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Aerospace series - Non-metallic materials - Structural adhesives - Test method - Part 3:
Peeling test metal-honeycomb core

Luft- und Raumfahrt - Nichtmetallische Werkstoffe - Strukturelle Klebstoffsysteme -
Prüfverfahren - Teil 3: Trommelschälversuch für Wabenkernverbunde

Série aérospatiale - Matériaux non métalliques - Systeme d'adhésifs structuraux -
Méthodes d'essai - Partie 3 : Essai de pelage métal-nid d'abeilles

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English Version

**Aerospace series - Non-metallic materials - Structural adhesives
- Test method - Part 3: Peeling test metal-honeycomb core**

Série aérospatiale - Matériaux non-métalliques - Système
d'adhésifs structuraux - Méthodes d'essai - Partie 3 : Essai
de pelage métal-nid d'abeilles

Luft- und Raumfahrt - Nichtmetallische Werkstoffe -
Strukturelle Klebstoffsysteme - Prüfverfahren - Teil 3:
Trommelschälversuch für Wabenkernverbunde

This European Standard was approved by CEN on 26 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 2243-3:2005) 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 April 2006, and conflicting national standards shall be withdrawn at the latest by April 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.

This European Standard supersedes EN 2243-3:1991.

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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Introduction

This standard is part of the series of EN non-metallic material standards for aerospace applications. The general organization of this series is described in EN 4385. This standard is a level 3 document as defined in EN 4385.

1 Scope

This standard defines the general requirements for the determination of strength of structural adhesives by testing in peel metal to honeycomb core joints, at ambient or 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 ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system* (ISO 7500-1:2004).

EN 2090, *Aerospace series — Aluminium alloy AL-P2024 — T3 — Clad sheet and strip — $0,3 \text{ mm} \leq a \leq 6 \text{ mm}$* .¹⁾

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

EN 4385, *Aerospace series — Non-metallic materials — General organisation of standardisation — Links between types of standards*.¹⁾

EN 4606, *Aerospace series — Aluminium honeycomb core*.²⁾

3 Definitions, symbols and abbreviations

3.1 Definitions

Not applicable

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

F peeling load (in newtons);

F_0 rolling load (in newtons) = Load necessary to roll up the skin;

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

2) In preparation at the date of publication of this standard.

F_1 peeling and rolling load (in newtons);

W width of test piece (in centimeter);

τ peeling strength (in newtons . centimetre/centimetre).

4 Health and safety

This standard does not necessarily include all health and safety requirements, associated with its use.

Persons using this standard shall be familiar with normal laboratory/test house practices.

It is the responsibility of the user to establish satisfactory health and safety practices and to ensure conformity with any European, national or local laws/regulations.

5 Principle/Technique

Not applicable

6 Resources

6.1 Apparatus

All test equipment shall be calibrated at intervals not exceeding 12 months.

6.1.1 Tensile testing machine

The tensile testing machine shall conform to class 1 of EN ISO 7500-1. The failing load of the test specimen shall be within 10 % and 90 % of the upper limit of the selected loading range of the machine.

6.1.2 Fixing

The peeling jig consists of a drum with lateral flanges, flexible load strips or cords and suitable clamps for fastening the test pieces in. The arrangement shown in Figure 1 has proved efficient.

The drum radius is 50 mm. The radii of the flanges including half the thickness of the flexible load strips or cords are 12,5 mm larger than the drum radius. The top clamp, for introducing the load into the test piece, and the clamp on the drum shall be disposed so that the covering layers are tangential to the drum surface in the beginning of test as shown in Figure 1.

The drum shall be counter-balanced by fixing a mass on the drum opposite the clamp. The maximum mass of the peeling jig shall not exceed 3,5 kg.

6.1.3 Recorder

It shall record continuously the displacement (see Figure 3) relative to the load applied throughout the test until total failure occurs.

6.2 Materials/Reagents

Not applicable

6.3 Qualification of personnel

Not applicable

7 Test samples/Test pieces

7.1 Materials

Aluminium alloy EN 2090

Honeycomb core: see EN 4606.

7.2 Surface preparation before bonding

EN 2334 unless otherwise specified.

7.3 Bonding

The application and curing of the adhesive system (adhesive and primer) shall be carried out according to the material standard unless otherwise agreed with the adhesive system manufacturer.

7.4 Dimensions of panels

The test panel shall be of sufficient size to permit the manufacture of at least one test piece (see Figure 2).

7.5 Storage of test panels after bonding

They shall be stored under the following conditions:

- temperature : $(23 \pm 2) ^\circ\text{C}$;
- relative humidity : $(50 \pm 5) \%$.

7.6 Cutting of panels and preparation of test pieces

The panels shall be cut into test pieces (see Figure 2).

The panels made with high temperature curing adhesives shall be cut only after a storage period of 16 hours (see note 1).

NOTE 1 For batch acceptance testing, this 16 hours period can be omitted. Nevertheless, for temperature curing adhesive, care shall be taken to cut panels only when their temperature is down to ambient.

Perform the cutting operation so as to avoid overheating ($\leq 50 ^\circ\text{C}$) or mechanical damage to the joint (see note 2).

NOTE 2 A fine-tooth, circular or band saw has been found suitable for this purpose.

Cutting shall be straight and parallel.

The use of cooling liquids is not permitted, unless otherwise specified.

7.7 Test pieces

7.7.1 Dimensions

See Figure 2.

7.7.2 Number of specimens

See material standard.

7.7.3 Identification

Each test piece shall be marked to identify the panel from which it was cut and its position in the panel.

Ensure top skin is labelled for traceability.

8 Testing procedure

8.1 Dimensions measurement

Measure the width W of test piece with an accuracy of $\pm 0,1$ mm.

8.2 Fixing

See Figure 1.

The test piece shall be carefully fixed to the drum as shown in Figure 1. The other end of the test piece shall be fixed on the top of the test machine using the top clamp.

When the test piece with the peeling jig is suspended on the top grid of the test machine, fastened by means of a bolt through the clamp, the test machine indicator shall be set at 0 and the yoke of the peeling jig shall be fastened by means of a bolt to a fitting in the bottom grip of the machine.

8.3 Test temperatures

When the test temperature is different from ambient temperature (23 ± 2 °C), then the chamber including jig shall be stabilized within the test temperature tolerance for at least 30 minutes prior to inserting the test piece.

The temperature control of the test piece shall be carried out using a thermocouple.

The junction of the thermocouple shall be firmly attached to the test piece in immediate contact with the metal. It shall be shielded from direct heating.

8.4 Loading

For test temperature different from ambient, and unless otherwise specified (see note), a minimum exposure time of 10 minutes at the required temperature shall be applied prior to loading.