SLOVENSKI STANDARD
SIST EN 6036:2016

01-februar-2016

Aeronavtika - Z vlakni ojačeni polimerni materiali - Preskusna metoda - Ugotavljanje natezne trdnosti rezanih, nerezanih in zapolnjenih vzorcev

Aerospace series - Fibre reinforced plastics - Test method - Determination of notched, unnotched and filled hole compression strength

Luft- und Raumfahrt - Faserverstärkte Kunststoffe - Prüfverfahren - Bestimmung der Kerbdruckfestigkeit an gekerbten, ungekerbten und gebolzten Probekörpern

Série aérospatiale - Matières plastiques renforcées de fibres - Méthode d'essai - Détermination de la résistance en compression trouée, lisse et trouée habitée

Ta slovenski standard je istoveten z: **EN 6036:2015**

ICS:

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

SIST EN 6036:2016 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 6036

November 2015

ICS 49.025.40

English Version

Aerospace series - Fibre reinforced plastics - Test method - Determination of notched, unnotched and filled hole compression strength

Série aérospatiale - Matières plastiques renforcées de fibres - Méthode d'essai - Détermination de la résistance en compression trouée, lisse et trouée habitée

Luft- und Raumfahrt - Faserverstärkte Kunststoffe - Prüfverfahren - Bestimmung der Kerbdruckfestigkeit an gekerbten, ungekerbten und gebolzten Probekörpern

This European Standard was approved by CEN on 10 August 2013.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN 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 CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 6036:2015 E

Contents

Page

European foreword

This document (EN 6036:2015) 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 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 May 2016, and conflicting national standards shall be withdrawn at the latest by May 2016.

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

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

1 Scope

This standard defines a method to be used to determine the compression strength of notched, unnotched and filled hole fibre reinforced plastics.

It is applicable to composite laminates with unidirectional layers or woven fabric reinforcement.

This standard does not give any direction necessary to meet 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
notched tensile strength
maximum compression load experienced by the notched test specimen divided by the initial cross sectional area within the gauge length

3.2
unnotched tensile strength
maximum compression load experienced by the unnotched test specimen divided by the initial cross sectional area within the gauge length

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

3.3
filled hole compression strength
maximum compression load experienced by the filled hole test specimen divided by the initial gross cross sectional area within the gauge length

3.4
K_{T1} **value**
unnotched compression strength divided by the filled hole compression strength

3.5
K_{T2} **value**
unnotched compression strength divided by the notched compression strength

4 Principle of the method

A compression test on unnotched specimen is carried out in order to determine the original material strength. The same test is performed either on notched or a filled hole specimen to determine the residual strength.

5 Designation of the method

The designation of the method used shall be in accordance with the following example:

Description block | **Identity block**

TEST METHOD **EN6036 II A**

Number of this standard

Specimen type II (see Figures 1 to 3)

Laminate configuration A (see Table 1)

NOTE If necessary, the code I9005 may be placed between the description block and the identity block.

6 Apparatus

6.1 Compression test machine accurate to within 1 % equipped with facilities to record maximum load and fitted with suitable grips or used with compression jig featuring a grip and movement alignment system.

6.2 Chamber adapted to the machine to carry out tests at temperature. The temperature shall be maintained within ± 3 °C.

6.3 Timer.

6.4 Thermocouple with recorder to monitor temperature for tests at other than ambient.

6.5 Flat faced micrometre with 6 mm diameter faces, accurate to 0,01 mm.

6.6 Vernier calliper accurate to the nearest 0,1 mm.

7 Test specimen

7.1 Specimen description

For the description, dimensions and tolerances, see Figure 1 for notched type specimen, Figure 2 for unnotched type specimen and Figure 3 for filled hole type specimen. The laminate configuration for the fibre directions are defined in Table 1.

7.2 Test specimen preparation

The specimens are cut out from laminates. The coefficient of variation in the thickness measurements shall be smaller than 2 % per laminate. The laminates shall be produced according to EN 2565 for carbon and in accordance with EN 2374 for glass.

Special precautions have to be taken to ensure that no delamination occur during machining especially for the drilling of the notched and filled hole test specimens.

The laminate should be inspected for example by C-Scan to establish that the laminate is worth testing. If the NDT reveals unacceptable defects, limits defined in the specification invoking the test, the laminate should not be tested. The process parameters shall be in line with the specification invoking the test.

7.3 Tabs

The tests may be performed without the specimen being tabbed. However, if tabs are used they shall be strain compatible with the composite being tested either, by using precured tabs of 2 plies of fabric, lay-up (+45,–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 to avoid the bonding temperature to add any undesired post cure effect to the laminate.

7.4 Number of specimens

Five specimens shall be tested per test condition, except when otherwise specified in the 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 had been machined from the same plate as the specimens under investigation are also tested.

7.5 Ageing

In case of tests after immersion, the conditions shall be according to EN 2489. For tests after exposure to humid atmosphere, the conditioning shall be in accordance with EN 2823.

8 Procedure

8.1 Conditioning

The storage and testing of as received specimens shall be carried out at (23 ± 2) °C, (50 ± 5) % relative humidity in accordance with EN 2743. Aged specimens shall be tested within a maximum of 8 h after removal from the exposure environment.

8.2 Determination of dimensions

Measure and record the thickness and width at three points in the gauge length of the specimen before ageing and again before mechanical testing. Use the micrometre (see 6.5) for the thickness and the vernier calliper (see 6.6) for the width. Average the three measurements.

8.3 Test at ambient temperature

Place the specimen in the jaws, ensuring that it is aligned within 1° and centred on the machine axis.

NOTE The jaws shall fully cover the tabs if used.

Select the load range such that failure occurs between 20 % and 80 % of full scale.

Compression load shall be applied at a constant cross head speed of 0,5 mm/min.

Record the maximum load *Pr*.

8.4 Test at temperature other than ambient

Apply a thermocouple (see 6.4) on the composite material as close as possible to the centre of the specimen and seal the thermocouple from the surrounding air by using vacuum bag sealant.

After a dry specimen has reached a temperature of 2 °C below the required elevated temperature or 2 °C above the required sub-zero temperature, the specimen shall be maintained at the required condition for five minutes prior to testing.

The above time for aged specimen is 1 min.

The heat up/soak cycle used shall be given in the test report.

For specimens that have been subjected to fluid immersion, apply EN 2489.

For specimens that have undergone humidity ageing, apply EN 2823.

Follow the same procedure as for the test at ambient temperature.

9 Presentation of the results

9.1 Tensile strength σ_c

For notched specimens

$$\sigma_{cn} = \frac{\text{Pr}}{t \times w}$$

For filled hole specimens

$$\sigma_{cf} = \frac{\text{Pr}}{t \times w}$$