SLOVENSKI STANDARD
SIST EN 2850:2018

01-februar-2018

Aeronavtika - Laminati iz termično utrjenih smol z enosmerno urejenimi ogljikovimi vlakni - Preskus s stiskanjem v smeri, vzporedni z vlakni

Aerospace series - Carbon fibre thermosetting resin unidirectional laminates - Compression test parallel to fibre direction

Luft- und Raumfahrt - Duroplast Verbundwerkstoffe - Unidirektionale Kohlenstoffaser - Druckversuch parallel zur Faserrichtung

Série aérospatiale - Fibres de carbone/résine thermodurcissable - Stratifiés unidirectionnels - Essai de compression parallèlement au sens des fibres

Ta slovenski standard je istoveten z: **EN 2850:2017**

ICS:

49.025.40 Guma in polimerni materiali Rubber and plastics

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EUROPEAN STANDARD

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EN 2850

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English Version

Aerospace series - Carbon fibre thermosetting resin - Unidirectional laminates - Compression test parallel to fibre direction

Série aérospatiale - Fibres de carbone/résine thermodurcissable - Stratifiés unidirectionnels - Essai de compression parallèlement au sens des fibres

Luft- und Raumfahrt - Unidirektionale Laminate aus Kohlenstoffasern und Reaktionsharz - Druckversuch parallel zur Faserrichtung

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

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European foreword

This document (EN 2850:2017) 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of an identical text or by endorsement, at the latest by April 2018, and conflicting national standards shall be withdrawn at the latest by April 2018.

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1 Scope

This European Standard defines a method for the determination of stress at failure and Young's modulus in compression of carbon thermosetting resin unidirectional laminates.

The method only covers test pieces the axis of which is parallel to the fibre direction.

This method covers fibres (or fabrics) other than carbon, when the relevant technical specification explicitly mentions it.

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 2372 [1], *Nuts, hexagon, thin, steel, cadmium plated — Classification: 1 100 MPa/235 °C — Aerospace series* [2]

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* [3]

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

EN 2744, *Aerospace series — Non-metallic materials — Preferred test temperatures*

EN 2823, *Aerospace series — Fibre reinforced plastics — Determination of the effect of exposure to humid atmosphere on physical and mechanical characteristics* [3]

EN 2859, Aerospace series — *Bolts, normal hexagonal head, close tolerance normal shank, short thread, in alloy steel, cadmium plated, metric series — Classification: 1 100 MPa (at ambient temperature) / 235 °C*

EN 3228, *Aerospace series — Nuts, hexagonal, plain, reduced height, normal across flats, in steel, cadmium plated — Classification: 900 MPa (at ambient temperature) / 235 °C*

EN 3783, *Aerospace series — Fibre composite materials — Normalisation of fibre dominated mechanical properties*

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1) Inactive for new design, see prEN 3228.

2) Published as ASD-STAN Standard at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (www.asd-stan.org)

3) Published as ASD-STAN Prestandard at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (www.asd-stan.org)

3 Principle of the method

The method consists in recording and measuring the longitudinal strain of the material as a function of the applied load during a compression test carried out at a constant rate until failure.

The load applied to the material may be introduced in two different ways:

— either mainly in shear through co-cured or bonded tabs (Method A);

— or exclusively in compression by direct end loading of the test piece (Method B).

It is important to note that the test results obtained using different test pieces are not comparable.

4 Terms and definitions

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

4.1
compression stress at any point in time during the test (σ_c)
compression load per initial unit cross-sectional area in the gauge length sustained by the test piece at any point in time during the test

4.2
compression stress at failure (σ_{c11})
compression stress at the moment of failure

Note 1 to entry: It is calculated using the formula given in 10.1.

4.3
strain (ε_{11})
change in the distance between reference points within the gauge length of the test piece produced by a compression load expressed in relation to the original distance between these points

Note 1 to entry: ε_{11} is the strain measured parallel to the fibre axis.

4.4
secant compression modulus
two methods of calculation are possible

Note 1 to entry: The one based on strain shall be preferred.

Note 2 to entry: Otherwise, the one based on the forces shall be used.

4.5
secant compression modulus [E_{c11} (α, β)]
slope of the straight line passing through the stress/longitudinal strain diagram at a point corresponding to α % strain with respect to the gauge length of the test piece and a point corresponding to β % strain on the same diagram

Note 1 to entry: α and β are defined in the material standard.

Note 2 to entry: In the absence of a material standard, α = 0,1 % and β = 0,5 % shall be chosen.

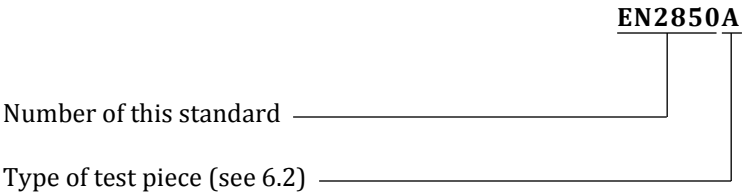
Note 3 to entry: It is calculated using the formula in 10.2.1.

4.6
secant compression modulus [E_{c11} (P_R/10, P_R/2)]
slope of the straight line passing through the stress/longitudinal strain diagram at a point corresponding to a stress calculated from P_R/10, and a point corresponding to a stress calculated from P_R/2, where P_R is the load at failure of the test piece

Note 1 to entry: It is calculated using the formula in 10.2.2.

5 Designation

Designation of the method shall be in accordance with the following example:



6 Test pieces

6.1 Preparation of test panels

Test panels shall be prepared according to EN 2565.

Manufacturing parameters, such as environmental products, curing cycle, etc. shall comply with the applicable technical specification.

6.2 Shape and dimension

Two types of test pieces are given:

— Type A (see example in Annex A);

— Type B (see example in Annex B).

Alternatives to type A are possible if they satisfy the following requirements:

— Gauge length g = (10 ± 0,25) mm;

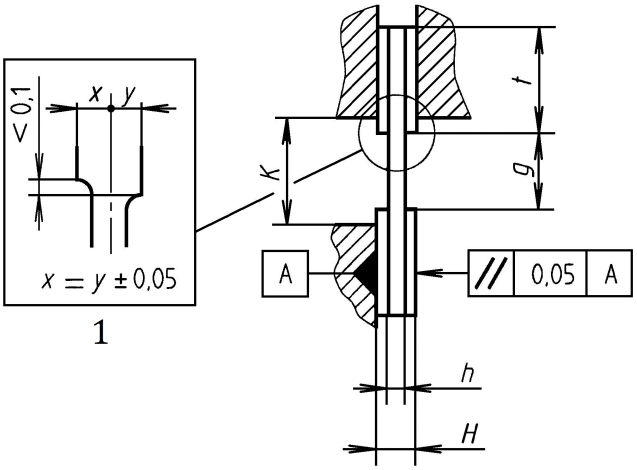
— Thickness h = (2 ± 0,2) mm;

— Total thickness H = (4,5 ± 0,5) mm;

— Width b = (10 ± 0, 2) mm;

— Tab length t = ≥ 50 mm;

— Distance between grips K = (13 ± 0,1) mm.



Key

1 Detail of the encircled area

Figure 1

Angle of misalignment of the fibres with respect to the compression loading axis shall be less than ± 0,5°.

6.3 Tabs

6.3.1 Bonded tabs

In the case of bonded tabs, a check shall be made that the temperature of the bonding cycle does not induce any undesirable post-curing effect in the laminate.

The material forming the tabs shall preferably be the same as that of the test pieces. It is preferable to form the tabs in a co-curing operation when testing at high temperature and/or after humidity ageing.

6.3.2 Integral tabs

The test piece is made up of n plies at 0° at its center and of m plies at ± 45° each side of the plies at 0°.

n is such that *n* plies are 2,25 mm to 2,5 mm thick.

m is such that (*n* + 2 *m*) plies are 4 mm to 5 mm thick.

The integral tabs are machined to provide the gauge length of the test piece (see Annex A - Test pieces A_2/A_4).

NOTE Where the grips slip, a ply of dry glass may be added to the surface of the tabs, prior to the curing of the panel.

6.4 Number

The number of test pieces to be used is defined in the technical specification. If it is not the case, five (5) test pieces shall be used.