

**Tsemendi teimimise meetodid - Osa 4: Koostisosade  
kvantitatiivne määramine**

**Methods of testing cement - Part 4: Quantitative  
determination of constituents**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-ENV 196-4:1999 sisaldab Euroopa standardi ENV 196-4:1993 ingliskeelset teksti.	This Estonian standard EVS-ENV 196-4:1999 consists of the English text of the European standard ENV 196-4:1993.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 26.07.1993.	Date of Availability of the European standard is 26.07.1993.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 91.100.10

Võtmesõnad: ashes, cement, cement clinker, components, determination, pozzolans, slags, tests,

### Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Aru 10, 10317 Tallinn, Eesti; [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

### The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:  
Aru 10, 10317 Tallinn, Estonia; [www.evs.ee](http://www.evs.ee); phone 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

EUROPEAN PRESTANDARD

ENV 196-4:1993

PRÉNORME EUROPÉENNE

EUROPÄISCHE VORNORM

July 1993

UDC 666.94:691.54:620.1:539.215

Supersedes ENV 196-4:1989

Descriptors: Cement, determination, components, slags, cement clinker, pozzolans, ashes, tests

English version

### Methods of testing cement - Part 4: Quantitative determination of constituents

Méthodes d'essais des ciments - Partie 4:  
Détermination quantitative des constituants

Prüfverfahren für Zement - Teil 4: Quantitative  
Bestimmung der Bestandteile

This European Prestandard (ENV) was approved by CEN on 1993-01-08 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## CEN

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

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

Contents list	Page
Foreword	3
1 Scope	4
2 Normative references	4
3 General requirements for testing	5
3.1 Number of tests	5
3.2 Determination of constant mass	6
3.3 Expression of masses and results	6
3.4 Repeatability and reproducibility	6
4 Preparation of a cement sample	7
5 Reagents	7
6 Determination of the contents of cement constituents	7
6.1 General	7
6.2 Selective dissolution method	8
6.2.1 Principle	8
6.2.2 Reagents	9
6.2.3 Apparatus	9
6.2.4 Procedure	10
6.2.5 Calculation of the contents of cement constituents	13
6.2.6 Repeatability and reproducibility	16
6.2.7 Qualitative determination of cement type	16
7 Determination of the contents of constituents for cements with three constituents	17
7.1 General	17
7.2 Determination of the slag content	17
7.2.1 Dense liquid separation method	17
7.2.2 Microscope method	24
7.3 Determination of the fly ash content	29
7.3.1 Selective dissolution method	29
7.4 Determination of the pozzolana content	31
7.4.1 Selective dissolution method	31
7.4.2 Dense liquid separation method	34

## Foreword

This European Prestandard was drawn up by Technical Committee CEN/TC 51 "Cement and building lime" the Secretariat of which is held by IBN. It is a revision of the European Prestandard ENV 196-4 of December 1989.

The main aim of this revision was to adapt the reference method in such a way that it would be qualitative and quantitative whatever the constituent materials, including blastfurnace slag (which was not the case for ENV 196-4 : 1989). This entailed recasting the analytical procedure and the calculation of the contents.

The opportunity was taken at the same time to unify the presentation of the different methods, reference and alternative, and to endeavour to standardize better the formation of the symbolic notations so that all ambiguity in the interpretation of the formulae for the calculations was ruled out.

According to the Common CEN/CENELEC Rules, the following countries are bound to announce this European Prestandard :

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

The European Standard EN 196 on methods of testing cement consists of the following Parts:

- Part 1 : Determination of strength
- Part 2 : Chemical analysis of cement
- Part 3 : Determination of setting time and soundness
- Part 4 : Quantitative determination of constituents
- Part 5 : Pozzolanicity test for pozzolanic cements
- Part 6 : Determination of fineness
- Part 7 : Methods of taking and preparing samples of cement
- Part 21: Determination of the chloride, carbon dioxide and alkali content of cement

## 1 Scope

This European Prestandard lays down the procedures for determining the contents of the constituents of cements that fall within the scope of ENV 197-1.

The first method outlined in clause 6 applies to all cements, whatever the number and nature of their constituents. This is a selective dissolution method which is to be considered as the reference method where the various constituents, generally of an unknown number, are not available separately at the same time as the cement, which is usually the case.

Any other method with the same objectives can be considered as an alternative to the reference method when it is shown that, with valid statistical calculation, it gives equivalent results.

In individual cases where the laboratory has been formally advised that:

- the cement contains only two constituents, the method is greatly simplified because it is sufficient to determine the set regulator content (R) to know the clinker content;
- the cement contains only three constituents, i.e. a set regulator, clinker and one of the following three: slag, pozzolana or fly ash. One of the methods given in clause 7 can then be applied. All the methods in this clause are variations of the reference method described in clause 6.

NOTE: In the different methods that this standard comprises, the term "granulated blastfurnace slag" defined in 4.2 of ENV 197-1 : 1992 is designated by the term "slag".

## 2 Normative references

This European Prestandard incorporates by dated or 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 of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 196-2 : 1987 Methods of testing cement - Part 2: Chemical analysis of cements

EN 196-7 : 1989 Methods of testing cement - Part 7: Methods of taking and preparing samples of cement

EN 196-21 : 1989 Methods of testing cement - Part 21: Determination of the chloride, carbon dioxide and alkali contents of cement

ENV 197-1 : 1992 Cement: Composition, specifications and conformity criteria  
Part 1: Common cements

ISO 3534 : 1977 Statistics - Vocabulary and symbols

### 3 General requirements for testing

#### 3.1 Number of tests

To carry out the calculation for the contents of the cement constituents, two tests shall be made for each. The following analytes are determined:

- for the general method by selective dissolution (clause 6): sulfuric anhydride and carbon dioxide contents, residues after EDTA and nitric acid dissolution and sulfide contents in the cement and in the EDTA residue;
- for the methods of analysis for cements with three constituents (clause 7): sulfuric anhydride and carbon dioxide contents, loss on ignition, calcium oxide, magnesium oxide and manganese oxide contents, sulfide contents and insoluble residues. Depending on the method used, only some of these analytes can be determined.

If, for each analyte, the difference between the two values obtained is less than twice the standard deviation for repeatability for this analyte, the value to take for further calculations is the arithmetic mean of the two values. If the difference between the two values is greater than twice the standard deviation for repeatability, a third test shall be carried out and the value to be taken for further calculations shall be the arithmetic mean of the two closest values.

Hence, for the general method by selective dissolution, only one calculation will need to be carried out for the quantitative determination of constituents, in particular for clinker.

Likewise, for the methods of analysis for cements with three constituents, a single calculation will enable the content of hydraulic or pozzolanic constituent to be determined.