



BSI Standards Publication

**Building and civil engineering  
sealants — Determination of resistance  
to prolonged exposure to water**

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## National foreword

This British Standard is the UK implementation of [ISO 13638:2021](#).

The UK participation in its preparation was entrusted to Technical Committee B/547, Sealants for building and construction.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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**Building and civil engineering  
sealants — Determination  
of resistance to prolonged  
exposure to water**

*Mastics pour bâtiments et ouvrages de génie civil — Détermination  
de la résistance à une immersion prolongée dans l'eau*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 8, *Sealants*.

This second edition cancels and replaces the first edition (ISO 13638:1996), which has been technically revised.

The main changes compared to the previous edition are as follows:

- The title of the document has been modified.
- The requirements of apparatus, preparation of test specimens and failure criterion have been modified in accordance with other revised ISO standards.
- The minimum times of repetition of the water immersion and cyclic movement procedures have been defined.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Building and civil engineering sealants — Determination of resistance to prolonged exposure to water

## 1 Scope

This document specifies a method for the determination of the ability of sealants to resist differing degrees of exposure to water under conditions of service.

The method assesses the effects of water immersion, for specified durations of time, on the ability of the sealant to fulfil its essential functions, principally to withstand joint movement.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

[ISO 6927](#), *Buildings and civil engineering works — Sealants — Vocabulary*

[ISO 9046](#), *Building construction — Jointing products — Determination of adhesion/cohesion properties of sealants at constant temperature*

[ISO 9047](#), *Building construction — Jointing products — Determination of adhesion/cohesion properties of sealants at variable temperatures*

[ISO 11600](#), *Building construction — Jointing products — Classification and requirements for sealants*

[ISO 13640](#), *Buildings and civil engineering works — Sealants — Specifications for test substrates*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in [ISO 6927](#) apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Principle

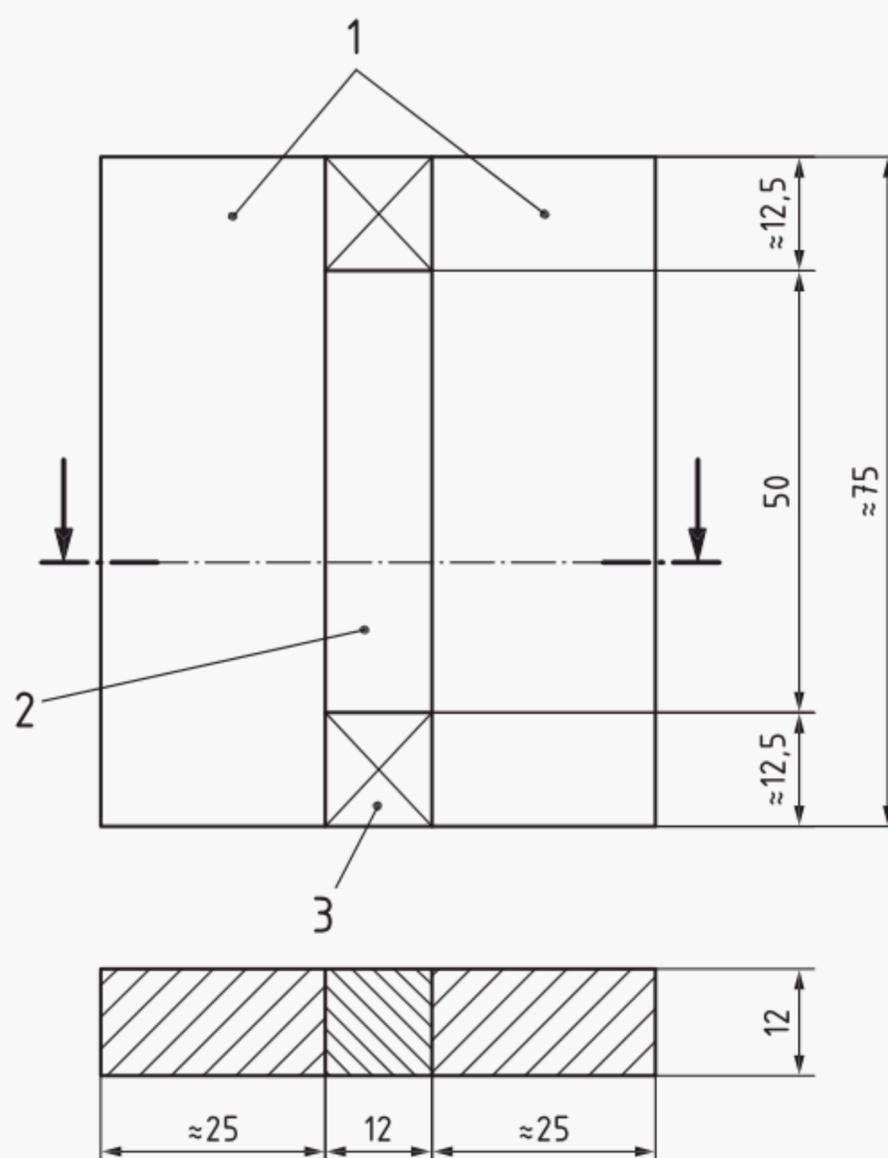
Test specimens are prepared in which the sealant to be tested adheres to two parallel contact surfaces. After immersion of the test specimens in water under defined conditions, they are subjected to repeated extension and compression movements in a suitable device, at an amplitude which is 50 % of that used in the test to assess the respective movement accommodation factor. This procedure is repeated a number of times, or until failure of one or more test specimens is observed. The number of repetitions of water immersion followed by extension/compression movement is related to the expected water resistance in service.

Water immersion may be carried out either at ambient temperature (23 °C), or at elevated temperature (40 °C or 50 °C) to accelerate the influence of the exposure to water.

c) trim the sealant surface so that it is flush with the faces of the substrates and spacers.

Set the test specimens on the edge of one of the substrates and remove the anti-adherent substrate as soon as possible. Let the specimens rest in this position to allow curing or optimum drying of the sealant. Maintain the spacers in place during conditioning.

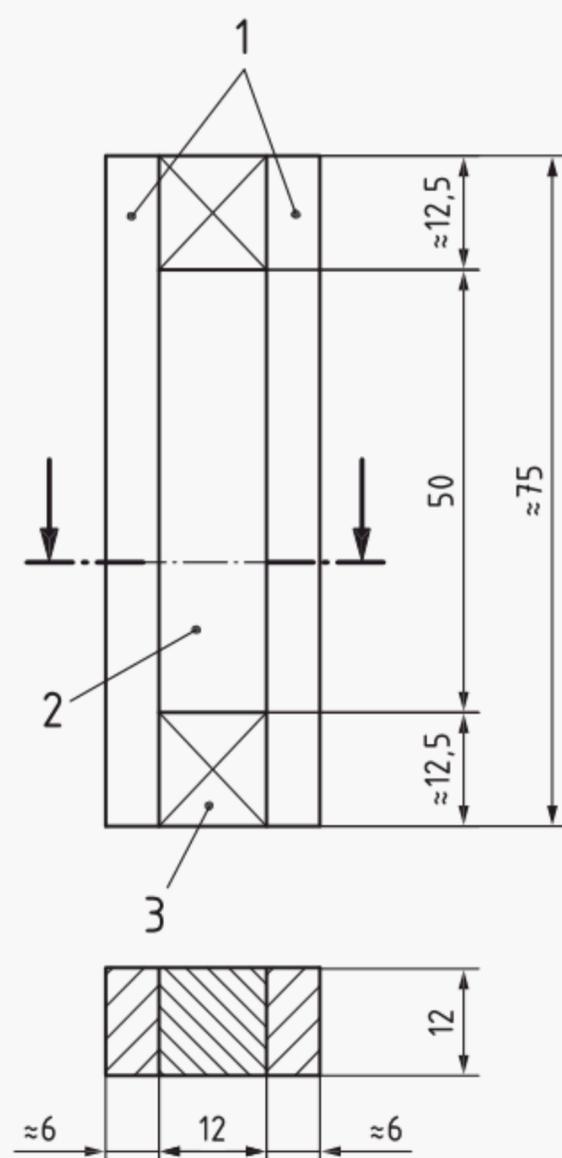
Dimensions in millimetres



**Key**

- 1 mortar substrates
- 2 sealant
- 3 spacer (5.2)

**Figure 1 — Test specimen with mortar substrates**



**Key**

- 1 aluminium or glass substrates
- 2 sealant
- 3 spacer (5.2)

**Figure 2 — Test specimen with anodized aluminium or glass substrates**

## 7 Conditioning

### 7.1 General

Condition the test specimens in accordance with either method A or method B, as agreed between the parties concerned.

### 7.2 Method A

Condition the test specimens for 28 days at  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 10) \%$  relative humidity.

### 7.3 Method B

Condition the test specimens according to method A and then subject them three times to the following storage cycle:

- a) 3 days in the oven (5.4) set at  $70 ^\circ\text{C}$ ;
- b) 1 day in the container (5.5) filled with distilled water maintained at  $23 ^\circ\text{C}$ ;
- c) 2 days in the oven (5.4) set at  $70 ^\circ\text{C}$ ;

d) 1 day in the container (5.5) filled with distilled water maintained at 23 °C.

Alternatively, this cycle may be performed in the order c), d), a) then b).

NOTE Method B is a commonly used conditioning procedure using the influence of heat and water. It is not suitable for giving information on the durability of the sealant.

## 8 Procedure

### 8.1 Water immersion

After conditioning, remove the spacers and store the test specimens for 3 weeks in the container (5.6) filled with distilled water maintained at 23 °C, 40 °C or 50 °C. At the end of the period of immersion, remove the test specimens from the water and store them for 1 h at  $(23 \pm 2)$  °C and  $(50 \pm 10)$  % relative humidity.

### 8.2 Cyclic movement

The movement accommodation factor for the sealant shall be determined by the method of [ISO 9046](#) or [ISO 9047](#), as appropriate by reference to [ISO 11600](#).

The amplitude of the extension/compression cycle in the test machine (5.6) shall be 50 % of the movement capability classification according to [ISO 11600](#).

The speed of extension and compression used in the cyclic test procedure shall be  $(5,5 \pm 0,5)$  mm/min and the amplitude  $\pm 6,25$  %,  $\pm 10$  % or  $\pm 12,5$  % of the nominal width, or as required. The procedure shall be carried out at  $(23 \pm 2)$  °C and  $(50 \pm 10)$  % relative humidity.

First extend the test specimens by the requisite amount and maintain this extension for 24 h. Then release the extension and compress the test specimens to the requisite amount. Maintain this compression for 24 h.

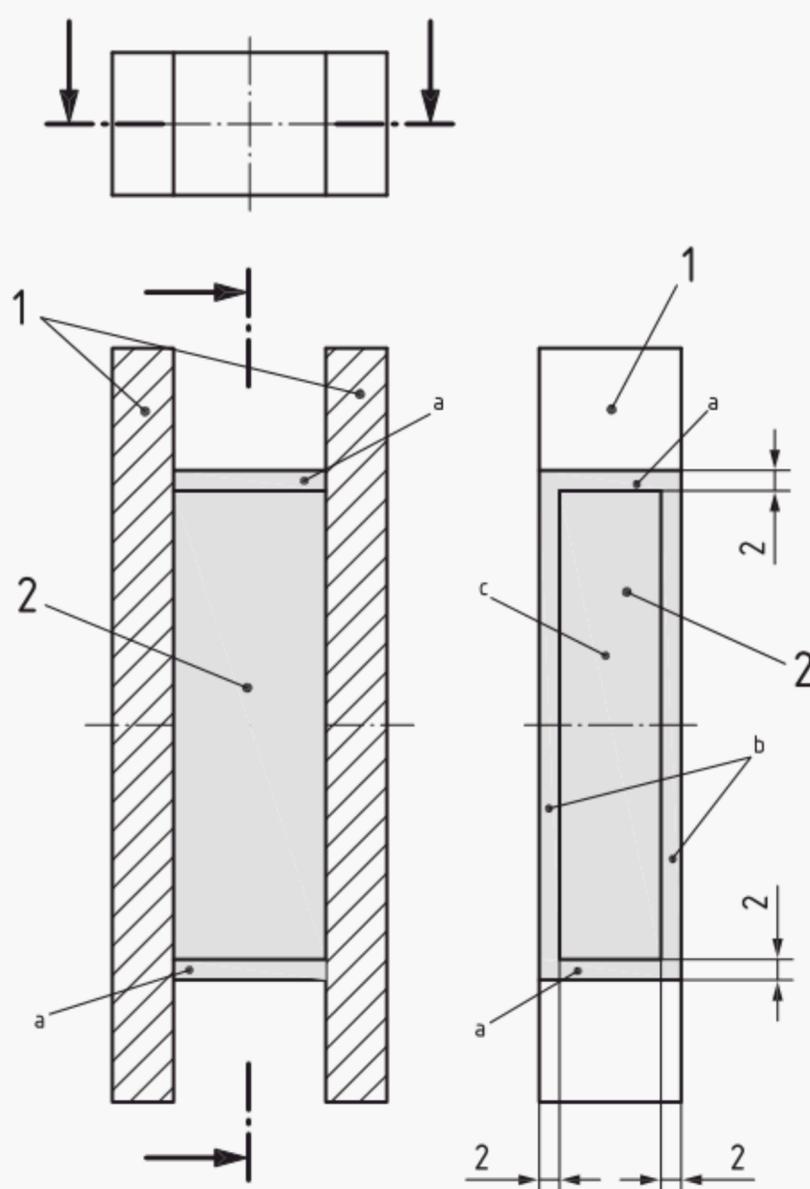
Repeat this extension/compression procedure twice. At the conclusion of the third cycle, release the compression and allow the specimens to recover for 1 h in air at  $(23 \pm 2)$  °C.

### 8.3 Visual inspection

Carefully examine the test specimens for any loss of cohesion or adhesion. Measure the depth of any adhesive or cohesive failures using a suitable measuring device (5.10) capable of reading to 0,5 mm.

Because of the excessive stress experienced by the sealant near the ends of the test specimens, during both the preparation and testing, loss of adhesion or cohesion observed within the excluded volume  $2 \text{ mm} \times 12 \text{ mm} \times 12 \text{ mm}$ , at either or both ends of the sealant, shall not be reported as a failure (see [Figure 3](#)).

If loss of adhesion or cohesion in the depth of the sealant exceeds 2 mm, anywhere on the sealant surface, the sealant test specimen has failed (see [Figure 3](#)).



**Key**

- 1 substrates
- 2 sealant
- a Zone A: Failure in the excluded volume 2 mm × 12 mm × 12 mm is allowed and not reported.
- b Zone B: For Subclass E sealants, failure ≤2 mm is allowed, but reported with the test results.
- c Zone C: For Subclass E sealants, failure extending from the sealant surface into this region (i.e. >2 mm deep) is not allowed. The test specimen fails and the failure is reported with the test results.

NOTE Loss of adhesion or internal voids observed solely in Zone C (e.g. as seen through a glass substrate) are not reported in the test report as failures, but mentioned as general observations with the test results.

**Figure 3 — Sections through sealant test specimen**

**8.4 Repeat of water immersion and cyclic movement**

If none, or only one, of the five specimens shows loss of adhesion or cohesion in the depth of the sealant exceeding 2 mm, all the specimens shall be returned to storage in distilled water at the same temperature as for the first immersion. Then repeat the procedures described in 8.1 to 8.3 and record the results of the visual inspection.

This procedure shall be repeated at least 3 times and as many times as agreed between the parties concerned, or until two or more specimens show loss of adhesion or cohesion in the depth of the sealant exceeding 2 mm, after repetition of the water immersion and cyclic movement procedures.

## 9 Test report

The test report shall make reference to this document and shall include the following information:

- a) name and type of sealant;
- b) batch of sealant from which the test specimens were prepared, if known;
- c) nature of the substrates ([5.1](#));
- d) the primer used, if applicable;
- e) the mixing ratio for multi-component sealants;
- f) the method of conditioning used (see [Clause 7](#));
- g) the temperature of the water used for immersion of the test specimens (see [8.1](#));
- h) the amplitude of extension/compression used (see [8.2](#));
- i) the total number of cycles of water immersion followed by extension/compression to which the test specimens were subjected;
- j) the results of the visual inspection of all the test specimens tested at the end of each of the test cycles carried out; i.e. whether any breaks in the sealant occurred and, if so, the type of failure (adhesion or cohesion);
- k) any deviations from the specified test conditions.

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