



SLOVENSKI STANDARD
SIST EN 14406:2004

01-december-2004

Dfc[nj cX]]b`g]ghYa]`nUnUy]rc`]b`dcdfUj]c`VYrcbg_]` _cbgffi _VY`E`DfYg_i gbY
a YrcXY`E`8c`c` Yj Ub`Y`g]c`db`Y`]b`f`Unj c`U`bUVfY`Ub`U`]b` \]f`c`g]h`bUVfY`Ub`U`
]b`Y`_VY`g`_Y`a` UgY

Products and systems for the protection and repair of concrete structures - Test methods
- Determination of the expansion ratio and expansion evolution

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken -
Prüfverfahren - Bestimmung des Ausdehnungsverhältnisses und der
Ausdehnungsentwicklung (standards.iteh.ai)

Produits et systemes de protection et de réparation des structures en béton - Méthodes
d'essai - Détermination du rapport d'expansion et de l'évolution de l'expansion

Ta slovenski standard je istoveten z: EN 14406:2004

ICS:

91.080.40 Betonske konstrukcije Concrete structures

SIST EN 14406:2004 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 14406:2004](#)

<https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-db600162403e/sist-en-14406-2004>

EUROPEAN STANDARD

EN 14406

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 - Determination of the expansion ratio and expansion evolution

Produits et systèmes pour la protection et la réparation des structures en béton - Méthodes d'essai - Détermination du rapport d'expansion et de l'évolution de l'expansion

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Bestimmung des Ausdehnungsverhältnisses und der Ausdehnungsentwicklung

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.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

page

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Test principle.....	4
5 Apparatus	5
6 Sampling and preparation	5
7 Procedure	5
8 Expression of results	6
9 Report	7

ITeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 14406:2004](https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-db600162403e/sist-en-14406-2004)

<https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-db600162403e/sist-en-14406-2004>

Foreword

This document (EN 14406:2004) 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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 14406:2004](https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-db600162403e/sist-en-14406-2004)

<https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-db600162403e/sist-en-14406-2004>

EN 14406:2004 (E)**1 Scope**

This document describes a test method to determine the expansion ratio and rate of injection products intended for ductile filling of wet cracks, voids and interstices.

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 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 and the following apply.

3.1**final expansion ratio**

ratio of the volume of reacted product and the initial volume of the unreacted injection products

expansion evolution

ratio of the volume of reacting product and the initial volume of the unreacted injection products as a function of time

4 Test principle

Water is added at a ratio of 5 % by weight to the mixed injection products. The ensuing reaction is measured as a function of the unrestricted expansion of the reacting materials in one direction.

NOTE 1 For special purposes, the product can be tested with other water contents (e.g. 10 %, 15 % or even 50 %).

NOTE 2 The test can be used to indicate the expansion properties of a product, e.g. induction time, general behaviour of the product during the expansion, and end properties of the expanded product. The expansion ratio should not be considered as a quality evaluation and a performance related characteristic.

5 Apparatus

5.1 Expansion measuring vessel, consisting of:

- a clear acrylic pipe, inner diameter of (48 ± 2) mm. The height of the tube e.g. 400mm, shall be adjusted to the expansion of the material;

a tool (e.g. ruler) fixed to the pipe, for measuring the height of the (expanding) product, with an accuracy of ± 1 mm; a polymeric e.g. polyethylene, bottom provided with a hole (20 ± 1) mm depth, with a diameter slightly higher than the outer diameter of the pipe;

- a plastic film, to seal the inserted tube into the bottom.

5.2 Stop watch with an accuracy of ± 1 s.

5.3 Mixing equipment.

5.4 Pipette, which allows to add water with an accuracy of 5 % relative to the requested amount.

5.5 Weighing device, capable of weighing the expansion measuring vessel to the nearest 0,01 g.

6 Sampling and preparation

The temperature of the injection product and mixing water shall be (21 ± 2) °C.

If two component products have to be tested, the mixture of the two components (ratio of the components, mixing procedure) shall be in accordance with the manufacturer's instructions.

For catalysed products, the catalyst content shall be selected to be at the minimum of the range recommended by the manufacturer.

7 Procedure

- The standard conditions of test shall be (21 ± 2) °C and (60 ± 10) % relative humidity.
- Immediately after the mixing of the injection product, a quantity of product sufficient to achieve a height of (20 ± 1) mm is poured into the pipe.
- The quantity of water to be added is determined by weighing before and after adding the product, and by considering that the mixture shall contain 5 % of water in weight (i.e. 5 g for 100 g of product).
- The mixing equipment, mounted on a drilling machine, is placed in the pipe.
- The water is added with a pipette, assuming a specific weight of $1\,000\text{ kg x m}^{-3}$.
- The mixing starts immediately. The speed is chosen to approximately 400 rpm and the mixing time to 10 s.

The following measurements are to be made:

- initial height H_i of the product;
- maximum height H_m of the expanded product;

EN 14406:2004 (E)

- at least 5 intermediate heights H_t well spread over the period of expanding;
- final height H_f , which is the value of height measured 1 h after reaching the maximum height.

The heights are to be measured to the top of the foam.

- Furthermore, observations concerning the general behaviour of the product shall be made.. Visual observations and the homogeneity of the expanded product shall be recognised, such as large bubbles, asymmetrical rise of the expanding product, as well collapse (reduction of volume not related to drying and thermal shrinkage).

At least three tests shall be performed.

Expression of results

- The final expansion ratio E_f of the product is expressed as follows:

$$E_f = \frac{H_f}{H_i}$$

where

H_f is the final height of the product,

H_i is the initial height of the product. [SIST EN 14406:2004](https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-7b600162407/sist-en-14406-2004)

[https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-](https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-7b600162407/sist-en-14406-2004)

[7b600162407/sist-en-14406-2004](https://standards.iteh.ai/catalog/standards/sist/e3ddcb49-d35b-4654-bbfd-7b600162407/sist-en-14406-2004)

- The rate of expansion is presented in diagrams $E_t f(t)$ where E_t is the expansion at time t, and is given by:

$$E_t = \frac{H_t}{H_i}$$

where

H_t is the height of the product at time t (s);

H_i is the initial height of the product.

- The induction time, which is the time from end of mixing until beginning of expansion.
- The period of time to reach maximum expansion, i.e. height H_m .