



# SLOVENSKI STANDARD

SIST EN 2243-1:2006

01-julij-2006

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**Aeronavtika – Nekovinski materiali – Konstrukcijska lepila – Preskusna metoda –  
1. del: Strig enojnega prekritja**

Aerospace series - Non-metallic materials - Structural adhesives - Test method - Part 1:  
Single lap shear

Luft- und Raumfahrt - Nichtmetallische Werkstoffe - Strukturelle Klebstoffe -  
Prüfverfahren - Teil 1: Bestimmung der Bindefestigkeit von einschnittig überlappten  
Klebungen im Zugversuch

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Série aérospatiale - Matériaux non-métalliques - Systeme d'adhésifs structuraux -  
Méthodes d'essai - Partie 1 : Essais de cisaillement d'un joint a recouvrement simple

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**Ta slovenski standard je istoveten z: EN 2243-1:2005**

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**ICS:**

49.025.50

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ICS 49.025.50

English Version

## Aerospace series - Non-metallic materials - Structural adhesives - Test method - Part 1: Single lap shear

Série aérospatiale - Matériaux non-métalliques - Système  
d'adhésifs structuraux - Méthodes d'essai - Partie 1 :  
Essais de cisaillement d'un joint à recouvrement simple

Luft- und Raumfahrt - Nichtmetallische Werkstoffe -  
Strukturelle Klebstoffsysteme - Prüfverfahren - Teil 1:  
Bestimmung der Bindefestigkeit von einschnittig  
überlappten Klebungen im Zugversuch

This European Standard was approved by CEN on 30 September 2005.

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.

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 Central Secretariat has the same status as the official versions.

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

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## Foreword

This European Standard (EN 2243-1:2005) has been prepared by the European Association of Aerospace Manufacturers - Standardization (AECMA-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 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 May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

The objective of this standard is to establish the test methods for defining the strength of suitable structural adhesives in metal to metal single lap shear, at ambient and other temperatures.

## 2 Normative references

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

EN 2087, *Aerospace series – Aluminium alloy AL-P2014A – T6 or T62 – Clad sheet and strip – 0,4 mm ≤ a ≤ 6 mm.*<sup>1)</sup>

EN 2088, *Aerospace series – Aluminium alloy AL-P2014A – T4 or T42 – Clad sheet and strip – 0,4 mm ≤ a ≤ 6 mm.*<sup>1)</sup>

EN 2090, *Aerospace series – Aluminium alloy AL-P2024- – T3 – Clad sheet and strip – 0,3 mm ≤ a ≤ 6 mm.*<sup>1)</sup>

EN 2092, *Aerospace series – Aluminium alloy AL-P7075- – T6 or T62 – Clad sheet and strip – 0,4 mm ≤ a ≤ 6 mm.*

EN 2334, *Aerospace series – Chromic-sulphuric acid pickle of aluminium and aluminium alloys.*

EN 2497, *Aerospace series – Dry abrasive blasting of titanium and titanium alloys.*

EN 2540, *Aerospace series – Steel FE-PM3902 (X7CrNiAl17-7) – Air melted – Solution treated and precipitation hardened – Sheet and strip – a ≤ 6 mm – 1 240 MPa ≤ R<sub>m</sub> ≤ 1 450 MPa.*<sup>1)</sup>

EN 2517, *Titanium alloy TI-P63 – Annealed – Sheets, strips and plates – a ≤ 100 mm – Aerospace series.*<sup>2)</sup>

EN 3456, *Aerospace series – Titanium alloy TI-P64001 – Annealed – Sheet and strip, hot rolled – a ≤ 6 mm.*<sup>1)</sup>

EN 3464, *Aerospace series – Titanium alloy TI-P64001 – Annealed – Plate – 6 mm < a ≤ 100 mm.*<sup>1)</sup>

## 3 Test samples

### 3.1 Shape and dimensions

The shape and dimensions of the test pieces and the panel out of which the pieces shall be cut, shall be as given in Figure 1.

### 3.2 Sheet material (general)

Aluminium alloys for use to 150 °C, see EN 2088 and EN 2090.

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

2) Published as AECMA Standard at the date of publication of this standard. Inactive for new design.

### 3.3 Sheet material (special)

For adhesives having a shear strength higher than approximately 45 MPa, aluminium alloys for use up to 150 °C can be used instead of the materials given in 3.2, see EN 2092 and EN 2087.

### 3.4 Sheet material (for test temperature above 150 °C)

#### 3.4.1 Corrosion resisting steel FE-PM3902

See EN 2540.

#### 3.4.2 Titanium alloy TI-P63 or TI-P64001

See EN 2517 or EN 3456 and EN 3464.

## 4 Surface preparation

The surface preparation prior to bonding shall conform to EN 2334 and EN 2497.

## 5 Bonding

The application of the adhesive system (adhesive and primer) as applicable and curing shall be carried out according to the instruction of the adhesive manufacturer or the material standard.

## 6 Storage of test samples after bonding

After curing the sample made with elevated temperature curing adhesives shall be exposed and/or after a storage period of 16 h under the conditions as given below (unless otherwise specified by the adhesive manufacturer).

The sample for room temperature curing adhesives not exposed and/or tested immediately after curing shall also be stored as given below (unless otherwise specified by the adhesive manufacturer).

Storage conditions:

- room temperature:  $(23 \pm 2)$  °C
- relative humidity:  $(50 \pm 5)$  %

## 7 Cutting and preparation of test pieces

The test sample shall be carefully cut into pieces with a suitable tool such as a band saw.

The setting and spacing of the teeth and the operational speed shall be such that the frictional heating of the bond will be kept to a minimum. The cutting shall be straight and parallel.

For cutting shall be straight and parallel.

For cutting corrosion resisting steel and titanium alloy test samples a suitable cutting fluid may be used.

## 8 Test conditions

**8.1** The test shall be carried out at the temperatures stated in the relevant material standard.

When the test temperature is different from the ambient temperature then the rate of the heating shall be between 6 °C to 10 °C per minute.

The rate of cooling need not be controlled.

The application of load for all tests at temperature other than ambient shall be made immediately after the specimen has been held at the specified test range for 10 min unless a longer term of exposure is required.

**8.2** For all test temperature excluding room temperature (23 ± 2) °C, temperature control of the test pieces shall be carried out with the aid of a thermocouple to ensure the accuracy of testing temperature and reproducibility of data.

The junction of the thermocouple shall be firmly attached to the test piece in immediate contact with the metal in the position shown in Figure 2 and shielded from the heat source.

**8.3** The number of test pieces for each determination shall be as required by the material standard.

**8.4** Each test piece shall be identified in order to establish the panel from which it was cut.

## 9 Method of test

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### 9.1 Tensile testing machine

**9.1.1** An approved tensile testing machine shall be used.

The failing load of the test piece shall be within 10 % to 90 % of the upper limit of the selected loading range of the machine.

**9.1.2** The test loads shall be recorded within an accuracy of 1 %.

### 9.2 Method of fixing

The ends of the specimen shall be gripped tightly with a good fit in the jaws of the testing machine.

The jaws and the test pieces shall be aligned such that the jaws are directly opposite each other and in such a position that an imaginary straight line will pass through the centre of the bonded area and through the point of fixing.

The specimen shall be gripped (50 ± 5) mm from each edge of the lap joint (see also Figure 3).

### 9.3 Speed rate of loading

The rate of loading shall be 2 800 N/min to 5 000 N/min.

## 10 Calculation of results

The test results to be reported shall be calculated as follows:

$$R = \frac{F}{L \times W}$$



where

- $R$  shear strength, in MPa
- $F$  failing load, in Newtons
- $L$  length of overload, in millimetres
- $W$  width of overlap, in millimetres

The dimensions  $L$  and  $W$  are to be measured before loading with an accuracy of  $\pm 0,1$  mm.

## 11 Test report

The test report shall include the following information:

- Complete identification of the adhesive system including the type, suppliers code numbers, date of manufacture, batch number, material standard, etc.
- Complete identification of the metal used, including actual proof stress in the direction of loading used for the adhesive test.
- Detailed information about the pre-treatment of the metal prior to bonding.
- Application and bonding conditions including autoclave or press bondline pressure, heat-up rate, cure time and temperature, etc. (standards.iteh.ai)
- The number of test pieces used. [SIST EN 2243-1:2006](https://standards.iteh.ai/catalog/standards/sist/b9596a5b-a6b2-435a-a009-c28a27a7157f/sist-en-2243-1-2006)
- Time exposure conditions and test temperature. <https://standards.iteh.ai/catalog/standards/sist/b9596a5b-a6b2-435a-a009-c28a27a7157f/sist-en-2243-1-2006>
- The type of testing machine and speed of load.
- Information about individual test pieces including actual dimensions and overload, sheet thickness, load at failure and shear strength.
- The nature of the failure, including the average estimated percentage of failure in cohesion and/or adhesion both of adhesive and possible adhesive primer.
- The average, maximum and minimum shear strength values of the test series.
- Any deviations from this test method shall be described in detail.