



**SLOVENSKI STANDARD**  
**SIST EN 14498:2004**  
**01-december-2004**

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a YrcXYE`Dfcgfcfb]bg\_Y`]b`a UgbYgdfYa Ya VY`]b`Y\_VYg\_Y`a UgY`dc`W\_`] bYa  
gi yYb`f` `bU`nfU\_i ]`b`bUa U\_Ub`f` ]`j`j`cX]

Products and systems for the protection and repair of concrete structures - Test methods  
- Volume and weight changes of injection products after air drying and water storage  
cycles

**iTeh STANDARD PREVIEW**

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken -  
Prüfverfahren - Änderungen von Volumen und Gewicht nach Wechsel-Beanspruchung  
durch Trocknung an der Luft und Lagerung in Wasser

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Produits et systemes de protection et de réparation des structures en béton - Méthodes  
d'essai - Changements de volume et de poids des produits d'injection par des cycles de  
séchage a l'air et de conditionnement dans l'eau

**Ta slovenski standard je istoveten z: EN 14498:2004**

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**ICS:**

91.080.40      Betonske konstrukcije      Concrete structures

**SIST EN 14498:2004**      en

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EUROPEAN STANDARD

EN 14498

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2004

ICS 91.080.40

English version

## Products and systems for the protection and repair of concrete structures - Test methods - Volume and weight changes of injection products after air drying and water storage cycles

Produits et systèmes de protection et de réparation des structures en béton - Méthodes d'essai - Variations de volume et de poids à l'issue de cycles de séchage à l'air et de conditionnement dans l'eau

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Änderungen von Volumen und Gewicht nach Wechselbeanspruchung durch Trocknung an der Luft und Lagerung in Wasser

This European Standard was approved by CEN on 16 April 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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## Foreword

This document (EN 14498:2004) has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", the secretariat of which is held by DIN.

It has been drafted by Sub-Committee 8 "Products and systems for the protection and repair of concrete structures" (Secretariat AFNOR).

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 March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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**EN 14498:2004 (E)****1 Scope**

This document describes a test method to determine the volume and weight changes of injection products used for swelling fitted filling of cracks, voids and interstices after air drying and water storage cycles.

**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 196-1:1994, *Methods of testing cement – Part 1: Determination of strength*.

EN 1504-1:1998, *Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 1: Definitions*.

prEN 1504-5:2001, *Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 5: Concrete injection*.

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 1504-1:1998 and prEN 1504-5:2001 apply.

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**4 Test principle**

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The volume and weight changes which occur during air drying and water storage, from 24 h after casting and onwards, are measured on prismatic specimens having dimensions of 5 mm x 40 mm x 160 mm.

**5 Apparatus**

- 5.1 Moulds complying with the requirements of 4.5 of EN 196-1:1994.
- 5.2 Apparatus for measuring the dimensions of the test specimens to an accuracy of 0,1 mm.
- 5.3 Balance capable of weighing 500 g to an accuracy of 0,01 g.
- 5.4 Water bath containing potable water for completely immersing the test specimens at a temperature of  $(21 \pm 2)$  °C. The volume of the water bath is chosen to comply with requirements in 7.3.4.
- 5.5 Storage room for conditioning the test specimens, at a temperature of  $(21 \pm 2)$  °C and a relative humidity of  $(60 \pm 10)$  %.
- 5.6 Support grid for supporting the specimens with a minimum of 5 mm clearance in a water bath or in air.
- 5.7 Air oven capable of maintaining the specified temperature to  $\pm 2$  °C. The oven shall be fitted with forced-ventilation equipment.

## 6 Sampling and preparation

### 6.1 General

Unless specified to the contrary, not less than six prism specimens shall be prepared and tested. Three specimens shall be used for measuring the volume and weight changes occurring under the conditions described in 7.3.2, and three specimens for measuring the volume and weight changes occurring under the conditions described in 7.3.3.

### 6.2 Preparation of specimens

The injection product shall be prepared and mixed in accordance with the manufacturer's instructions.

Immediately after mixing, it shall be poured into the moulds and the moulds covered with plastic film. The moulds shall be cured in the standard laboratory climate for 24 h. The thickness shall normally be  $(5 \pm 1)$  mm. Should handling difficulties occur with specimens of this thickness, the thickness may be increased to  $(10 \pm 1)$  mm or  $(15 \pm 1)$  mm.

## 7 Procedure

### 7.1 Measurements of volume and weight

#### 7.1.1 General

Standard conditions of measurements shall be  $(21 \pm 2)$  °C and  $(60 \pm 10)$  % relative humidity.

#### 7.1.2 Measurements of weights in air

The duration of measurement shall be as short as possible. In case of conditioning in water, the specimens shall be dabbed with a moist cloth to remove excess water.

#### 7.1.3 Measurement of volume

The volume is measured as follows:

- by weighing the specimen in air:  $W_s$  ;
- by measuring the apparent weight in water at  $(21 \pm 2)$  °C of the specimen and the suspension wire:  $W_{(s+w)i}$  ;
- by measuring the apparent weight in water at  $(21 \pm 2)$  °C of the suspension wire immersed at the same length :  $W_{(w)i}$ .

The volume in  $\text{cm}^3$  is given by:

$$V = \frac{1}{0,998} [W_s + W_{(w)i} - W_{(s+w)i}]$$

where

0,998 is the specific gravity of water at  $(21 \pm 2)$  °C, in  $\text{g} \cdot \text{cm}^{-3}$ .

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NOTE The measurement of the apparent weight of specimens conditioned in air should be made after  $(120 \pm 5)$  s immersion. After the weighing, the specimens should be immediately surface dried by removing surface moisture with a moist towel.

**7.2 Initial measurement**

The specimens shall be carefully removed from the moulds  $(24 \pm 1)$  h after mixing.

The volume and weight of each of the specimens shall be measured.

**7.3 Conditioning****7.3.1 General**

After the initial measurement at  $(24 \pm 1)$  h, 3 specimens shall be submitted to conditioning regime A (7.3.2), and 3 specimens to conditioning regime B (7.3.3).

**7.3.2 Conditioning regime A**

- The specimens shall be stored for 14 days fully immersed in potable water at a temperature of  $(21 \pm 2)$  °C.
- The volume and weight shall be measured at the following times: 1 h, 2 h, 4 h, 6 h, 24 h, 48 h, 72 h, 96 h, 168 h, 264 h, 312 h and 336 h.
- If the volume and weight of the specimens are not constant after 336 h (14 days), the immersion period shall be prolonged until a constant weight is reached. Constant weight is reached for this test when the weight variation during 3 consecutive measures at 24 h interval is less than 1 %. At the end of the immersion period, the volume and weight shall be measured.

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**7.3.3 Conditioning regime B**

- The specimens shall be subject to 10 wetting and drying cycles, as follows:
  - 1 day drying in the oven at  $(50 \pm 2)$  °C;
  - 6 days storage fully immersed in potable water at a temperature of  $(21 \pm 2)$  °C.
- The volume and weight shall be measured at the end of every cycle after the 6 days immersion.
- After the wetting and drying cycles the specimens shall be immersed in potable water at a temperature of  $(21 \pm 2)$  °C until constant weight is reached, as defined in 7.3.2.
- At the end of the immersion period, the volume and weight shall be measured.

**7.3.4 Storage conditions**

During immersion, the specimens shall be stored on the grid, so as not to restrict volume changes of the specimens under the test conditions.

During air and water storage, a spacing of at least 100 mm shall be maintained between specimens to ensure uniform moisture or water exchange around the specimens. In addition, during water storage, the spacing between the specimens and the upper water level and between the specimens and the sides of the water bath shall be at least 100 mm.



## 8 Expression of results

The change in volume, expressed in %, rounded to the first decimal, is determined at each time, according to the following equation:

$$\Delta V_t = \frac{V_t - V_i}{V_i} \times 100$$

where

$V_i$  is the initial volume ;

$V_t$  is the volume at time  $t$ .

The change in weight, expressed in %, rounded to the first decimal, is determined at each time, according to the following equation:

$$\Delta W_t = \frac{W_t - W_i}{W_i} \times 100$$

where

$W_i$  is the initial weight;

$W_t$  is the final weight at time  $t$ .

Upon completion of the conditioning, the test specimens shall be inspected visually for evidence of cracking or other phenomena.

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## 9 Test report

The test report shall contain the following information:

- a) a reference to this document;
- b) name and address of the test laboratory;
- c) identification number of the test report;
- d) name and address of the manufacturer or supplier of the product;
- e) name and identification marks or batch number of the product;
- f) date of supply of the product;
- g) date of preparation of the test specimens and any deviation from the prescribed method of preparation; procedure of preparation of the test specimens (ratios of the several components, mixing equipment, ...) and thickness of the specimens;
- h) conditions of storage of prepared specimens prior to test;
- i) date of test and details of the test equipment used, including the make, type and capacity and the calibration details or the identification number of the apparatus;