BSI Standards Publication

# Testing hardened concrete

Part 13: Determination of secant modulus of elasticity in compression

bsi.

# National foreword

This British Standard is the UK implementation of EN 12390-13:2013. It supersedes BS 1881-121:1983, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/517/1, Concrete production and testing.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.


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**Compliance with a British Standard cannot confer immunity from legal obligations.**

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EUROPEAN STANDARD **EN 12390-13**



# EUROPÄISCHE NORM

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English Version

# Testing hardened concrete - Part 13: Determination of secant modulus of elasticity in compression

Essais pour béton durci - Partie 13: Détermination du module sécant d'élasticité en compression

Prüfung von Festbeton - Teil 13: Bestimmung des Elastizitätsmoduls unter Druckbelastung (Sekantenmodul)

This European Standard was approved by CEN on 21 September 2013.

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

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# Foreword

This document (EN 12390-13:2013) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, 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of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

It is based on an extensive investigation and comparison of existing National Standards: ASTM, BS, DIN, ISO, NORD TEST and UNI followed by the analysis of a test programme involving five laboratories carried out by UNI.

This standard is one of a series concerned with testing concrete.

The series EN 12390, *Testing hardened concrete,* consists of the following parts:

— *Part 1: Shape, dimensions and other requirements of specimens and moulds*

— *Part 2: Making and curing specimens for strength tests*

— *Part 3: Compressive strength of test specimens*

— *Part 4: Compressive strength - Specification for testing machines*

— *Part 5: Flexural strength of test specimens*

— *Part 6: Tensile splitting strength of test specimens*

— *Part 7: Density of hardened concrete*

— *Part 8: Depth of penetration of water under pressure*

— *Part 13: Determination of secant modulus of elasticity in compression*

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# 1 Scope

This European Standard specifies the method for the determination of the secant modulus of elasticity in compression of hardened concrete on test specimens which may be cast or taken from a structure.

The test method allows the determination of two secant moduli of elasticity: the *initial modulus*, $E_{C,0}$ measured at first loading and the *stabilized modulus*, $E_{C,S}$ measured after three loading cycles.

Two different test methods are given. The first (method A) is for determination of both initial and stabilized moduli, the second (method B) is for determination of stabilized modulus only.

# 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 of specimens and moulds*

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*

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

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

EN 12504-1:2009, *Testing concrete in structures — Part 1: Cored specimens – Taking, examining and testing in compression*

EN ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing (ISO 9513)*

# 3 Terms and definitions, symbols and scripts

## 3.1 Terms and definitions

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

**3.1.1**
**initial secant modulus of elasticity**
$E_{C,0}$
secant slope of the stress strain curve at first loading

**3.1.2**
**stabilized secant modulus of elasticity**
$E_{C,S}$
secant slope of the stress strain curve after three loading cycles

**3.1.3**
**base or gauge length**
length used as reference base for strain measurement

**3.1.4**
**measuring line**
straight line laying on the lateral surface of the specimen and parallel to the vertical axis (see Figure 1)