

Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints

The European Standard EN 29142:1993 has the status of a
British Standard

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This British Standard, having been prepared under the direction of the Adhesives Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 September 1993

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National foreword

This British Standard has been prepared under the direction of the Adhesives Standards Policy Committee. It is the English language version of EN 29142:1993 *Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints*, published by the European Committee for Standardization (CEN), which endorses ISO 9142:1990 *Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints*, published by the International Organization for Standardization (ISO).

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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English version

Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints

(ISO 9142:1990)

Adhésifs — Guide pour la sélection de conditions normales d'essai de vieillissement en laboratoire des assemblages collés
(ISO 9142:1990)

Klebstoffe — Auswahlrichtlinien für Labor-Alterungsbedingungen zur Prüfung von Klebverbindungen
(ISO 9142:1990)

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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.

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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 Brussels

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Foreword

Following the positive result of the primary questionnaire, CEN Technical Board decided to submit

ISO 9142:1990, *Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints*.

to the formal vote. The result was positive.

NOTE There are other, specific, standards for classifying wood adhesives and for testing their performance requirements, and for testing adhesives for aerospace applications.

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 December 1993, and conflicting national standards shall be withdrawn at the latest by December 1993.

In accordance with the CEN/CENELEC Internal Regulations, 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 United Kingdom.

1 Scope

This International Standard describes laboratory ageing conditions under which adhesive joints may be exposed to various environmental influences — climatic or chemical — for the purpose of assessing the effects of such influences on certain properties.

The ageing conditions are applicable to bonded assemblies and may be used to constitute a set of tests for the evaluation of an adhesive.

The results obtained using the procedures described in this International Standard are not necessarily applicable to the determination of the service life of a bonded assembly because there is no direct relation between the test results and the behaviour of a bonded assembly over a period of time under service conditions. However, for certain specific applications, experience with the procedures may enable a correlation to be established.

NOTE 1 The ageing conditions should be related to the specific application of the adhesives.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 175:1981, *Plastics — Determination of the effects of liquid chemicals, including water*.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 483:1988, *Plastics — Small enclosures for conditioning and testing using aqueous solutions to maintain relative humidity at constant value*.

ISO 3205:1976, *Preferred test temperatures*.

ISO 3768:1976, *Metallic coatings — Neutral salt spray test (NSS test)*.

ISO 4587:1979, *Adhesives — Determination of tensile lap-shear strength of high strength adhesive bonds*.

ISO 4588:1989, *Adhesives — Preparation of metal surfaces for adhesive bonding*.

ISO 4892:1981, *Plastics — Methods of exposure to laboratory light sources*.

ISO 6238:1987, *Adhesives — Wood-to-wood adhesive bonds — Determination of shear strength by compression loading*.

3 Principle

Definition of the ageing conditions that relate most closely to the application for the adhesive by reference to the preferred conditions set out in Annex A to Annex F.

4 Materials

4.1 De-ionised or distilled water, having a conductivity less than 200 $\mu\text{S/m}$.

4.2 Materials for ageing tests, under special environmental conditions (see appropriate annex).

5 Apparatus

5.1 Conditioning chamber, meeting the requirements of ISO 483, capable of being maintained at a temperature of $(23 \pm 2)^\circ\text{C}$ and a relative humidity of $(50 \pm 5)\%$.

5.2 Dry-heat chamber, ventilated and adjustable to a temperature between 20°C and 200°C .

5.3 Humid chamber, meeting the requirements of ISO 483, adjustable to a relative humidity between 25 % and 100 %. The chamber shall be equipped with

- a) a device to enable the temperature to be measured to within 1°C ;
- b) a device to enable the relative humidity to be measured to within 3 % R.H.

5.4 Cold chamber, adjustable to a temperature of $(-40 \pm 3)^\circ\text{C}$.

5.5 Controlled-pressure chamber, capable of operating at a pressure of $0,6\text{ MPa}^{1)}$ and at an underpressure of $0,092\text{ MPa}$.

6 Specimens

6.1 Number and type

The number of test specimens, and the type used, will depend on the properties to be measured and the required ageing conditions. The test specimens shall be prepared in accordance with the requirements of the appropriate ISO standard test method. Prepare a sufficient number of specimens to provide homogeneous sets of samples for testing and to provide control samples. The following standards, which do not constitute an exhaustive list, are applicable: ISO 4587, ISO 4588, ISO 6238.

¹⁾ 1 MPa = 10 bar

6.2 Conditioning

Specimens shall be conditioned in the conditioning chamber (5.1) for a minimum duration of 24 h before being subjected to ageing. The conditioning shall be carried out after the adhesive has been cured in accordance with the materials specification or the methods specified by the manufacturer of the adhesive.

7 Procedure

7.1 Tests before ageing

Determine the properties required for the sample under test by the appropriate test method, using specimens conditioned in accordance with 6.2.

7.2 Ageing

Expose conditioned specimens to the environmental conditions as defined in Annex A to Annex F, as required.

7.3 Tests after ageing

Determine the properties after ageing in accordance with the procedure(s) of the appropriate standard(s). Unless there are indications to the contrary in the annexes, condition test specimens in the conditioning chamber (5.1)

- for (3 ± 1) h in the case of specimens exposed at a relative humidity higher than 50 %,
- for at least 24 h for all other specimens,

before determining the properties.

In addition to the test results, all changes visible during the ageing and testing periods, including mode of failure, shall be noted.

7.4 Controls

For control purposes, a representative group of specimens shall be kept in the conditioning chamber (5.1) for the period of time covered by the ageing conditions selected.

8 Expression of results

For properties that can be measured, the results obtained are expressed as either

- absolute values or
- a relative variation with respect to the initial value.

For properties that cannot be measured, the nature of the effects observed shall be noted, e.g. rupture between the substrate and adhesive, failure of cohesion of the adhesive joint due to partial or total corrosion of the substrate beneath the adhesive, etc.

NOTE 2 It may be worth verifying that the variation in a measured property is caused only by the ageing process from the following three values:

- A the value of the property measured before accelerated ageing;
- B the value of the same property measured on the control specimen which has undergone only intrinsic ageing at $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5) \% \text{ R.H.}$ (see 7.4);
- C the value of the property measured after ageing.

This can be done by calculating the following ratios:

- a) $[(A - B)/A] \times 100$ (this ratio represents the intrinsic ageing during the period concerned);
- b) $[(A - C)/A] \times 100$ (this ratio represents the overall ageing due to intrinsic ageing and the accelerated ageing under the conditions specified in this International Standard);
- c) $[(B - C)/A] \times 100$ (this ratio represents the degree of ageing due to ageing under the conditions specified in this International Standard).

9 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) a description of the type of ageing carried out, with reference to the relevant annex(es) and the duration of exposure and number of test cycles;
- c) the results of observations made in accordance with 7.3 (last paragraph) and clause 8;
- d) details of any operations not laid down in this International Standard, as well as any incidents liable to have had an effect on the results.