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## Metode preskušanja zidarske malte - 11. del: Določevanje upogibne in tlačne trdnosti strjene malte

Methods of test for mortar for masonry - Part 11: Determination of flexural and compressive strength of hardened mortar

Prüfverfahren für Mörtel für Mauerwerk - Teil 11: Bestimmung der Biegezug- und Druckfestigkeit von Festmörtel

Méthodes d'essai des mortiers pour maçonnerie - Partie 11: Détermination de la résistance à la flexion et à la compression du mortier durci

Ta slovenski standard je istoveten z: EN 1015-11:2019

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91.100.10 Cement. Mavec. Apno. Malta Cement. Gypsum. Lime.  
Mortar

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

# EN 1015-11

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English Version

## Methods of test for mortar for masonry - Part 11: Determination of flexural and compressive strength of hardened mortar

Méthodes d'essai des mortiers pour maçonnerie -  
Partie 11: Détermination de la résistance en flexion et  
en compression du mortier durci

Prüfverfahren für Mörtel für Mauerwerk - Teil 11:  
Bestimmung der Biegezug- und Druckfestigkeit von  
Festmörtel

This European Standard was approved by CEN on 16 September 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (EN 1015-11:2019) 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of an identical text or by endorsement, at the latest by May 2020, and conflicting national standards shall be withdrawn at the latest by May 2020.

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 1015-11:1999.

The following main changes made to the previous edition include:

- Editorial revision (inversion Clauses 3 and 4, Clause 3, 5.1);
- Clause 6 has changed; time of starting and ending are indicated;
- 7.2.3: An additional type of compaction has been added;
- The storage condition different for air lime mortars and air lime-cement mortars with cement not exceeding 50 % of the total binder mass (Table 1 and Table 2);
- 9.1.2: Tolerance for plate width added.

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, Turkey and the United Kingdom.

**EN 1015-11:2019 (E)****1 Scope**

This document specifies a method for determining the flexural and compressive strength of moulded mortar specimens. This document is applicable to cement/air-lime mortars, air-lime mortars, mortars with hydraulic binders and retarded mortars.

**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 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 998 (all parts), *Specification for mortar for masonry*

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

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

EN ISO 5436-1, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Measurement standards — Part 1: Material measures (ISO 5436-1)*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1)*

**3 Terms, definitions and symbols**

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**3.1 Terms and definitions**

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For the purposes of this document, the following terms and definitions apply.

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

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

**3.1.1****air-lime**

limes mainly consisting of calcium oxide or hydroxide which slowly harden in air by reacting with atmospheric carbon dioxide and generally do not harden under water as they have no hydraulic properties

Note 1 to entry: The definition of air-lime comprises an English translation of a term used in most European countries.

### 3.2 Symbols

- $F$  is the maximum load applied to the specimen, in newtons (N).
- $l$  is the distance between the axes of the support rollers, in millimetres (mm).
- $b$  is the width of specimen, in millimetres (mm).
- $d$  is the depth of the specimen, in millimetres (mm).

## 4 Principle

The flexural strength of mortar is determined by three point loading of hardened moulded mortar specimens to failure. The compressive strength of the mortar is determined on the two parts resulting from the flexural strength test. Where the flexural strength is not required, the parts for compressive strength testing can be produced from the specimens in any way which does not lead to these parts being damaged.

## 5 Apparatus

**5.1 Metal moulds** consisting of an open frame of removable walls forming three compartments when assembled (see Figure 1 for typical design and Annex A for a detailed description).

**5.1.1 Metal moulds for use with mortars with hydraulic binders and air-lime mortars** with mass of air-lime not exceeding 50 % of total binder mass, a typical mould is given in EN 196-1.

**5.1.2 Metal moulds for use with mortars based on air-lime/cement with cement mass** not exceeding 50 % of total binder mass. [/catalog/standards/sist/a10b9a8b-330d-451a-8780-8591b37dce95/sist-en-1015-11-2020](https://catalog/standards/sist/a10b9a8b-330d-451a-8780-8591b37dce95/sist-en-1015-11-2020)

**5.2 Tamper** consisting of a rigid, non-absorptive rod of square cross-section, each side of which is  $(12 \pm 1)$  mm. The tamping face is flat and at right angles to the length of the tamper. The mass of the tamper is  $(50 \pm 1)$  g.

**5.3 Storage chamber** capable of maintaining a temperature of  $20\text{ °C}$  ( $+3\text{ °C}/-2\text{ °C}$ ) and a relative humidity of  $(95 \pm 5)\%$  or  $(65 \pm 5)\%$ .

**5.4 White cotton gauze**, four sheets each with a size of approximately 150 mm x 175 mm.

**5.5 Absorbent filter paper** with a specific mass of  $(200 \pm 20)$  g/m<sup>2</sup> and water absorption capacity of  $(160 \pm 20)$  g/m<sup>2</sup>; twelve sheets each with a size of approximately 150 mm x 175 mm.

The number of filter paper sheets may be increased or decreased to account for lower or higher water absorption capacity.

**5.6 Polyethylene bags** capable of containing the metal moulds.

**5.7 Non-absorptive plates** of sufficient area to cover the metal mould and which can support a mass of 5 kg.

**5.8 Palette knife, or similar metal straight edge.**

**5.9 Metal grid**, providing support for storing and curing the specimens.

## EN 1015-11:2019 (E)

## 5.10 Trowel.

Additional apparatus is described in 8.1 and 9.1.

Dimensions in millimetres

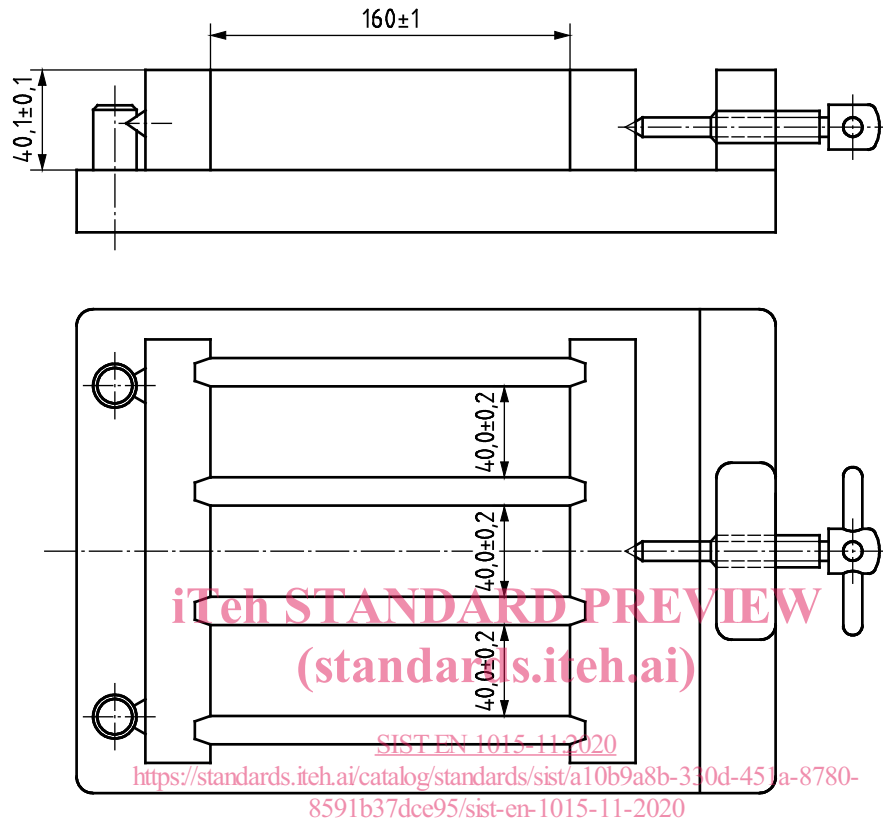


Figure 1 — Typical mould for forming test specimens

## 6 Sampling

### 6.1 General

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 simple divider or by quartering or by preparation from water and the other constituents in the laboratory. Two test samples shall be prepared.

### 6.2 Laboratory prepared mortars

The length of the mixing period shall be measured from the moment all the constituents are introduced into the mixer. The mortar shall be brought to a defined flow value as specified in EN 1015-2 determined in accordance with EN 1015-3 or EN 1015-4 and reported. The test procedure shall start after mixing but shall be concluded within the specified workable life of the mortar (preferably within 30 min after completion of mixing). Before testing, the batch shall be gently stirred by hand using a trowel or palette knife in 5 s to 10 s to counteract any false setting, etc., but without any additional mixing of the batch.



### 6.3 Mortars, other than laboratory prepared mortars

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 used for specimen preparation within their specified workable life.

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.

The flow value of the mortar in the bulk test sample shall be determined in accordance with EN 1015-3 and reported.

## 7 Preparation and storage of test specimens

### 7.1 General

The test specimens shall be specimens 160 mm x 40 mm x 40 mm. Three specimens shall be provided. For the compressive strength test, break the specimens into two halves to provide six half specimens.

### 7.2 Preparation

#### 7.2.1 General

Prepare mortars based on hydraulic binders (retarded or not retarded), and air-lime/cement mortars with mass of air-lime not exceeding 50 % of the total binder mass, in accordance with 7.2.2.

Prepare mortars based on air-lime, and air-lime/cement mortars with cement mass not exceeding 50 % of the total binder mass, in accordance with 7.2.3.

Prepare mortars of unknown composition according to the manufacturer's instructions, in accordance with either 7.2.2 or 7.2.3.

Preparation and storage conditions are given in Tables 1 and 2.

Prepare at least three specimens for testing at an age of 28 d, or more if retarding agents are incorporated in the mortar, unless otherwise specified.

Clean the moulds and lubricate the internal faces of the assembled moulds with a thin layer of mineral based oil that does not affect setting of mortars, to prevent adhesion of the mortar.

#### 7.2.2 Mortars with hydraulic binders, and air-lime/cement mortars with mass of air-lime not exceeding 50 % of the total binder mass

Fill the mould with mortar in two approximately equal layers, each layer being compacted by 25 strokes of the tamper. Alternatively, the mould may be tilted through approximately 30° and tapped ten times, returned to the horizontal and then tilted and tapped a further ten times. The method of compaction shall be reported.

Skim off the excess mortar with a palette knife, or similar metal straight edge, leaving the mortar surface plane and level with the top of the mould. Then store the mould as described in 7.3.

#### 7.2.3 Mortars based on air-lime, and air-lime/cement mortars with cement mass not exceeding 50 % of the total binder mass

Place the assembled mould frame, clamped together at right angles, on a non-absorptive plate on which two layers of dry white cotton gauze have been placed. Fill the mould with mortar in two approximately equal layers, each layer being compacted by 25 strokes of the tamper. Alternatively the mould may be tilted through approximately 30° and tapped ten times, returned to the horizontal and then tilted and tapped a further ten times. The method of compaction shall be reported.