
**Aerospace series - Carbone fibre reinforced plastics - Unidirectional laminates -
Determination of the apparent interlaminar shear strength**

Aerospace series - Carbone fibre reinforced plastics - Unidirectional laminates -
Determination of the apparent interlaminar shear strength

Luft- und Raumfahrt - Kohlenstoffaserverstärkte Kunststoffe - Unidirektionale Laminate -
Bestimmung der scheinbaren interlaminaren Scherfestigkeit

Série aérospatiale - Plastiques renforcés de fibres de carbone - Stratifiés unidirectionnels
- Détermination de la résistance apparente au cisaillement interlaminaire

<https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c->

[b911660cb5cf/sist-en-2563-2001](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

Ta slovenski standard je istoveten z: EN 2563:1997

ICS:

49.025.40 Guma in polimerni materiali Rubber and plastics

SIST EN 2563:2001

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 2563:2001

<https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001>

EUROPEAN STANDARD

EN 2563

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 1997

ICS 49.040.10

Descriptors: aircraft industry, reinforced plastic, carbon fibre, determination, shear strength

English version

**Aerospace series - Carbone fibre reinforced
plastics - Unidirectional laminates - Determination
of the apparent interlaminar shear strength**

Série aérospatiale - Plastiques renforcés de
fibres de carbone - Stratifiés unidirectionnels
- Détermination de la résistance apparente au
cisaillement interlaminaire

Luft- und Raumfahrt - Kohlenstoffaserverstärkte
Kunststoffe - Unidirektionale Lamine -
Bestimmung der scheinbaren interlaminaeren
Scherfestigkeit

(standards.iteh.ai)

SIST EN 2563:2001

<https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001>

This European Standard was approved by CEN on 1996-08-04. 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 Central Secretariat or to any CEN member.

The European Standards exist 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.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Page 2
EN 2563:1997

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries 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 AECMA, 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 July 1997, and conflicting national standards shall be withdrawn at the latest by July 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 2563:2001

[https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

[b911660cb5cf/sist-en-2563-2001](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

STANDARD FOR THE
EVOLUTION OF THE
RESEARCH

STANDARD FOR THE
EVOLUTION OF THE
RESEARCH

1 Scope

This standard specifies the method for the determination of the apparent interlaminar shear strength of carbon fibre reinforced plastics in the form of unidirectional laminates by means of a flexural test.

It is intended for specimens in which the length is parallel to the fibre direction.

This method can equally be applied to carbon fibre reinforced plastics in the form of woven fabrics. In the case of cross-ply laminates comprising layers orientated in different directions, the results obtained by the formula given in 8.1 can only be used to make comparisons of laminates with identical lay-up.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- 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 - Reinforced plastics - Standard procedures for conditioning prior to testing ¹⁾
- EN 2744 Aerospace series - Non-metallic materials - Preferred test temperatures
- 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 Definitions

For the purposes of this standard, the following definition apply :

Apparent interlaminar shear strength : it is the maximum shear stress calculated at half thickness of the specimen at the moment of first failure.

4 Principle

This method consists of the determination of the resistance to delamination under shear forces parallel to the layers of the laminate. For this determination, a specimen of rectangular cross section is tested in flexure on two supports. The load is applied at the centre of the specimen by means of a loading nose midway between the supports.

This test gives information about the quality of the resin - fibre relation.

1) Published as AECMA Prestandard at the date of publication of this standard

5 Apparatus

- 5.1 Micrometer with 6 mm diameter flat faces and accurate to 0,01 mm
- 5.2 Testing machine, accurate to within 1 % in the load range used
- 5.3 Device for recording load with respect to time or to loading nose displacement.
- 5.4 If necessary, heated cabinet, regulated so as to conform to EN 2744 for tests at temperatures other than ambient.
- 5.5 Thermocouple and recorder for tests at temperatures other than ambient.
- 5.6 Test fixture

See figure 1 and table 1.

It shall allow an adjustment of the distance between supports.

It shall ensure accurate positioning of the specimen and shall have less than a 0,02 mm off-centre error of loading nose with respect to supports.

The misalignment between loading nose and supports shall not be greater than 0,02 mm.

The loading nose and supports shall be made from steel having a tensile strength ≥ 1000 MPa.

<https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001>

6 Specimens

Take specimens from panels prepared according to EN 2655.

6.1 Form and dimension

See figure 1 and table 1.

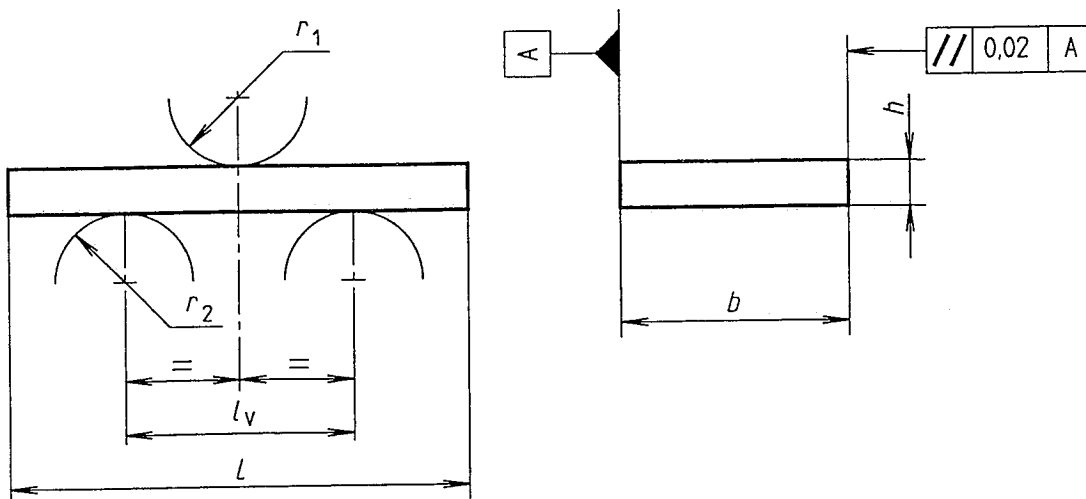


Figure 1

Table 1

Dimensions in millimetres	
Symbols	Values
r_1	3 ± 0,1
r_2	3 ± 0,1
b	10 ± 0,2
L	20 ± 0,25
l_V	10 ± 0,1
h 1)	2 ± 0,2
1) If the ply thickness causes any uncertainty regarding the number of layers necessary to obtain a laminate of the required thickness, this number of layers shall be specified in the relevant material standard.	

The scatter between specimen thicknesses within a set, see 6.2, shall be such that :

$$\frac{h \text{ max.} - h \text{ min.}}{\bar{h}} \leq 0,05$$

where :

h max. is the maximum thickness, in millimetres ;

h min. is the minimum thickness, in millimetres ;

\bar{h} is the arithmetic mean thickness h of specimens within a set (millimetres).

The length of the specimen is parallel to the fibre direction for unidirectional laminates and parallel to the warp direction for fabrics.

6.2 Number

Minimum of five

7 Procedure

7.1 Conditioning

EN 2743 for tests in the initial state,

EN 2489 for tests after immersion,

EN 2823 for tests after exposure to humid atmosphere.

7.2 Tests

7.2.1 Measure the width b to within 0,01 mm at the centre of the specimen.

Determine h by calculating the arithmetic mean of three measurements of the thickness to within 0,01 mm taken across the width at the centre of the specimen.

Measure the distance between supports to within 0,1 mm.

7.2.2 For qualification testing and in case of disagreement, the distance between supports shall be adjusted so that :

$$l_V = (5 \cdot \bar{h}) \pm 0,1$$

where :

l_V is the distance between supports (millimetres) ;

\bar{h} is the arithmetic mean thickness h of specimens within a set (millimetres).

7.2.3 For tests at temperatures other than ambient, the period separating the conditioning and start of the test shall conform to the following conditions :

- for specimens which have not been aged or subjected to immersion, the exposure time at the test temperature shall be established by preliminary tests ;
- for specimens subjected to immersion, see EN 2489 ;
- for specimens subjected to humid atmosphere, see EN 2823.

7.2.4 Locate the specimen in the test fixture, ensuring that its axis is perpendicular to the supports.

7.2.5 Load the specimen smoothly at a constant displacement rate of the loading nose of $V = (1 \pm 0,1)$ mm/min.

(standards.iteh.ai)

7.2.6 Record load as a function of time or displacement of the loading nose.

[SIST EN 2563:2001](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

7.2.7 Record the load at failure (P_R).

[https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

[b911660cb5cf/sist-en-2563-2001](https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660cb5cf/sist-en-2563-2001)

8 Expression of results

8.1 The apparent interlaminar shear strength shall be calculated as follows :

$$\tau = \frac{3 P_R}{4 b h}$$

where :

- τ is the apparent interlaminar shear strength, in megapascal ;
- P_R is the maximum load at the moment of first failure, in newtons ;
- b is the width of specimen, in millimetres ;
- h is the thickness of specimen, in millimetres.

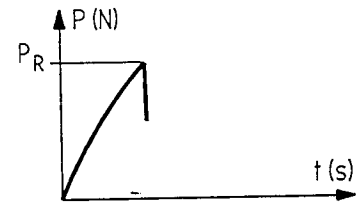
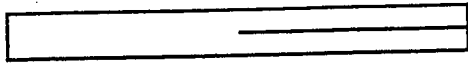
8.2 Validity

8.2.1 If a specimen fails in shear approximately at the neutral fibre axis (see figure 2), the interlaminar shear strength is calculated in accordance with the formula in 8.1.

8.2.2. If a specimen fails in flexure or by plastic deformation (see figure 3), the result obtained by the formula in 8.1 is not a true shear stress at failure.

This result may only be used for comparison with those from a series of tests related to a same material (e.g. batch control).

Single shear



Multiple shear

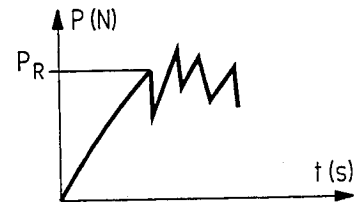
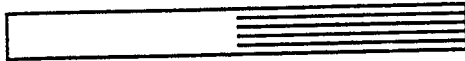
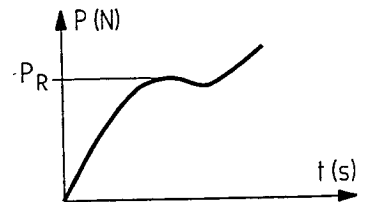


Figure 2
iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 2563:2001

Plastic deformation <https://standards.iteh.ai/catalog/standards/sist/2643b6e9-7ae9-41e5-891c-b911660eb5cf/sist-en-2563-2001>



Flexure

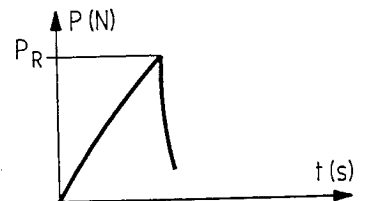


Figure 3