

Methods of test for mortar for masonry —

Part 9: Determination of workable life and correction time of fresh mortar

The European Standard EN 1015-9:1999, incorporating amendment A1:2006, has the status of a British Standard

ICS 91.100.10

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 1015-9:1999, incorporating amendment A1:2006. It is included in a package of standards relating to masonry mortar and rendering and plastering mortar which supersedes the following British Standards which are withdrawn.

BS 4551-1:1998, *Methods of testing mortars, screeds and plasters — Part 1: Physical testing*;

BS 4721:1981, *Specification for ready-mixed building mortars*;

BS 5838-2:1980, *Specification for dry packaged cementitious mixes — Part 2: Prepacked mortar mixes*.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\overline{A1}$ $\overleftarrow{A1}$. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by $\overline{A1}$ $\overleftarrow{A1}$.

The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated testing, to Subcommittee B/519/2, Mortar.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 November 1999

Amendments issued since publication

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English version

Methods of test for mortar for masonry — Part 9: Determination of workable life and correction time of fresh mortar

Méthodes d'essai des mortiers pour maçonnerie —
Partie 9: Détermination de la période d'ouvrabilité
et du temps ouvert du mortier frais

Prüfverfahren für Mörtel für Mauerwerk —
Teil 9: Bestimmung der Verarbeitbarkeitszeit und der
Korrigierbarkeitszeit von Frischmörtel

This European Standard was approved by CEN on 8 July 1999.

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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

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125, Masonry, the Secretariat of which is held by BSI.

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 2000, and conflicting national standards shall be withdrawn at the latest by December 2001.

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Foreword to amendment A1

This document (EN 1015-9:1999/A1:2006) has been prepared by Technical Committee CEN/TC 125 “Masonry”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 1015-9:1999 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

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1 Scope

This European Standard specifies methods for determining the workable life and correction time of freshly mixed mortars (in the following referred to as fresh mortars).

Method A is a method for the determination of the workable life of general purpose masonry or rendering mortars, including those containing mineral binders and both dense and lightweight aggregates.

Methods B and C are methods for the determination of the workable life and correction time for thin-layer mortars.

2 Normative references

^[A1] 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. ^[A1]

^[A1] EN 771, ^[A1] *Specification for masonry units.*

^[A1] EN 998-1, ^[A1] *Specification for mortar for masonry — Part 1: Rendering and plastering mortar with inorganic binding agents.*

^[A1] EN 998-2, ^[A1] *Specification for mortar for masonry — Part 2: Masonry mortar.*

EN 1015-2, *Methods of test for mortar for masonry — Part 2: Bulk sampling of mortars and preparation of test mortars.*

EN 1015-3:1998, *Methods of test for mortar for masonry — Part 3: Determination of consistence of fresh mortar (by flow table).*

3 Principle

The workable life of a sample of fresh mortar, initially brought to a defined flow value, is measured by the time in minutes at which it reaches a defined limit of stiffness or workability during a defined type test.

4 Apparatus

4.1 Apparatus for Method A — Workable life of general purpose mortar

4.1.1 *A weighing instrument*, preferably with a tare device, reading to at least 15 kg with graduations of not greater than 100 g.

4.1.2 *Disposable, rigid and open topped moulds or containers*, with an internal diameter of not less than 75 mm and 50 mm to 100 mm high.

4.1.3 *A stop clock.*

4.1.4 *A penetration rod*, consisting of a round brass rod, approximately 5 mm in diameter and with a total length of approximately 65 mm, its lower end enlarged to a diameter of $6,175 \text{ mm} \pm 0,025 \text{ mm}$ over a length of $25 \text{ mm} \pm 0,25 \text{ mm}$ and with the penetrating face flat at right angles to the length of the rod.

4.1.5 *A loosely fitting brass washer*, approximately 20 mm in external diameter, rests on the stop formed at the change in diameter of the rod. The rod is held vertically in a device such as a lever type drill stand that enables it to be lowered vertically in a controlled and steady manner over a distance of at least 40 mm. (See Figure 1.)

4.1.6 *A palette knife.*

4.1.7 *A trowel.*

4.2 Apparatus for Method B — Workable life of thin-layer mortar

4.2.1 *A flow table*, in accordance with EN 1015-3.

4.2.2 *A trowel.*

4.2.3 *A palette knife.*

4.3 Apparatus for Method C — Correction time of thin-layer mortar

4.3.1 *Masonry units*, of the material to be used in practice as substrate for the actual thin-layer mortar.

4.3.2 *A weighing instrument*, accurate to 0,1 % of the mass of the weighed masonry unit.

4.3.3 *A ventilated oven*, capable of maintaining temperatures of $105 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$, $70 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ and $60 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ respectively.

4.3.4 *A trowel.*

4.3.5 *A palette knife.*

4.3.6 *A storage chamber*, capable of maintaining a temperature of $20 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and a relative humidity of $65 \% \pm 5 \%$.

5 Sampling, preparation and storage of test samples

The fresh mortar for this test shall have a minimum volume of 1,5 l or at least 1,5 times the quantity needed to perform the test, whichever is the greater, and shall be obtained either by reduction of the bulk test sample (see EN 1015-2) using a sample divider or by quartering or by preparation from dry constituents and water in the laboratory. The flow value of the mortar in the bulk test sample shall be determined in accordance with EN 1015-3 and reported.

Laboratory mixed samples shall, before testing, be brought to a defined flow value as specified in EN 1015-2.

Ready to use mortars (factory-made wet mortars which are retarded), and pre-batched air-lime/sand wet mortars when not gauged with hydraulic binders, shall be tested within their specified workable life.

The length of mixing period shall be measured from the moment all constituents are introduced into the mixer.

Before testing, the batch shall be gently stirred by hand using a trowel or palette knife for 5 s to 10 s to counteract any false setting etc., but without any additional mixing of the batch.

Any deviation from the mixing procedure shall be noted.

Two test samples shall be tested.

6 Method A — Workable life of general purpose mortar

6.1 General

The workable life of the fresh mortar is measured by the time in minutes at which it reaches a defined limit of resistance to penetration of a standard rod forced into it.

6.2 Procedure

Fill sufficient moulds with test mortar and any control mix to provide adequate area of surface for the required number of penetrations of the rod. Fill each mould in about 10 increments, minimizing excess mortar to be struck off, and tapping the mould on the bench four times after each increment. Strike off the surface plane and level with the top of the mould using a palette knife.

Store the filled moulds in air at a temperature of $20\text{ °C} \pm 2\text{ °C}$ and a relative humidity of not less than 95 %, e.g. in a sealed polyethylene bag.

Place a mould on the scale under the penetration rod so that the portion of the sample surface immediately beneath the rod is at least 20 mm from the rim of the mould or from the position of any previous penetrations. Adjust the tare device or record the mass of the filled mould. By means of the lever on the drill stand, lower the penetration rod slowly into the sample until the loose washer just touches the surface (see Figure 1).

Note the reading of the scale in kilograms. Correct this reading, if necessary, for the mass of the filled mould, and then divide it by 3 to express the resistance to penetration in N/mm^2 .

For a non-retarded mortar measure the resistance to penetration at intervals of 15 min, starting at 30 min before the declared workable life, until it exceeds the prescribed limit of resistance (see 6.3).

For retarded mortars, check the penetration intermittently, at convenient times, until the resistance starts to increase, then proceed as described above.

6.3 Calculation and expression of results.

Measure the workable life from the completion of either the addition of water to the dry constituents, or the addition of cement or gypsum to a wet mix of lime and/or sand as follows.

Determine the time in minutes, rounded to the nearest minute, to give the resistance to penetration of $0,5\text{ N/mm}^2$ by interpolation of the results immediately below and above this figure.

Calculate the mean value from the individual values of each mortar test sample, all values rounded to the nearest minute. The mean value is the workable life of the mortar.

7 Method B — Workable life of thin-layer mortar

7.1 General

The workable life is measured by the time in minutes at which the flow value of the mortar differs by 30 mm from the initial flow value determined 10 min after mixing the batch.

7.2 Procedure

Determine the flow value, in accordance with clause 6 of EN 1015-3:1998 at intervals of 15 min.

During the test period keep the mortar in a bucket, covered with a moist cloth, and stored in air at a temperature of $20\text{ °C} \pm 2\text{ °C}$. Before each test the mortar mix may be given an additional mixing by hand.

7.3 Calculation and expression of results

Determine the time in minutes, rounded to the nearest minute and measured from the time of completion of the mixing, that the flow value of the mortar differs by 30 mm from the initial flow value determined 10 min after mixing, by interpolation of the results immediately below and above this figure.

Calculate the mean value from the individual values of each mortar test sample, all values rounded to the nearest minute. The mean value is the workable life of the mortar.

8 Method C — Correction time of thin-layer mortar

8.1 Principle

The correction time is measured by the time in minutes at which 50 % of the contact surface of a cube, placed on a layer of mortar applied on the specified masonry unit substrate, and then removed, is covered with adhering mortar.

The method is not applicable where perforated masonry units are being used.

8.2 Procedure

Cut cubes with dimensions $50\text{ mm} \times 50\text{ mm} \times 50\text{ mm}$ from the specified masonry units ensuring that the face to be used as the contact face is one from the original bed face.

Before performing the test, dry the prescribed masonry units and cubes in an oven at the temperature shown in Table 1.

Table 1 — Drying temperatures for masonry units and cube specimens

Masonry unit material	Drying temperature °C
Clay Calcium silicate Autoclaved aerated concrete	105 ± 5
Natural stone Aggregate concrete Manufactured stone	70 ± 5
Masonry units with organic constituents	60 ± 5

Consider the masonry units to have reached constant mass if two consecutive weighings, two hours apart during the drying, do not differ by more than 0,2 % of their mass. Then condition the masonry units by storage in air of temperature $20\text{ °C} \pm 2\text{ °C}$ and $65\% \pm 5\%$ relative humidity for two days.

Carry out the test at an air temperature of $20\text{ °C} \pm 2\text{ °C}$ and $65\% \pm 5\%$ relative humidity, by the following procedure.

- a) Apply the thin-layer mortar with a trowel to the contact surface (bed face) of the masonry unit substrates and immediately sweep off $\overline{A_1}$ 10 min \pm 1 min after completion of the mixing of the mortar $\overline{A_1}$.
- b) Apply a 2 mm to 3 mm layer of thin-layer mortar to the surface of the substrate pre-treated as described in a).
- c) Place a cube with contact face (derived from a bed face) on the mortar layer and keep it there for 30 s by applying to it a load of 1,2 kg in the case of masonry units with a density $\geq 1\,000\text{ kg/m}^3$ and a load of 0,5 kg in the case of masonry units with a density $< 1\,000\text{ kg/m}^3$.
- d) Remove the cube perpendicularly from the bed surface and determine the percentage area of the contact surface on the cube covered with adhering mortar to the nearest 10 %.
- e) Repeat c) and d) at intervals of 1 min using a fresh cube until 50 % of the contact surface of a cube is covered with adhering mortar, and record each interval and corresponding percentage area of covered surface. Record the time in minutes. Repeat the procedure a) to e).

NOTE Each time a cube is placed on the masonry unit it should be at least 20 mm away from the site where cubes were placed previously.

8.3 Calculation and expression of results

Calculate the mean value from the individual values of each mortar sample, all values rounded to the nearest minute. The mean value is the correction time of the mortar.

9 Test report

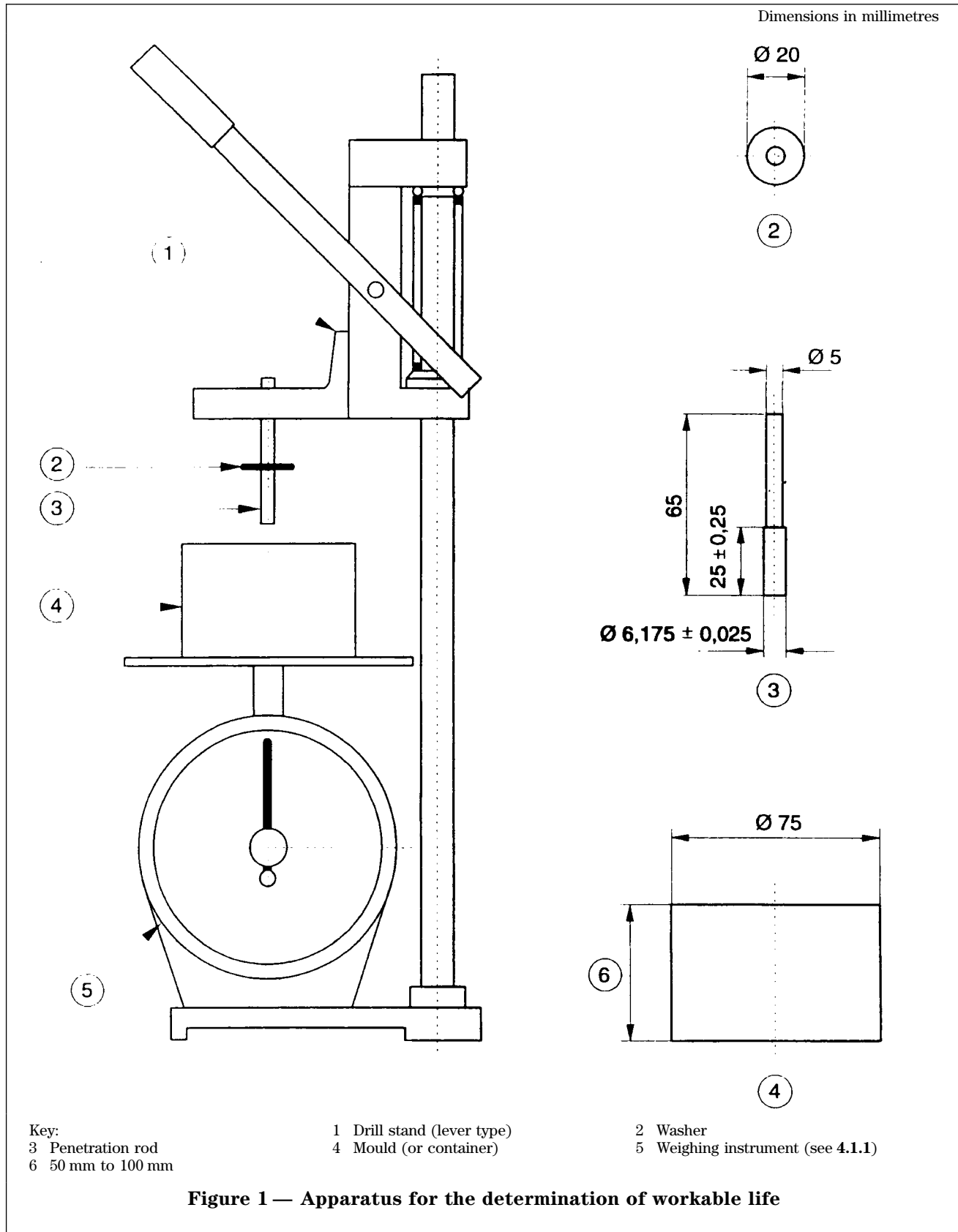
The test report shall include the following information:

- a) the number, title and date of issue of this European Standard;
- b) the place, date and time of taking the bulk test sample¹⁾;

NOTE This is the sample taken from the bulk supply that is to be used for all of the tests in EN 1015.

- c) the method used for taking the bulk test sample (if known) and the name of the organization that took it;
- d) the type, origin and designation of the mortar by reference to the relevant part of $\overline{A_1}$ EN 998; $\overline{A_1}$
- e) the date and time of testing;
- f) preparation (mixing, casting) and storage (curing) conditions;
- g) the date and time of preparing samples for test (i.e. date and time of any mixing, casting, moulding, or demoulding procedure, if appropriate);
- h) type and description of any substrate in accordance with the relevant part of $\overline{A_1}$ EN 771 $\overline{A_1}$ and the initial rate of water absorption, if known;
- i) initial flow value of test mortar in accordance with EN 1015-3;
- j) age of mortar when tested;
- k) total mass of each individual test sample;
- l) test method used (Method A — Workable life of general purpose mortar, Method B — Workable life of thin-layer mortar or Method C — Correction time of thin-layer mortar), and reference limit value of workable life;
- m) test results (individual values and mean value of the workable life of general purpose mortar rounded to the nearest minute; individual values and the mean value of the workable life and the correction time of thin-layer mortar rounded to the nearest minute);
- n) remarks, if any.

¹⁾ This information is contained on the certificate of sampling (see EN 1015-2).



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