

# **Products and systems for the protection and repair of concrete structures — Test methods — Determination of compressive strength of repair mortar**

The European Standard EN 12190:1998 has the status of a  
British Standard

ICS 91.100.30

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### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 4, an inside back cover and a back cover.

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 February 1999

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English version

## Products and systems for the protection and repair of concrete structures — Test methods — Determination of compressive strength of repair mortar

Produits et systèmes pour la protection et la réparation des structures en béton — Méthodes d'essais — Détermination de la résistance à la compression pour les mortiers de réparation

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken — Prüfverfahren — Bestimmung der Druckfestigkeit von Reparaturmörteln

This European Standard was approved by CEN on 2 October 1998.

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European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Ref. No. EN 12190 1998 E

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104, Concrete (performance, production, placing and compliance criteria), the Secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 1999, and conflicting national standards shall be withdrawn at the latest by April 1999.

This European Standard is one of a series dealing with products and systems for the protection and repair of concrete structures. It describes a method for determining the compressive strength of repair mortar or concrete samples, which can be made using PC (polymer mortars and polymer concretes), PCC (polymer hydraulic cement mortars or concretes) or HC (hydraulic mortars and hydraulic concretes) as defined in EN 1504-1. The method applies to materials with a maximum aggregate size of 8 mm.

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.

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## 1 Scope

This European Standard specifies a method for determining the compressive strength of mortars and concretes for structural and non-structural repair, as defined in EN 1504-1.

The method applies to all types of repair mortar and concrete with a maximum aggregate size of 8 mm. It distinguishes between mortar with hydraulic and polymer binders. Hereafter, the term mortar refers to both mortars and concretes.

NOTE For repair mortars and concretes with aggregate in excess of 8 mm in size, conventional concrete test methods according to prEN 206 are used.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. Normative references are cited at the appropriate places in the text and the relevant 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 this European Standard refers to the latest edition of the publication.

EN 1504, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity.*

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

prEN 206, *Concrete — Performance, production and conformity.*

## 3 Definitions

For the purposes of this standard, the definitions contained in EN 1504-1 apply.

## 4 Principle

For PC, PCC and HC mortar the principle of the test method is to determine the cube compressive strength of 40 mm specimens.

An alternative method is to use the equivalent cube method based on prismatic test specimens of 40 mm × 40 mm × 160 mm in size. For prisms of PC mortar, the compressive strength shall only be determined after preparing the sample by cutting into 40 mm cube specimens.

## 5 Equipment

The following equipment is required.

**5.1 Concrete mixer**, forced action pan type mixer.

**5.2 Mortar mixer**, in accordance with EN 196-1.

**5.3 Moulds**, for producing test specimens, as described in EN 196-1, comprising prismatic moulds 40 mm × 40 mm in cross section and 160 mm in length and 40 mm cube test specimens.

**5.4 Vibrating table**, to compact the mortar, where required.

**5.5 Climatic chambers**, programmable and adjustable.

**5.6 Saw**, with a diamond tipped blade.

**5.7 Balance**, with an upper load limit of not less than 1 kg and a minimum accuracy of 0,01 g.

**5.8 Compressive strength testing machine and jig**, as described in EN 196-1.

## 6 Preparation of test specimens

Use the following mixing technique for preparing the repair mortar. Unless stated otherwise by the manufacturer, use the mortar mixer (5.2), set to a low speed. For PCC and cementitious mortar, add the gauging liquid to the bowl and then add the dry ingredients, mixing for a total period of at least two minutes. For PC mortar, combine the component parts of the mortar in accordance with the manufacturer's instruction, mixing until fully blended and streak-free.

Where manufacturer's instructions preclude use of part bags of material, a concrete mixer (5.1) or other method recommended by the manufacturer shall be used.

NOTE It has been found that certain types of repair mortar can foam excessively under the action of the mixer specified in EN 196-1. An alternative is to use a concrete mixer (5.1).

The mixed material shall be carefully placed into the mould and compacted using a hand tamper or rod as required. Where permitted by the manufacturer, the mortar shall be compacted by vibrating table or other means. Handling and storage of the test specimens before demoulding as well as demoulding of the specimens shall be in accordance with EN 196-1.

After manufacture, the test specimens shall be cured in accordance with annex A.

## 7 Test procedure

### 7.1 Bulk density

Determine the bulk density of three mortar test prisms or six mortar test cubes by weighing them after storage to the nearest 0,1 g. Measure the dimensions of the specimens to the nearest 0,1 mm. Calculate the bulk density  $\rho$  to the nearest 10 kg/m<sup>3</sup> using the equation:

$$\rho = \frac{w}{v}$$

where:

$w$  is the mass of the prism or cube in kilogrammes;

$v$  is the volume of the prism or cube in cubic metres.

Calculate the mean value and standard deviation of the density to the nearest 10 kg/m<sup>3</sup>.

The water displacement method described in prEN 206 shall be used for HC mortar that is cured under water, or as an alternative method for PCC or PC mortars which have a low water absorption of less than 1%. Calculate the mean value and standard deviation to the nearest 10 kg/m<sup>3</sup>.

## 7.2 Compressive strength

Prepare the PCC and cementitious mortar prisms by cutting or breaking into equal halves by suitable means which does not subject the specimens to harmful stresses. For PC prisms, cube specimens shall be prepared by cutting with a saw (5.6).

Determine compressive strength of six cube or prism end specimens in accordance with EN 196-1 for each age required.

The age of the mortar at the time of testing shall be as defined in the EN 1504 series, and shall be as a minimum 7 days and 28 days for HC and PCC and 7 days for PC.

The compressive strength  $R_c$ , in newton per square millimetre, shall be calculated to the nearest 0,5 N/mm<sup>2</sup> using the following equation:

$$R_c = \frac{F_c}{A}$$

where:

- $F_c$  is the maximum load at failure, in newton;
- $A$  is the test area, of 1600 mm<sup>2</sup>.

Calculate the mean value and standard deviation, to the nearest 0,5 N/mm<sup>2</sup>.

## 8 Test report

The test report shall include the following information:

- a) a reference to this European Standard;
- b) name and address of the testing laboratory;
- c) identification number of the test report;
- d) name and address of the organization or the person who ordered the test;
- e) name and address of the manufacturer or supplier of the product;
- f) name or other identification marks on the product;
- g) date of supply of the product;
- h) date of manufacture of the test specimens, the maximum aggregate size, the compaction method used and the dimensions of the specimen;
- i) date of test;
- j) curing and conditioning data for the test specimens, (duration, temperature, relative humidity);
- k) identification of the test equipment and instruments used, including the make, type, test capacity, calibration details and measurement range;

- l) the individual results for bulk density and compressive strength;
- m) the mean value and standard deviation of the bulk density and compressive strength results;
- n) inaccuracy or uncertainty of the test results;
- o) date and signature.

## Annex A (normative)

### Summary of temperatures and humidities for the curing, conditioning and testing of repair products and systems.

#### A.1 Curing

##### A.1.1 HC (grouts, mortars and concretes)

- prepare as in EN 196-1, cover in film for 24 h;
- demould after 24 h;
- cure under water at  $(21 \pm 2)^\circ\text{C}$  for 27 days.

##### A.1.2 PCC (grouts, mortars and concretes)

- prepare as in EN 196-1, cover in film for 24 h;
- demould after 24 h and wrap in film for 48 h;
- unwrap and cure for 25 days in a standard laboratory climate of  $(21 \pm 2)^\circ\text{C}$  and  $(60 \pm 10)\%$  RH.

##### A.1.3 PC (grouts, mortars and concretes)

- Cure for 7 days at  $(21 \pm 2)^\circ\text{C}$  and  $(60 \pm 10)\%$  RH.

#### A.2 Conditioning and testing

For specific applications, the following definition applies:

##### A.2.1 Standard laboratory climate (Dry conditioning):

- Take from the curing/storage environment and condition for 7 days in a standard laboratory climate of  $(21 \pm 2)^\circ\text{C}$  and  $(60 \pm 10)\%$  RH.

**BS EN  
12190:1999**

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BSI  
389 Chiswick High Road  
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W4 4AL