

ICS 91.100.10

Descriptors: masonry work, mortars: materials, tests, determination, bulk density

English version

## Methods of test for mortar for masonry - Part 6: Determination of bulk density of fresh mortar

Méthodes d'essai des mortiers pour maçonnerie - Partie 6:  
Détermination de la masse volumique apparente du mortier  
frais

Prüfverfahren für Mörtel für Mauerwerk - Teil 6:  
Bestimmung der Rohdichte von Frischmörtel

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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Contents	Page
Foreword .....	3
1 Scope .....	4
2 Normative references .....	4
3 Principle .....	4
4 Symbols .....	4
5 Apparatus .....	4
6 Sampling, preparation and storage of test samples .....	5
7 Procedure .....	5
8 Calculation and expression of results .....	7
9 Test report .....	7
Annex A Bibliography (informative) .....	9

## 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of an identical text or by endorsement, at the latest by April 1999, and conflicting national standards shall be withdrawn at the latest by September 2000.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.

## 1 Scope

This European Standard specifies a method for the determining the bulk density of fresh mortars including those containing mineral binders and both dense and lightweight aggregates.

## 2 Normative references

This European Standard incorporates by dated by 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 other 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.

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|-------------|--|
| 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

The bulk density of a fresh mortar is determined by the quotient of its mass and the volume which it occupies when it is introduced, or introduced and compacted in a prescribed manner into a measuring vessel of a given capacity.

## 4 Symbols

$\rho_m$  is the bulk density of fresh mortar in, (kg/m<sup>3</sup>)

$m_1$  is the mass of the empty vessel, (g)

$m_2$  is the mass of the vessel filled with mortar, (g)

$V_v$  is the volume of measuring vessel, (l)

## 5 Apparatus

**5.1 A measuring vessel** comprising a cylindrical bowl with an internal diameter of about 125 mm, made of metal resistant to corrosion by mortar and with sufficient dimensional stability. The capacity of the measuring vessel is approximately 1 l and determined with an accuracy of 0,1 %, and its mass  $m_1$  determined with an accuracy of 1 g.

Note: It is advisable to use the same measuring vessel by which the air content of the fresh mortar is determined (see EN 1015-7).

## **5.2 A palette knife**

## **5.3 A trowel**

## **5.4 A scoop**

**5.5 A vibrating table**, if necessary, operating in vertical direction with a frequency of  $50 \text{ Hz} \pm 1 \text{ Hz}$  and amplitude  $0,375 \text{ mm} \pm 0,050 \text{ mm}$ .

**5.6 A weighing instrument** with a capacity of at least 5 kg and an accuracy of 1 g.

## **6 Sampling, preparation and storage of test samples**

The fresh mortar for this test shall have a minimum volume of 3 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

EN prEN1015-3 and reported.

Laboratory mixed test 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 the constituents are introduced into the mixer.

Before testing, the batch shall be gently stirred by hand using a trowel (5.3) or palette knife (5.2) for 5 - 10 seconds 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 Procedure**

### **7.1 General**

Determine the bulk density of laboratory-mixed test samples with a defined flow value achieved, as specified in Clause 6, in accordance with 7.2.2 unless otherwise specified by the manufacturer.

Determine the bulk density of bulk test samples as specified in table 1 dependent on their consistence in use, observing instructions given by the manufacturer where appropriate.

Note: When testing mortars containing air entraining agents, care should be taken to ensure that the procedure will not influence the air content.

**Table 1 - Procedures for the determination of the bulk density of mortars**

Consistence in use	Flow value mm	Procedure
Stiff mortar	< 140 mm	Test the mortar in accordance with 7.2.1
Plastic mortar	140 mm to 200 mm	Test the mortar in accordance with 7.2.1 or 7.2.2
Soft mortar	> 200 mm	Test the mortar in accordance with 7.2.3

## **7.2 Filling and compaction**

### **7.2.1 Filling and compaction by the vibration method**

Fill the measuring vessel (5.1) with the mortar by means of the scoop (5.4) until the mortar projects above the vessel. Place the vessel on a vibrating table (5.5) as described in clause 5 and vibrate until no further settling can be observed. During the vibration, add further mortar until it projects above the vessel again. Using the palette knife, skim off any excess mortar leaving the mortar surface plane and level with the top edge of the vessel. Wipe the edge clean with a damp cloth.

### **7.2.2 Filling and compaction by the shock method**

Fill the measuring vessel with the mortar by means of the scoop up to about half the height. For compaction of the mortar, tilt the vessel about 30 mm on alternate sides and allow to fall a total of 10 times onto a solid, rigid substrate with a mass of not less than 25 kg. For mortars with air entraining agents reduce the number of shocks to 5.

Then fill the measuring vessel with further mortar to the top edge and compact the mortar in the same manner. Subsequently add mortar till it projects above the edge. Using the palette knife, skim off any excess mortar leaving the mortar surface plane and level with the top edge of the vessel. Wipe the edge clean with a damp cloth.

### **7.2.3 Filling method**

Fill the measuring vessel with the mortar by means of the scoop in such a way that the mortar flows from the centre of the vessel to its outer surface<sup>1</sup>. Add mortar till it projects above the edge. Using the palette knife, skim off any excess mortar leaving the mortar surface plane and level with the top edge of the vessel. Wipe the edge clean with a damp cloth

### **7.2.4 Weighing**

Determine the total mass  $m_2$  of the vessel filled with mortar to the nearest 1 gram.

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<sup>1</sup> This avoids the inclusion of air bubbles

## 8 Calculation and expression of results

Calculate the bulk density of fresh mortar ( $\rho_m$ ) from the following:

$$\rho_m = \frac{m_2 - m_1}{V_v}$$

Calculate the mean value of the two measurements rounded to the nearest 10 kg/m<sup>3</sup>. If the individual values from the two test samples deviate from their mean value by less than 10%, use this mean value as the bulk density 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 bulk density of the mortar. If the results deviate 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<sup>2</sup>;

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) flow value of the test mortar and any control mix determined in accordance with prEN 1015-3;

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<sup>2</sup> This information is contained on the certificate of sampling(see EN 1015-2)

- i) total mass of each individual test sample;
- j) test method used (method of filling and compaction);
- k) test results (individual and mean values of bulk density in  $\text{kg/m}^3$  rounded to the nearest 10  $\text{kg/m}^3$ );
- l) remarks, if any.



**Annex A Bibliography (informative)**

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EN 1015-7      Methods of test for mortar for masonry - Part 7 : Determination of air content of fresh mortar