BS EN 15434-1:2023

BSI Standards Publication

Bonding sealants

Part 1: Bonded glazing sealants for direct light exposure

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National foreword

This British Standard is the UK implementation of EN 15434-1:2023. It supersedes BS EN 15434:2006+A1:2010, which is withdrawn.

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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Mastics de collage - Partie 1 : Mastics de scellement et/ou de collage en exposition direct à la lumière

Klebende Dichtstoffe - Teil 1: Klebende Dichtstoffe für Glaskonstruktionen

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European foreword

This document (EN 15434-1:2023) has been prepared by Technical Committee CEN/TC 349 "Sealants for joints in building construction", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by October 2023, and conflicting national standards shall be withdrawn at the latest by October 2023.

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

This document supersedes EN 15434:2006+A1:2010.

The main changes compared to the previous edition are listed below:

— clauses prepared for the purposes of the Construction Products Directive (CPD) were deleted;

— updated technically and improved editorially.

This document is one part of the product European Standards within the EN 15434 series on *Bonding sealants.*

This document is one of a series of interrelated standard parts dealing with:

— glass products for bonded sealant glazing systems;

— installation of glass products in a bonded manner on building facades;

— bonding sealants.

The interrelated parts are:

— EN 13022-1, *Glass in building — Structural sealant glazing — Part 1: Glass products for structural sealant glazing systems for supported and unsupported monolithic and multiple glazing*;

— EN 13022-2, *Glass in building — Structural sealant glazing — Part 2: Assembly rules.*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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1 Scope

This document covers the requirements for, and testing of sealants for use in one or more of the following applications:

a) Manufacturing of insulating glass units where direct ultraviolet resistance and mechanical resistance (bonding use) of the insulating glass edge seal are required;

b) Manufacturing of factory-made bonded sealant glazing elements when referred to by the relevant European Standards and/or European Technical Approval Guidelines;

c) Assembling of glass products into or onto supports, where also direct ultraviolet resistance and/or mechanical resistance (bonding use) of the seal are required, under controlled environmental conditions as described in EN 13022-2.

This document covers the evaluation of conformity and the factory production control with respect to the production of sealants in conformity with this document.

This document describes the role of sealants that are in conformity with this document, with respect to sealing and bonding.

This document does not apply to sealants for the manufacture of insulating glass units where the seal is fully protected, i.e. by a frame, from ultraviolet radiation.

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.

EN 572-1:2012+A1:2016, *Glass in building - Basic soda-lime silicate glass products - Part 1: Definitions and general physical and mechanical properties*

EN 572-2, *Glass in building - Basic soda lime silicate glass products - Part 2: Float glass*

EN 1279-1, *Glass in Building - Insulating glass units - Part 1: Generalities, system description, rules for substitution, tolerances and visual quality*

EN 1279-4:2018, *Glass in Building - Insulating Glass Units - Part 4: Methods of test for the physical attributes of edge seal components and inserts*

EN ISO 6927, *Buildings and civil engineering sealants - Vocabulary (ISO 6927)*

EN 13022-1, *Glass in building - Structural sealant glazing - Part 1: Glass products for structural sealant glazing systems for supported and unsupported monolithic and multiple glazing*

EN 13022-2, *Glass in building - Structural sealant glazing - Part 2: Assembly rules*

EN ISO 527-3:2018, *Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:2018)*

EN ISO 868, *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868)*

EN ISO 1183-1, *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1)*

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EN ISO 4892-2, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2)*

EN ISO 7389:2003, *Building construction - Jointing products - Determination of elastic recovery of sealants (ISO 7389:2002)*

EN ISO 8339:2005, *Building construction - Sealants - Determination of tensile properties (Extension to break) (ISO 8339:2005)*

EN ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227)*

EN ISO 10563, *Buildings and civil engineering works - Sealants - Determination of change in mass and volume (ISO 10563)*

EN ISO 11358-1:2022, *Plastics - Thermogravimetry (TG) of polymers - Part 1: General principles (ISO 11358-1:2022)*

EN ISO 11600, *Building construction - Jointing products - Classification and requirements for sealants (ISO 11600)*

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2)*

EN 16759, *Bonded Glazing for doors, windows and curtain walling - Verification of mechanical performance of bonding on aluminium and steel surfaces*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 11600, EN 13022-1, EN 13022-2, EN 1279-1 and EN ISO 6927 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
cure
irreversible transformation of a sealant from a liquid or paste-like state into a hardened or rubber-like solid state

3.2
initial cure
stage in the curing where sealant has appropriate cohesive strength to resist to different levels of action/loads

3.3
bonding
joining elements with as result transfer of imposed loads (permanent or variable actions) to the support frame

3.4
significant change
variation in performance beyond the permitted tolerance for the characteristic

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3.5
sealing
making gas and water tight

3.6
failure patterns
state when a sealant in a joint no longer performs its intended function. Can be cohesive (in the body of the sealant), adhesive (at the interface between sealant and substrate), boundary/thin film (in a portion of a joint very close to the interface between sealant and substrate)

3.7
breaking stress
breaking stress of each sample shall be calculated using the maximum force and the measured dimensions of this sample; these values are then used to determine the average value of X_{mean} and $R_{u,5}$ stress at the maximum value

3.8
design elongation
maximum relative elongation, corresponding to the linear and elastic recovery domain

[SOURCE: EN 13022-2]

3.9
design stress
design stress in tension (σ_{des}) or in shear (Γ_{des})

[SOURCE: EN 13022-2]

4 Apparatus and substrates

4.1 Substrate

For preparation of the specimens as defined in Annex A. The substrate material shall be flat float glass in accordance with EN 572-1:2012+A1:2016 and EN 572-2 to be used as standard glass substrate unless otherwise indicated in the various clauses.

4.2 Spacers

Cross section (12 mm x 12 mm) with anti-adherent surface.

4.3 Anti-adherent substrate

For the preparation of the test specimens, e.g. polyethylene (PE) film, according to the advice of the sealant manufacturer (see EN ISO 8339:2005, 5.3).

4.4 Tensile test machine

A test machine with recording device, for direct pull tensile force test at a rate of (5,5 ± 0,5) mm/min and with suitable capacity and sensitivity for the tests.

4.5 Separator and clamps

Clamps with appropriate dimensions to hold the test specimens extended or compressed to various % of the original width or any other width agreed between the parties concerned. The fitting should not exert any bending force (axial movement only).

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4.6 Oven

Air circulating oven with mechanical ventilation (open valve), capable of controlling the temperature to within ± 2 °C.

4.7 Conditioning chambers

Conditioning chamber suitable for controlling the temperature to (60 ± 2) °C and RH to (85 ± 10) %.

Cold Chamber capable of controlling the temperature to (−20 ± 2) °C or optionally (−40 ± 2) °C or (−30 ± 2) °C.

Artificial ageing chamber capable of exposing test pieces to water and radiation.

4.8 Container

Recipient used for immersion in distilled water with the ability to keep the water temperature constant at ± 1 °C.

4.9 Artificial light source

The artificial source shall be Xenon lamps in accordance with EN ISO 4892-2.

The power of the artificial light source shall be (60 ± 5) W/m² measured at the level of the sample, and between 300 and 400 nm. The irradiance shall not vary by more than ± 10 % over the whole specimen exposure area. The temperature at the level of the surface of the test specimen shall be of (60 ± 5) °C, measured by a black panel thermometer. The black panel thermometer shall be used with a blackened absorbing metal plate that approximates the absorption characteristics of a “black body”. The plate shall be at least 1 mm thick and of a size to fit the test specimen holders. The temperature of the metal plate is measured by a suitable thermometer or thermocouple with good thermal contact. For measuring the test temperature, it shall be mounted in a test specimen holder with the blackened side of the metal plate facing the artificial light source. Readings shall only be taken after sufficient time has elapsed for the temperature to become steady. In case a black standard panel is used instead of a black standard thermometer, it shall be validated at the beginning of the test that an equivalent temperature can be made sure.

5 Requirements sealant

5.1 General

For conformity purposes, the sealant manufacturer shall describe the product in a product description, which will be part of the factory production control documentation, or of the quality insurance system, whichever is applied.

Disclosure of the product description is entirely at the discretion of the sealant manufacturer or his agent.

The product description shall contain at least a normative part and may contain an informative part when the manufacturer foresees further development of the product.

The product description shall be prepared under the responsibility of the sealant manufacturer or his agent.

Sealants are described by the tests given in 5.2, 5.3 and 5.4. The same conditioning procedure shall be used in all relevant test methods except where mentioned.

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5.2 Identification

5.2.1 Description

The description consists of three sub parts:

1) Component description:

   name and/or type of the sealant, together if it concerns a mono or a multiple components sealant. In the case of a multiple components sealant, the mixing ratio and the tolerances of the mixing ratio within which the performances of the characteristics and properties do not change significantly;

2) Initial cure information:

   relevant data (or figure or values) depending on the temperature and the relative humidity, the chemistry of the curing system, number of components, section of the sealant to be applied, the nature of the adhesion surfaces …;

3) Cured sealant description:

   list of identification test results in accordance with 5.2 in order to ensure no significant change in the characteristics, properties and durability of the sealant.

The definition of product families shall be consistent with the normative part of the product description. The substitution of raw materials or change in the process shall maintain the conformity with the product description. The substituting material can be added to the product family and also the product description when compliance has been demonstrated.

5.2.2 General

All tests of 5.2 except 5.2.6 are carried out on cured products. When no conditioning procedure (cure) has explicitly been stated by the sealant manufacturer, use only method A or method B as described in EN ISO 8339. For multiple components sealants the tests shall be performed at the nominal mixing ratio as defined in 5.2.

5.2.3 Thermogravimetric analysis

The determination of the thermogravimetric analysis shall be carried out following EN ISO 11358-1:2022, 8.2, “Temperature scanning mode” according to the following specific conditions:

— conditioning before testing: at least 1 day at standard laboratory conditions;

— purging gas: nitrogen and synthetic air respectively, with flow rate approximately 100 ml/min, depending on equipment;

— sample size: approximately 50 mg;

— heating rate: 20 K/min;

— heating mode: heating up from 40 °C to minimum 900 °C in nitrogen flow, then 10 min isotherm at 900 °C in synthetic air flow.

The rate of heating shall not change during significant weight loss. In cases where the given method departs from this requirement, the method shall be adapted to prevent this.

Number of test specimens: 1.

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Evaluation:

— oxidative or non-oxidative conditions;

— curve and the first derivate of the curve;

— the percentage of cumulative losses up to 900 °C;

— zones of maximum loss through volatilisation;

— exo- or endothermic conversion zones.

5.2.4 Density

The determination of the density on three fully cured specimens shall be in accordance with EN ISO 1183-1.

5.2.5 Hardness

The determination of the indentation hardness shall be in accordance with EN ISO 868. The test shall be performed on the cured sealant after (28 ± 3) days for single component sealant and after seven days for two-component sealants.

At least three samples shall be tested and five measurements taken per sample. The average value and tolerances of all measurements, recorded to the nearest unit, shall be declared.

5.2.6 Change in volume or shrinkage

The aim of this test is to evaluate the degree of change of volume or shrinkage of the bonding sealants to limit the initial stresses in the bonding joints. The test shall be carried out on three samples in accordance with EN ISO 10563 using a mechanically ventilated oven. Shrinkage shall be less than 10 %.

5.2.7 Elastic modulus of the sealant

The aim of this test is to provide the (stress, strain) values needed to allow determining a linear approximation of the elastic modulus E (Young modulus). This value can subsequently be used for calculations in related application standards.

The test shall be carried out on five test samples prepared in conformity with EN ISO 527-3:2018, 6.1, type 5 with all the dumbbell test specimens having a thickness of (2,2 ± 0,2) mm. Speed of the traction: (5,5 ± 0,5) mm/min. All other parameters of the test procedure follow EN ISO 527-1.

From the stress-at-elongation graph recorded, the following shall be noted:

— stress at elongations of 5 %, 10 %, 15 %, 20 % and 25 %;

— stress and elongation at rupture.

5.2.8 Elastic recovery

The purpose of the test is to evaluate the elastic recovery behaviour and consequently the relaxation behaviour after long term loading.

The test shall be carried out on three test specimens in accordance with EN ISO 7389:2003, method A using an imposed elongation equal to (2x the design elongation). Adapted equipment should be used to ensure adequate accuracy of measurement better than or equal to 0,1 mm.

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