taken that the (co-)bonding temperature does not add any undesired post cure effect to the laminate.

7.5 Number of test specimens

Five specimens shall be tested per test condition, except when otherwise specified in the applicable technical specification. If tests are carried out after ageing or at a temperature different from room temperature, care should be taken to assure that room temperature/dry reference specimens which have been machined from the same plate as the specimen under investigation are also tested.

7.6 Ageing of specimen

In case of tests after immersion, the conditioning shall be according to EN 2489.

In case of tests after exposure to humid atmosphere, the conditioning shall be according to EN 2823.