
**Adhesives — Determination of resistance
to flow (sagging)**

Adhésifs — Détermination de la résistance au fluage (coulure)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14678 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

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Foreword

This European Standard (EN ISO 14678:2005) has been prepared by Technical Committee CEN/TC 193 "Adhesives", the secretariat of which is held by AENOR, in collaboration with Technical Committee ISO/TC 61 "Plastics, Subcommittee SC 11, Products".

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of an identical text or by endorsement, at the latest by February 2006, and conflicting national standards shall be withdrawn at the latest by February 2006.

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 United Kingdom

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Introduction

When an adhesive joint is prepared, it is important that the applied adhesive does not flow away from the area of the joint. Flow can occur before the joint has been assembled, e.g. before solvent or water has evaporated, or after the joint has been closed, but before the adhesive has set, e.g. during the curing, solidification, or drying process.

The flow of an applied adhesive will be influenced by the stress applied and the duration and temperature of the bonding process. The extent of flow of an adhesive will also be influenced by the surface energies involved and the degree of roughness of the adherents. The occurrence of flow under gravity is called sagging (see Clause 3).

This European Standard describes three types of test for the assessment of sagging. In the first type of test, which simulates the conditions before joint assembly, the extent of flow of an adhesive down a surface which is either vertical (Methods 1, 2 and 3) or at 60° to the horizontal (Method 4) is measured. In the second type of test, which simulates conditions after assembly (Methods 5 and 6), the flow of adhesive from a hole or slot is observed. The third type of test simulates conditions during the cure cycle for structural film adhesives (Method 7). The method appropriate to the type of adhesive and its consistency should be selected.

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1 Scope

This European Standard describes seven methods for the assessment of the flow characteristics of adhesives after application at room temperature and during cure, by the measurement of sagging. These methods may be used both for specifying an adhesive and for quality control purposes.

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 923:1998, *Adhesives — Terms and definitions*

EN 1067, *Adhesives — Examination and preparation of samples for testing*

EN 13887, *Structural Adhesives - Guidelines for surface preparation of metals and plastics prior to adhesive bonding*

EN ISO 15605, *Adhesives - Sampling (ISO 15605:2000)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 923:1998 together with the following apply.

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3.1
flow
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deformation of an adhesive or adhesive layer

3.2
sagging

downward movement of an adhesive film between the time of application and setting resulting in an uneven coating having a thick lower edge

NOTE The resulting sagging is usually restricted to a local area of a vertical surface.

4 Guidance: Typical applications for the seven test methods are as follows:

- * Method 1: Use of an applicator to apply a wet film (see Clause 7) - Resistance to flow after application.
- * Method 2: Use of a plug former (see Clause 8) - Resistance to sagging after application.
- * Method 3: Use of a scraper (see Clause 9) to apply a film of adhesive - Resistance to flow after application during cure.
- * Method 4: Use of test blocks (see Clause 10) to measure static flow of adhesives after application and during cure.
- * Method 5: Flow from a lap joint (see Clause 11) - Resistance to flow after application.
- * Method 6: Flow of adhesive through a hole (see Clause 12) - Resistance to dripping after application.
- * Method 7: Flow of structural adhesive films (see Clause 13) - Resistance to flow during the cure cycle.

5 Sampling

Take a sample of the product to be tested in accordance with EN ISO 15605. Examine and prepare this sample for testing in accordance with EN 1067, where applicable, depending on which of the seven test methods is to be employed.

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6 Safety

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Persons using this standard shall be familiar with normal laboratory practice.

This standard does not purport to address all the safety problems, if any, associated with its use.

It is responsibility of the user to establish safety and health practices and to ensure compliance with any European and national regulatory conditions.

7 Method 1: Use of an applicator to apply a wet film

7.1 Principle

A wet film of the adhesive of defined thickness and shape is applied to a flat horizontal surface of a substrate using an applicator. After application the test panel is placed vertically in the test atmosphere for a specified time. The extent of sagging of the applied adhesive is measured (using the top edge of the test panel as a reference).

7.2 Supplementary information

This method of test requires that the following supplementary information shall be specified when the method is performed:

- a) description of the test substrate;
- b) procedure for preparation of the test surface;
- c) details of the conditioning atmosphere;

- d) details of the test atmosphere;
- e) temperature;
- f) method of mixing of two-component adhesives and the time between mixing and application;
- g) method of application of the adhesive and the applicator gap size;

NOTE The wet film thickness given by an applicator is generally less than the depth of the gap.

- h) duration of the test.

7.3 Apparatus and materials

7.3.1 Test panel(s), of glass or other specified material. Dimensions of approximately (300 · 200) mm are convenient. Sufficient panels to allow for three strips of adhesive of similar thickness are required.

7.3.2 Applicator(s), of different gap sizes (or stencils and suitable applicators, if the nature of the adhesive requires this apparatus).

7.3.3 Enclosure(s), to provide the specified conditioning and/or test atmospheres.

7.4 Conditioning and pretreatment

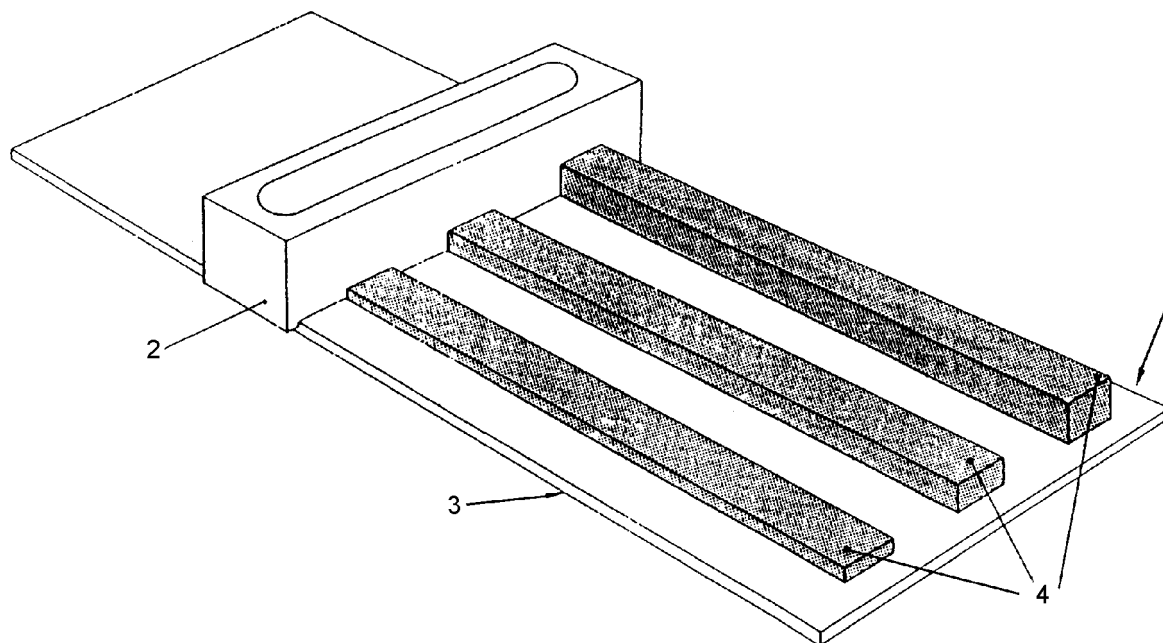
Cut test panels as required. Thoroughly clean each panel and carry out any specified pretreatment. Condition the adhesive and the prepared test panels (if required) in the specified conditioning atmosphere.

NOTE If not otherwise specified, the recommended conditions are (23 ± 2) °C and (50 ± 5) % RH.

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7.5 Procedure <https://standards.iteh.ai/catalog/standards/sist/f23574ac-7b94-41c8-99e0-0ab89005c88b/iso-14678-2005>

Place a prepared test panel in a horizontal position and apply strips of the adhesive parallel to the longer edge (see Figure 1). Mark one of the longer edges as the reference edge and, as quickly as possible, measure the distance in millimetres of the further edge of each strip from it.



Key

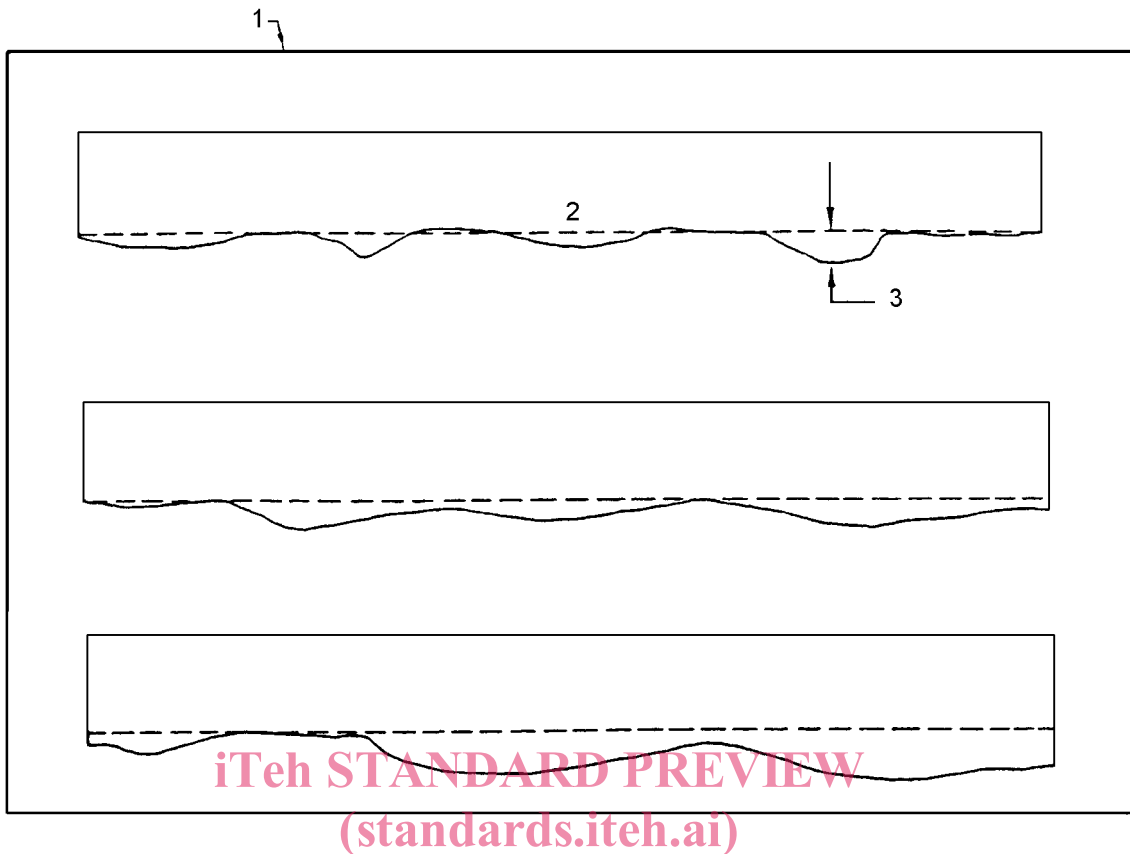
- 1 Reference edge
- 2 Applicator
- 3 Test panel
- 4 Extruded strips

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Figure 1 — Applicator for preparing adhesive strips (Method 1: Use of an applicator to apply a wet film)

Taking care to avoid vibration, mount the test panel within 2° of the vertical so that the strips are horizontal and the reference edge is at the top (see Figure 2). Place the panel in the test atmosphere for the specified time and then determine the sagging of the adhesive by measuring the maximum distance of flow of each strip from the reference edge.

**Key**

- 1 Reference edge <https://standards.iteh.ai/catalog/standards/sist/f23574ac-7b94-41c8-99e0-0ab89005c88b/iso-14678-2005>
- 2 Line of lower edge of strip before test
- 3 Maximum distance of flow

Figure 2 — Flow of adhesive strips (Method 1: Use of an applicator to apply a wet film)

NOTE The test panel may be reused only if the surface condition in the actual bonding process can be reproduced in the test.

Repeat the test for at least three strips at each applicator gap size.

7.6 Expression of results

For each strip calculate the sagging as the maximum difference in millimetres between the distance of the further edge of the strip from the reference edge before and after the test.

Express the result as the mean sagging in millimetres of the repeated tests at each specified applicator gap size.

7.7 Test report

The report shall state the following:

- reference to this European Standard;
- all information necessary for the complete identification of the adhesive;

- c) items of supplementary information given in 7.2;
- d) result for each applicator gap depth;
- e) that the method of test complied with the requirements of this standard, i.e. Method 1, or if it did not, the respects in which it did not comply;
- f) any operating details not specified in the method, as well as any incidents likely to have affected the results, such as, for example, phase separation, etc;
- g) date of the test.

8 Method 2: Use of a plug former

8.1 Principle

The adhesive is used to fill a cavity of known dimensions. The adhesive plug is then extruded and the apparatus is placed vertically in the test atmosphere for the specified time and the degree of sagging measured.

8.2 Supplementary information

This method of test requires that the following supplementary information shall be specified when the method is called up:

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- a) details of the test atmosphere; **(standards.iteh.ai)**
- b) details of the conditioning atmosphere; [ISO 14678:2005](https://standards.iteh.ai/catalog/standards/sist/f23574ac-7b94-41c8-99e0-0ab89005c88b/iso-14678-2005)
- c) temperature; <https://standards.iteh.ai/catalog/standards/sist/f23574ac-7b94-41c8-99e0-0ab89005c88b/iso-14678-2005>
- d) method of mixing of two-component adhesives and the time between mixing and application;
- e) duration of the test.

8.3 Apparatus and materials

8.3.1 Flow test apparatus. Block of metal, e.g. brass, light alloy or steel with a bright finish and overall dimensions not less than (100 · 50) mm.

The upper part of the block is drilled to provide a cylindrical cavity of diameter (38 ± 0,05) mm. The adhesive plug is extruded from the cavity by a solid plunger closely fitting the cavity and provided with means of positioning the face of the plunger flush with the face of the block and at a depth of (9,5 ± 0,05) mm. A graduated scale shall be marked or engraved on the lower face of the block. The first line shall be tangential to the lowest point of the circumference of the cavity and subsequent lines shall be spaced at (1 ± 0,1) mm or (2 ± 0,1) mm intervals over a distance of 50 mm. A suitable design is shown in Figure 3 with end plates fitted to support the block during filling.