



**SLOVENSKI STANDARD**  
**SIST EN 2243-5:1998**  
**01-februar-1998**

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**Aeronavtika - Konstrukcijska lepila - Preskusne metode - 5. del: Preskusi s staranjem**

Aerospace series - Structural adhesives - Test methods - Part 5: Ageing tests

Luft- und Raumfahrt - Strukturelle Klebstoffe - Prüfverfahren - Teil 5: Alterungsversuche

Série aérospatiale - Adhésifs structuraux - Méthodes d'essais - Partie 5: Essais de vieillissement

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**ICS:**

49.025.50      Lepila

Adhesives

**SIST EN 2243-5:1998**

**en**

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EUROPEAN STANDARD  
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**EN 2243**

Part 5

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**English version**

**Aerospace series  
Structural adhesives  
Test methods  
Part 5 — Ageing tests**

**Série aérospatiale  
Adhésifs structuraux  
Méthodes d'essais  
Partie 5 — Essais de vieillissement**

**Luft- und Raumfahrt  
Strukturelle Klebstoffe  
Prüfverfahren  
Teil 5 — Alterungsversuche**

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN 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 CEN Central Secretariat has the same status as the official versions.

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**CEN**

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

Central Secretariat : Rue de Stassart, 36, B—1050 Bruxelles

## 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 successively received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

According to the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard :

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## 1 Scope

This standard specifies ageing tests for determining resistance of adhesive bonded joints against environmental influences.

## 2 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.

- ISO 3768-1976,      Metallic coatings - Neutral salt spray test (NSS test)
- EN 2243-1,          Aerospace series - Structural adhesives - Test methods - Part 1 -Single lap shear<sup>1)</sup>
- EN 2243-2,          Aerospace series - Structural adhesives - Test methods - Part 2 -Peel metal/metal
- EN 2379,            Aerospace series - Test fluids for non metallic materials <sup>2)</sup>
- EN 2743,            Aerospace series - Reinforced plastics - Standard procedures for conditioning prior to testing <sup>3)</sup>

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## 3 Apparatus

### 3.1 Relative humidity test [SIST EN 2243-5:1998](https://standards.iteh.ai/catalog/standards/sist/bc266963-cf13-424b-bb01-d403ca263248/sist-en-2243-5-1998)

Exposure at 50 °C or 70 °C.

A humidity cabinet is required in which the exposure zone can be maintained at a temperature of  $(50 \pm 3)^\circ\text{C}$  or  $(70 \pm 3)^\circ\text{C}$  and 95 % to 100 % relative humidity.

It shall be possible to record the temperature continuously.

To obtain and to maintain the humidity only freshly distilled water shall be used. Airflow is allowed.

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

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

3) Published as AECMA pre-standard at the date of publication of the present standard.

### 3.2 Salt spray test

A salt spray cabinet is required, in accordance with ISO 3768.

### 3.3 Fluid immersion tests

Containers are required of sufficient size, capable of maintaining a fluid temperature within the required temperature range (see table 1), independent of the location of the test panel in the fluid.

It shall be possible to record the temperature continuously.

## 4 Preparation of test panels and test pieces

### 4.1 Single lap shear test

Test panels shall be fabricated and cut to test pieces in accordance with EN 2243-1.

The position of the test pieces in the test panel shall be defined by coding with number 1 to 7. Test pieces with codes 1 and 5 shall be used as reference test pieces (see 6.1).

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### 4.2 Peel test - metal/metal

Test panels shall be fabricated and cut into test pieces in accordance with EN 2243-2.

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Note :For salt spray testing, the test panels shall be protected against corrosion before cutting to test pieces.

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The position of the test pieces in the test panel shall be defined by means of a number code.

From each test panel a minimum of three test pieces shall be used as reference test pieces (see 6.1).

## 5 Procedure

## 5.1 Ageing

See table 1.

Table 1

Environment	Temperature °C	Time days	Number	Code	Clause ref.	Type of test piece						
Relative humidity 95 % to 100 %	50 ± 3	30	5	A11	5.1.1	Single lap shear						
		60	5	A12								
		90	10	A13								
Relative humidity 95 % to 100 %	50 ± 3	30	3	A21		5.1.1	Peel - metal/metal					
		60	3	A22								
		90	4	A23								
Relative humidity 95 % to 100 %	70 ± 3	10	5	B11			5.1.1	Single lap shear				
		20	5	B12								
		30	10	B13								
Relative humidity 95 % to 100 %	70 ± 3	10	3	B21				5.1.1	Peel - metal/metal			
		20	3	B22								
		30	4	B23								
Salt spray ISO 3768	35 ± 2	30	3	C1	5.1.2							
		60	3	C2								
		90	4	C3								
Phosphate ester fluids EN 2379 (XX)	70 ± 2	15	5	D1	5.1.3	Single lap shear						
		30	5	D2								
		60	10	D3								
Test fuel EN 2379 (XXI)	40 ± 2	30	5	E1			5.1.3		Single lap shear			
		60	5	E2								
		90	10	E3								
Standard test fuel EN 2379 (XXII)	40 ± 2	30	5	F1				5.1.3		Single lap shear		
		60	5	F2								
		90	10	F3								
Anti-icing fluid EN 2379 (XIV)	40 ± 2	30	5	G1							5.1.3	Single lap shear
		60	5	G2								
		90	10	G3								
Hydraulic fluid EN 2379 (XII)	70 ± 2	15	5	H1	5.1.3	Single lap shear						
		30	5	H2								
		60	10	H3								

### 5.1.1 Relative humidity (exposure at 50 °C or 70 °C)

The exposure shall be continuous. Any interruptions shall be recorded.

The test pieces shall be suspended in the exposure area in such a way that the minimum distance between each other and the sides of the humidity cabinet is 25 mm.

The test pieces shall be arranged so that condensate from one test piece does not drip on another.

### 5.1.2 Salt spray

See ISO 3768.

Furthermore, the test pieces shall be suspended in such a way that the minimum distance between each other and the sides of the cabinet is 25 mm.

### 5.1.3 Fluids

The test piece shall be exposed in the test fluid in such a way that the joints are completely immersed.

The position of the test piece is not critical, provided the minimum distance of the joints between each other and the sides and bottom of the container is 10 mm.

The exposure time shall be estimated from the time the test fluid has reached the test temperature specified in the table 1.

Each test shall start with fresh fluid which shall not be changed during the test.

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### 5.2 Cleaning

<https://standards.iteh.ai/catalog/standards/sist/bc266963-ef13-424b-bb01-d403ca263248/sist-en-2243-5-1998>

Immediately after exposure the test pieces shall be cleaned with water (maximum temperature 35 °C) and dried with clean dry cloths.

### 5.3 Destructive testing

Destructive testing shall be carried out according to the test standards (and after 24 h, but within 30 h, after removal from the exposure).

Conditioning during this period of time shall take place at standard atmosphere according to EN 2743.

Reference test pieces shall be destructively tested within 3 days of the completion of the cure.



## 6 Calculations

### 6.1 Single lap shear tests

Calculation of the shear strength per test piece is to be carried out according to EN 2243-1.

The reduction percentage of the aged test piece compared with the reference test piece shall be calculated as follows :

$$\text{Reduction} = \frac{R_1 - R_2}{R_1} \times 100 \%$$

in which :

$R_1$  = average shear strength of all reference test pieces

$R_2$  = average shear strength of all aged test pieces.

### 6.2 Peel test - metal/metal

#### 6.2.1 Calculation of reduction in peel strength

Calculation of the peel strength per test piece is to be carried out according to EN 2243-2.

The reduction percentage of the aged test piece compared with the reference test piece shall be calculated as follows :

$$\text{Reduction} = \frac{F_1 - F_2}{F_1} \times 100 \%$$

in which :

$F_1$  = average peel strength of all reference test pieces

$F_2$  = average peel strength of all aged test pieces.

#### 6.2.2 Calculation of attacked area

Remove the thin peel sheet by peeling the remaining portion of the test piece by hand or other means.

Judge the adhesive faced side of the thick (1,6 mm) adherend without any removal of adhesive as follows :

- All areas where the thick adherend only has been corroded are clearly shown as the adhesive has been removed by the thin adherend.
- All areas where the thin adherend only or both thin and thick adherend have been attacked are recognized by corrosion residues on the adhesive surface or by a sudden change in type of failure.