SLOVENSKI STANDARD
SIST EN 3783:2014

01-marec-2014

Aeronavtika - Kompozitni materiali z vlakni - Standardizacija mehanskih lastnosti materialov z večinskim deležem vlaken

Aerospace series - Fibre composite materials - Normalisation of fibre dominated mechanical properties

Luft- und Raumfahrt - Faserverbundwerkstoffe - Normierung von faserabhängigen mechanischen Eigenschaften

Série aérospatiale - Matériaux composites à base de fibres - Standardisation des caractéristiques mécaniques liées aux fibres

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49.025.40 Guma in polimerni materiali Rubber and plastics

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Aerospace series - Fibre composite materials - Normalisation of fibre dominated mechanical properties

Série aérospatiale - Matériaux composites à base de fibres - Standardisation des caractéristiques mécaniques liées aux fibres

Luft- und Raumfahrt - Faserverbundwerkstoffe - Normierung von faserabhängigen mechanischen Eigenschaften

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

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Foreword

This document (EN 3783:2013) 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of an identical text or by endorsement, at the latest by February 2014, and conflicting national standards shall be withdrawn at the latest by February 2014.

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1 Scope and field of application

This standard describes the procedure for normalisation of fibre dominated mechanical properties. The procedure is valid for carbon, glass and aramid reinforced laminates.

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 2329, *Aerospace series — Textile glass fibre preimpregnates — Test method for the determination of mass per unit area*

EN 2557, *Aerospace series — Carbon fibre preimpregnates — Determination of mass per unit area*

EN 2564, *Aerospace series — Carbon fibre laminates — Determination of the fibre-, resin- and void contents*

3 Principle

When presenting mechanical data in which the characteristic is mostly dependent upon the fibre, it is usual to adjust the result to a specific fibre volume.

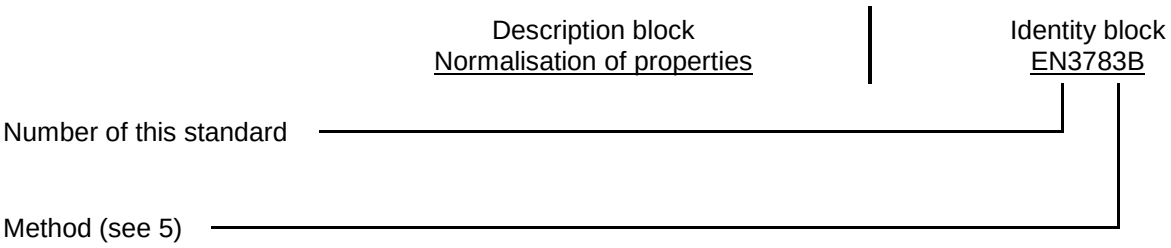
The method consists of the measurement or calculation of the fibre content by volume of the test laminates or specimens.

This fibre content is then used to adjust the results of mechanical tests which depend, in a linear relationship, upon the fibre volume content.

The results are corrected to a predefined nominal content using the rule of mixtures.

4 Designation

EXAMPLE



5 Procedure

5.1 Fibre volume content (V_f) determination

5.1.1 Method A (carbon fibre composite only)

The fibre content (V_f) in % on the test laminate is measured by digestion of representative specimens cut from the same laminate as that used for the mechanical tests to be adjusted.

The method to be used is that defined in EN 2564. The average fibre volume obtained for the laminate is the result to be used for correction (see 5.2).

5.1.2 Method B and C

Measure the thickness (t_1) in mm of the test laminate as an average of 10 uniformly spaced readings using a 6 mm to 8 mm diameter flat faced micrometer. If this thickness is divided by the number of plies used for the laminate, the measured cure ply thickness in mm is obtained (t_p).

5.1.2.1 Method B

Using the product declared nominal cured ply thickness (t_n) as defined in the material specification, the fibre volume (V_f) in % for the laminate is calculated using the equation:

$$V_f = \frac{t_n}{t_p} \cdot V_n \quad (1)$$

Where V_n in % is the nominal fibre volume as defined in the material specification and upon which the nominal cured ply thickness is based.

5.1.2.2 Method C

Because of accepted tolerances in prepreg fibre mass per unit area, a certain inaccuracy in fibre volume estimation will result when using method B above. This variable can be eliminated by using true fibre weight measured on the prepreg sample before laminating.

Measure the fibre mass per unit area (M_f) in g/m^2 of a suitably representative sample of prepreg according to EN 2329 or EN 2557 (as appropriate).

The theoretical cured ply thickness (t_2) in mm can now be calculated by the equation:

$$t_2 = \frac{M_f}{p_f \cdot V_n} \times 10^{-1} \quad (2)$$

Where V_n is as defined in 5.1.2.1 above and p_f is the average fibre density (in g/cm^3) of the batch (or batches) used f_{pr} the material in question.

The laminate fibre volume content is calculated by the equation:

$$V_f = \frac{t_2}{t_p} \cdot V_n \quad (3)$$

or

$$V_f = \frac{M_f \times 10^{-1}}{p_f \cdot t_p} \quad (4)$$

NOTE Methods B and C require that no fibres be displaced in the laminating process owing to lateral movement of fibres during consolidation.

5.2 Correction of results

The characteristics which are to be corrected to a nominal fibre content shall be defined in the material specification.

These characteristics shall be those which are dominated by the reinforcement (such as tensile, flexural or compression strength and modulus).

Unless stated in the technical specification, the proportion of fibres (which dominates the property) shall be greater than 20 % in the test direction.

Where specified, each result is to be corrected by multiplying the value by the factor k:

$$k = \frac{V_n}{V_f} \tag{6}$$

Where V_n in % is the nominal fibre volume as defined in the material specification.

This correction is only valid for fibre volumes close to the nominal, that is to say, according to the following requirement:

$$\frac{V_f - V_n}{V_n} < 0{,}2 \tag{7}$$

Unless otherwise stated in the material specification, the value of V_f obtained by method B is to be used.

6 Test report

The test report shall contain the information required by the appropriate test method. In addition, the following information shall also be included.

6.1 Individual and mean corrected results.

6.2 The method used (A, B or C).

6.3 The laminate fibre volume (V_f).

6.4 The nominal fibre volume (V_n) to which the results have been normalised.