



SLOVENSKI STANDARD

SIST EN 12504-1:2019

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Nadomešča:
SIST EN 12504-1:2009

Preskušanje betona v konstrukcijah - 1. del: Izvrtani preskušanci - Jemanje, pregled in tlačni preskus

Testing concrete in structures - Part 1: Cored specimens - Taking, examining and testing in compression

Prüfung von Beton in Bauwerken Teil 1: Bohrkernproben - Herstellung, Untersuchung und Prüfung der Druckfestigkeit

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Essais pour béton dans les structures - Partie 1 : Carottes - Prélèvement, examen et essais en compression

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Ta slovenski standard je istoveten z: EN 12504-1:2019

ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12504-1

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ICS 91.100.30

Supersedes EN 12504-1:2009

English Version

Testing concrete in structures - Part 1: Cored specimens - Taking, examining and testing in compression

Essais pour béton dans les structures - Partie 1 :
Carottes - Prélèvement, examen et essais en
compression

Prüfung von Beton in Bauwerken - Teil 1:
Bohrkernproben - Herstellung, Untersuchung und
Prüfung der Druckfestigkeit

This European Standard was approved by CEN on 29 April 2019.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 12504-1:2019) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by SN.

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of an identical text or by endorsement, at the latest by December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

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 12504-1:2009.

It is recognized good practice to include measurement of density prior to the determination of compressive strength, as a check on compaction of the concrete.

In drafting the standard consideration has been given to the results of the research programme, part funded by the EC under the Measurement and Testing Programme, contract MAT1-CT94-0043.

The standard includes simple guidance on the process of taking cores, but does not consider a sampling plan. It also provides procedures for visual examination and compressive strength testing, but not the interpretation of the results.

This standard is one of a series on testing concrete.

EN 12504, *Testing concrete in structures*, consists of the following parts:

- *Part 1: Cored specimens – Taking, examining and testing in compression;*
- *Part 2: Non-destructive testing – Determination of rebound number;*
- *Part 3: Determination of pull-out force;*
- *Part 4: Determination of ultrasonic pulse velocity.*

This edition includes the following significant technical changes with respect to EN 12504-1:2009:

- a) editorial revisions;
- b) measurement of core dimensions;
- c) core samples to be tested in an *in situ* or wet conditions;
- d) procedures for preparation of specimens prior to testing.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 12504-1:2019 (E)**1 Scope**

This document specifies a method for taking cores from hardened concrete, their examination, preparation for testing and determination of compressive strength.

This document does not give guidance on the decision to drill cores or on the locations for drilling.

This document does not provide procedures for interpreting the core strength results.

For the assessment of in situ compressive strength in structures and precast concrete components, EN 13791 may be used.

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 12390-1, *Testing hardened concrete — Part 1: Shape, dimensions and other requirements for specimens and moulds*

EN 12390-3:2019, *Testing hardened concrete — Part 3: Compressive strength of test specimens*

EN 12390-4, *Testing hardened concrete — Part 4: Compressive strength — Specification for testing machines*

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3 Terms and definitions

No terms and definitions are listed in this document.

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 <http://www.iso.org/obp>

4 Principle

Cores extracted using a core drill are carefully examined, prepared by grinding or capping and tested in compression using standard procedures.

5 Apparatus

5.1 Core drill, equipment capable of extracting cores from the hardened concrete to the dimensions set out in 6.4 to the tolerances set out in 8.3.

5.2 Compression testing machine, conforming to EN 12390-4 and related to the size of specimens and their expected failure load.

NOTE Concrete compression testing machines conforming to EN 12390-4 may need to be adapted to test cores (see the Foreword of EN 12390-4).

5.3 Balance or scale, capable of determining the mass of the core, as tested, to a maximum permissible error of 0,1 % of the mass.

5.4 Callipers and/or rules, capable of measuring the dimensions of the core and the steel reinforcement to a maximum permissible error of 1 %.

5.5 Gauge, capable of establishing that the relevant flatness of the specimen is within the requirements of 8.3 c).

5.6 Squares and gauges (or other means), capable of establishing that the perpendicularity and straightness of specimens are within the requirements of 8.3 d) and 8.3 e).

6 Taking cores

6.1 General

The aggregate size has a significant influence on the measured strength when the core diameter divided by the upper aggregate size is less than about 3.

It is essential that full consideration is given to the aims of the testing and the interpretation of the data, before deciding to drill cores.

NOTE 1 Informative Annex A provides information on the effect of aggregate size and core diameter on the strength of core specimens.

NOTE 2 See EN 13791 for requirements relating to core testing for compressive strength assessment.

6.2 Location

Consider any structural implications resulting from taking a core prior to drilling.

Cores should be taken at points away from joints or edges of the concrete element and where there is little or no reinforcement.

6.3 Drilling

Unless otherwise specified, drill the cores perpendicular to the surface in such a manner as not to damage the cores. Keep the drill rigidly positioned during coring.

Drilling through reinforcement shall be avoided wherever possible.

If transverse reinforcement is encountered, record its diameter and position in mm.

Ensure that cores for determination of compressive strength do not contain any reinforcing bars in, or close to, the direction of the longitudinal axis. Any such core shall be rejected and a replacement core taken.

6.4 Length of cores

In deciding the length of cores to be taken for strength testing, take into account:

- the diameter of the core;
- the possible method of adjustment;
- whether comparison is to be made with cube strength or cylinder strength.

6.5 Marking and identification

Immediately after drilling, clearly and indelibly mark each core. Record its location and orientation within the element from which it has been drilled. If a core is subsequently cut to produce a number of specimens, mark each specimen to indicate its position and orientation within the original core.

The core shall be surface dried with a dry cloth or paper towel and then placed in a sealed container to avoid moisture exchange with the environment e.g. sealed polythene bag.

EN 12504-1:2019 (E)**7 Examination****7.1 Visual inspection**

Carry out a visual examination of the cored specimen to identify any abnormalities.

If required, an estimation of the cores' excess voidage shall be made by reference to standard documentation or by comparison to a reference concrete of known excess voidage.

7.2 Measurements

Measurements shall be as follows:

- a) core diameter d_m .

Before starting end preparation, the core diameter shall be measured to an accuracy of 0,5 % of the dimension, from pairs of measurements taken at right angles, at the half and quarter points of the length of the core. The average core diameter d_m is calculated from the six measurements and expressed to the nearest 1 mm.

- b) core length, the length of the as received core shall be measured to the nearest 5 mm. After completion of the end preparation, the length of the core, measured to an accuracy of 0,5 % of the dimension, is the average of measurements taken at three positions approximately 120° to each other and expressed to the nearest 1 mm.

- c) reinforcement, the diameter of any reinforcement shall be measured and the position, measuring from the centre of the exposed bar to the end(s) and/or axis of the core, both as received and after end preparation. Measurement shall be to the nearest mm.

If it is required to determine the density of the core, this shall be determined in accordance with the procedures given in EN 12390-5 prior to capping the ends of the core.

All measurements should be recorded.

8 Preparation of cores**8.1 General**

The specimen shall be kept in the sealed container until it is to be trimmed to length or the ends capped.

If it is specified to test the specimen in a saturated condition remove the specimen from the sealed container and place in water at (20 ± 2) °C for at least 48 h.

Remove the specimen from the sealed container or water and prepare the cores to give the dimensions and tolerances given in 8.2 and 8.3 using the procedures given in Annex A of EN 12390-3:2019 and as detailed below for the different end preparations.

NOTE End preparation by grinding is recommended as it is the most precise method of preparing the ends of the specimen but other methods have similar precision for normal strength concretes if they are undertaken by laboratories experienced in the capping method. For anticipated concrete strengths greater than 50 MPa (N/mm²) based on a 2:1 specimen or 60 MPa (N/mm²) based on a 1:1 specimen, capping by calcium aluminate cement mortar or sulfur mixture should not be used.

- a) Sulfur or sandbox capping – take the specimen out of the sealed container or water, wipe the surface with a dry cloth or paper towel, leave exposed to laboratory air for 16 h to 24 h, cap and test within 24 h of being exposed;

- b) Ground or calcium aluminate capping – take the specimen out of the sealed container or water, wipe the surface with a dry cloth or paper towel, grind or cap. Test within 16 h to 24 h of being exposed.

If required, return the ground or calcium aluminate capped specimen to the sealed container or water immediately after end preparation until required for testing.

At the time of test, the calcium aluminate capping should be at least as strong as the concrete specimen.

8.2 Length/diameter ratios

The preferred length diameter/ratios after preparation are:

- a) 2,0 if the strength result is to be compared to cylinder strength;
b) 1,0 if the strength result is to be compared to cube strength.

8.3 Tolerances

Prepare the specimen to within the following tolerances:

- a) To be classified as a 2:1 core the capped or ground length to diameter ratio shall be within the range between 1,95 to 1 and 2,05 to 1.
b) To be classified as a 1:1 core the capped or ground length to diameter ratio shall be within the range between 0,90 to 1 and 1,10 to 1.
c) For flatness, the tolerance for the end surfaces prepared by grinding or capping, using high alumina cement or sulphur, shall conform to EN 12390-1.
d) For perpendicularity, the tolerance for the prepared ends, with respect to the side, shall comply with EN 12390-1.
e) For straightness, the tolerance on the generating line of the core shall be 3 % of the average core diameter.

If other smaller diameter cores are tested then the tolerances above should be considered with regard to their adequacy and narrowed if necessary; for example, reduced in proportion to the actual specimen diameter to 100 mm.

9 Compression test

9.1 Storage

Record the storage condition(s) of the specimen i.e. sealed container or water.

9.2 Testing

Carry out the testing in accordance with EN 12390-3 using a compression testing machine conforming to EN 12390-4 (see the Note to 5.2).

Do not test cores with cracked, hollow, or loose caps.

Remove any loose sand or other material on the surface of the specimen.

If the specimen is to be tested whilst it is still wet, remove any surface water.