

**Methods of testing cement - Part 9: Heat of hydration -
Semi-adiabatic method**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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English Version

Methods of testing cement - Part 9: Heat of hydration - Semi-adiabatic method

Prüfverfahren für Zement - Teil 9: Hydrationswärme -
Teiladiabatisches Verfahren

This European Standard was approved by CEN on 21 February 2010.

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Foreword

This document (EN 196-9:2010) has been prepared by Technical Committee CEN/TC 51, "Cement and building limes", the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by September 2010, and conflicting national standards shall be withdrawn at the latest by September 2010.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This document supersedes EN 196-9:2003.

EN 196, *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 times and soundness*
- *Part 5: Pozzolanicity test for pozzolanic cement*
- *Part 6: Determination of fineness*
- *Part 7: Methods of taking and preparing samples of cement*
- *Part 8: Heat of hydration — Solution method*
- *Part 9: Heat of hydration — Semi-adiabatic method*
- *Part 10: Determination of the water-soluble chromium (VI) content of cement*
- CEN/TR 196-4, *Methods of testing cement — Part 4: Quantitative determination of constituents*

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a method of measuring the heat of hydration of cements by means of semi-adiabatic calorimetry, also known as the Langavant method. The aim of the test is the continuous measurement of the heat of hydration of cement during the first few days. The heat of hydration is expressed in joules per gram of cement.

This standard is applicable to all cements and hydraulic binders, whatever their chemical composition, with the exception of quick-setting cements.

NOTE 1 An alternative procedure, called the solution method, is described in EN 196-8. Either procedure can be used independently.

NOTE 2 It has been demonstrated that the best correlation between the two methods is obtained at 41 h for the semi-adiabatic method (EN 196-9) compared with seven days for the heat of solution method (EN 196-8).

2 Normative references

The following referenced documents are indispensable for the application 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 573-3:2009, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition and form of products*

3 Principle

The semi-adiabatic method consists of introducing a sample of freshly made mortar into a calorimeter in order to determine the quantity of heat emitted in accordance with the development of the temperature. At a given point in time the heat of hydration of the cement contained in the sample is equal to the sum of the heat accumulated in the calorimeter and the heat lost into the ambient atmosphere throughout the period of the test.

The temperature rise of the mortar is compared with the temperature of an inert sample in a reference calorimeter. The temperature rise depends mainly on the characteristics of the cement and is normally between 10 K and 50 K.

4 Apparatus

4.1 Calorimeter, consisting of an insulated flask sealed with an insulated stopper and encased in a rigid casing which acts as its support (see Figure 1). Both the calorimeter used for the test and that for the reference (see 4.2) shall have the following construction and characteristics:

- a) **Insulated flask** (e.g. Dewar flask), made of silver plated borosilicate glass; cylindrical in shape with a hemispherical bottom. The internal dimensions shall be approximately 95 mm in diameter and 280 mm in depth; and external diameter of approximately 120 mm. A rubber disc of approximately 85 mm diameter and 20 mm thickness shall be placed at the bottom of the flask to act as support for the sample container and evenly distribute the load on the glass wall.
- b) **Very rigid casing**, having a sufficiently wide base to ensure good stability of the whole unit (e.g. made of duralumin, 3 mm thick). The flask shall be separated from the lateral walls of the casing by approximately 5 mm air space and rest on a support 40 mm to 50 mm thick made of a material having low thermal