BRITISH STANDARD

BS EN
1015-7:1999

Methods of test for mortar for masonry —

Part 7: Determination of air content of fresh mortar

The European Standard EN 1015-7:1998 has the status of a British Standard

ICS 91.100.10

National foreword

This British Standard is the English language version of EN 1015-7:1998. It is included in a package of standards declared by CEN/TC 125 that will partially supersede BS 4551-1, *Methods of testing mortars, screeds and plasters — Part 1: Physical testing*, the corresponding test methods of which, it is intended, will be withdrawn on 30 September 2000 if all the European Standards inlcuded in the package are available.

The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated testing, to Subcommittee B/519/2, Mortar, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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Methods of test for mortar for masonry — Part 7: Determination of air content of fresh mortar

Méthodes d'essai des mortiers pour maçonnerie — Partie 7: Détermination de la teneur en air du mortier frais

Prüfverfahren für Mörtel für Mauerwerk — Teil 7: Bestimmung des Luftgehaltes von Frischmörtel

This European Standard was approved by CEN on 4 September 1998.

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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

Ref. No. EN 1015-7:1998 E

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 April 1999, and conflicting national standards shall be withdrawn at the latest by September 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and includes the performance requirements referred to in the Eurocode for masonry structures.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

1 Scope

This European Standard specifies two methods for determining the air content of fresh mortars including those containing mineral binders and both dense and lightweight aggregates.

Method A "The pressure method" and Method B "The alcohol method".

For air content less than 20 %, method A is applicable. For air content of 20 % or more, method B is applicable.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

prEN 998-1, *Specification for mortar for masonry — Part 1: Rendering and plastering mortar with inorganic binding agents.*

prEN 998-2, *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.*

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

3 Principle

A volume of mortar is placed into a specified measuring vessel. Water is introduced on top of the mortar surface, and by means of applied air-pressure or the use of an alcohol-water mix water is forced into the mortar displacing air from within any pores. The water level falls and reflects the volume of air displaced from the mortar.

4 Symbols

L	air content of mortar (%);
$V_{m,i}$	initial volume of mortar (ml);
$V_{m,f}$	final volume of mortar plus alcohol (ml).

5 Apparatus

5.1 Apparatus for Method A — Pressure method

5.1.1 *Sample container and cover assembly,* comprising a metal bowl (sample container) with a capacity of approximately 1 litre, fitted with a metal cover assembly to which is attached a sealed air chamber (pressure chamber). A pressure gauge for measurement of the applied air pressure (see Figure A.1) is connected to it.

5.1.2 *Tamper*, consisting of a rigid, non-absorptive rod of circular cross-section, approximately 40 mm in diameter and approximately 200 mm long. The tamping face is flat and at right angles to the length of the tamper. The mass of the tamper is 0,250 kg $\pm$ 0,015 kg.

5.1.3 *Trowel.*

5.1.4 *Palette knife.*

5.2 Apparatus for Method B — Alcohol method

5.2.1 *Graduated measuring cylinder*, with a capacity of 500 ml and approximately 50 mm in diameter.

5.2.2 *Rubber bung*, fitting the measuring cylinder.

5.2.3 *Funnel*, fitting the measuring cylinder.

5.2.4 *Trowel.*

5.3 Materials for method B — Alcohol method

Mixture of ethyl alcohol, 60 % by volume, and water, 40 % by volume.

6 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 either be obtained 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 prEN 1015-3 and reported.

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

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 the constituents are introduced into the mixer.

Before testing, the batch shall be gently stirred by hand using a trowel (**5.1.3** or **5.2.4**) or palette knife (**5.1.4**) in 5 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.

7 Method A — Pressure method

7.1 Applicability

This method shall only be used for mortars with declared air contents of less than 20 %.

7.2 Operational principle

A specified pressure is applied in the closed apparatus by means of a hand pump or compressed air line through a valve connection at the top of the apparatus. The cover assembly (**5.1.1**) is fitted with air valves, air bleeder valves, and valves for bleeding off water or through which water may be introduced as necessary for the particular meter design. The cover has machined smooth interior surfaces contoured to provide an air space above the top level of the sample container (**5.1.1**).

The operational principle of this meter consists of equalizing a known volume of air at a known pressure in a sealed air chamber with the unknown volume of air in the mortar sample container, the two chambers being connected through an air valve. The lowered air pressure in the air chamber reflects the air content of the mortar sample and is read from the dial on the pressure gauge, which is calibrated in terms of percentage of air for the observed pressure at which equalization takes place.

7.3 Procedure

Fill the bowl completely with mortar in four approximately equal layers, each layer being compacted by 10 short strokes with the tamper (**5.1.2**), evenly distributed to give a flat mortar surface.

Using the palette knife skim off the excess mortar, leaving the mortar surface plane and level with the top edge of the bowl.

Wipe the outside of the bowl clean and dry and clamp the cover securely in place on the bowl.

Close the main air valve between the air chamber and the sample container (see annex A). Fill the air space under the cover and above the mortar with water through valve A, keeping valve B open until all the air above the mortar surface is expelled.

Pump air into the sealed air chamber until a stabilized pressure is reached equal to that determined in the calibration test (see annex A). Close both valves A and B and open the valve between the air chamber and the sample container. When equilibrium is reached read the air content from the calibrated pressure gauge or from a calibration curve. Record this value to the nearest 0,1 %.

7.4 Calculation and expression of results

Calculate the air content as the mean value from the two individual values of each mortar test sample rounded to the nearest 0,5 %. If the two individual values deviate more than 10 % from their mean value, repeat the test with two additional test samples taken from the reduced bulk test sample, in which case use the individual and mean values of the two additional samples.

8 Method B — Alcohol method

8.1 General

This method shall only be used for mortars with declared air contents of 20 % or more.

8.2 Procedure

Fill the measuring cylinder (**5.2.1**) with approximately 200 ml of mortar using the funnel (**5.2.3**), taking care to avoid creating voids in the mortar. Tap the measuring cylinder to level the mortar surface and record the mortar volume, $V_{m,i}$, to the nearest ml. Pour the mixture of alcohol and water carefully into the measuring cylinder up to the 500 ml mark.

Seal the measuring cylinder with the rubber bung and invert 20 times to obtain a complete dispersion of the mortar in the alcohol-water mixture. Let the mixture settle for 5 min and read the resulting surface level, $V_{m,f}$, to the nearest ml. Repeat this process until two consecutive readings do not differ by more than 1 ml.

8.3 Calculation and expression of results

Calculate the air content, L, of each mortar sample from the following formula to the nearest 0,1 %.

$$L = \frac{(500 - V_{m,f})}{V_{m,i}} \times 100\,\%$$

Calculate the mean value of the two measurements to the nearest 0,5 %. If the two individual air content values deviate from their mean value by less than 10 %, use the mean value as the air content of the mortar. If the two individual values deviate from their mean value by more than 10 %, repeat the test using further mortar from the reduced bulk test sample (see clause **6**) and if the results deviate from their mean value by less than 10 % use the mean value from the repeat test as the air content of the mortar. If the results differ by more than 10 % consider the measurements unsatisfactory and take fresh test samples from the bulk test sample or laboratory prepared mortar and repeat the test.

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 sample[1)];

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 prEN 998;

e) the date and time of testing;

f) preparation (mixing, casting) and storage (curing) conditions;

g) the date and time of preparing test samples for test (i.e. date and time of any mixing, casting, moulding, or demoulding procedure, if appropriate);

h) the flow value of the test mortar determined in accordance with prEN 1015-3;

i) age of mortar when tested;

j) test method used (Method A — Pressure method or Method B — Alcohol method);

k) test results (individual values and mean value of air content);

l) remarks, if any.

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

Annex A (normative)
Calibration of the pressure test apparatus

A calibration curve shall be established between air contents of 0 % and 25 % in increments of 5 %. Each value shall be calculated from the mean value of three measurements according to the following procedure.

Fill the sample container with boiled water, at 20 °C ± 2 °C.

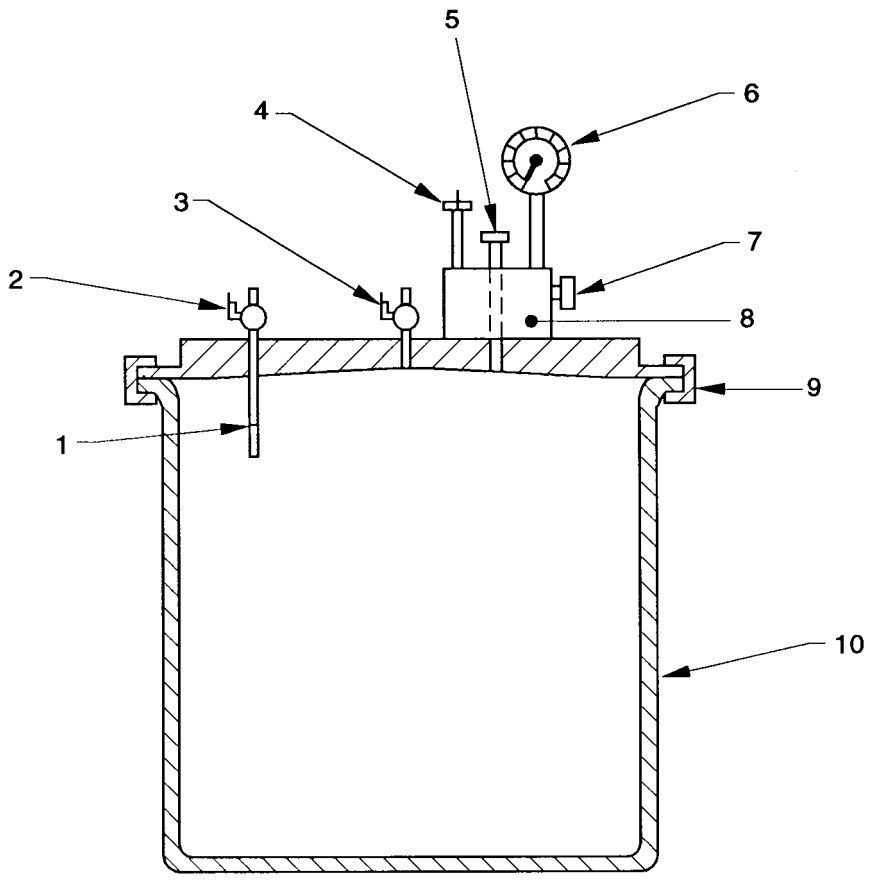
Fix the extension tube to the corresponding valve A (see Figure A.1). Fit the cover and close the air valve between the air chamber and the sample container. Fill the chamber with water through valve A, keeping valve B open, until all air is expelled. Then close valves A and B.

Connect the calibrating vessel to valve A. Pump air into the air chamber until the pressure reaches an initial prescribed level. Then open the air valve to force just a sufficient quantity of water to expel from the sample container and fill the calibration vessel full or to predetermined lines marked on the vessel (10 ml water corresponds to 1 % air content), using valve A to control the flow.

Close valve A and remove the calibration vessel.

Release the air from the apparatus through valve B and then open valve A to drain the extension tube back into the sample container. At this point of the procedure the sample container contains a volume of air corresponding to the predetermined volume of water in the calibration vessel.

Pump air into the air chamber until the pressure reaches the initial prescribed level. Close valves A and B and then open the valve between the air chamber and the sample container. When equilibrium is reached the reading on the pressure gauge should correspond to the percentage of air determined to be in the sample container. If two or more determinations show the same variation from the correct air content, as determined by the volume of water in the calibration vessel, reset the dial hand to the correct air content and repeat the test until the gauge reading corresponds to the calibration air content within 0,1 %.



Key:		1	Extension tubing for calibration checks	2	Valve A
3	Valve B	4	Pump	5	Main air valve
6	Pressure gauge	7	Air bleeder valve	8	Air chamber
9	Clamping device	10	Metal bowl		

Figure A.1 — Schematic diagram of test apparatus showing metal bowl sample container and cover assembly

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