

**Tooted ja süsteemid
betoonkonstruktsioonide kaitseks ja
parandamiseks. Määratlused, nõuded,
kvaliteedikontroll ja vastavuse
hindamine. Osa 5: Betooni sissepritse**

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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 1504-5:2005 sisaldab Euroopa standardi EN 1504-5:2004 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 22.02.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 1504-5:2005 consists of the English text of the European standard EN 1504-5:2004.</p> <p>This document is endorsed on 22.02.2005 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p>Käsitlusala: This Part of this European Standard specifies requirements and conformity criteria for the identification, performance (including durability aspects) and safety of injection products for the repair and protection of concrete structures, used for: - force transmitting filling of cracks, voids and interstices in concrete (category F, see 3.1); - ductile filling of cracks, voids and interstices in concrete (category D, see 3.1); - swelling fitted filling of cracks, voids and interstices in concrete (category S, see 3.1).</p>	<p>Scope: This Part of this European Standard specifies requirements and conformity criteria for the identification, performance (including durability aspects) and safety of injection products for the repair and protection of concrete structures, used for: - force transmitting filling of cracks, voids and interstices in concrete (category F, see 3.1); - ductile filling of cracks, voids and interstices in concrete (category D, see 3.1); - swelling fitted filling of cracks, voids and interstices in concrete (category S, see 3.1).</p>
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English version

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

Produits et systèmes pour la protection et la réparation des structures en béton - Définitions, exigences, maîtrise de la qualité et évaluation de la conformité - Partie 5 : Produits et systèmes d'injection du béton

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Definitionen, Anforderungen, Qualitätsüberwachung und Beurteilung der Konformität - Teil 5: Injektion von Betonbauteilen

This European Standard was approved by CEN on 9 July 2004.

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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.

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Foreword

This document (EN 1504-5:2004) 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 June 2005, and conflicting national standards shall be withdrawn at the latest by December 2008.

It has been developed by sub-committee 8 "Products and systems for the protection and repair of concrete structures", the secretariat of which is held by AFNOR.

This part 5 of 1504 does not supersede any other European Standard.

This part 5 of EN 1504 includes a normative Annex A dealing with classification, an informative Annex B dealing with special applications, an informative Annex C dealing with release of dangerous substances, and an informative Annex D dealing with Factory Production Control on products.

This part of this European Standard is one of the parts of this standard on products and systems for the repair and protection of concrete structures, the other parts listed below:

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

EN 1504-2, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 2: Surface protection systems for concrete.*

EN 1504-3¹⁾, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 3: Structural and non-structural repair.*

EN 1504-4, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 4: Structural bonding.*

EN 1504-6¹⁾, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 6: Anchoring of reinforcing steel bar.*

EN 1504-7¹⁾, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 7: Reinforcement corrosion protection.*

EN 1504-8, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 8: Quality control and evaluation of conformity.*

ENV 1504-9²⁾, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 9: General principles for the use of products and systems.*

EN 1504-10, *Products and systems for the protection and repair of concrete structures — Definitions, requirements — Quality control and evaluation of conformity — Part 10: Site application of products and systems and quality control of the works.*

1) To be published.

2) ENV 1504-9 will have to be modified when adopted as EN to reflect the published texts of parts 2 to 8 and part 10.

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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Introduction

Concrete injection is used as a method for the following principles defined in ENV 1504-9:

- principle 1 [IP]: Protection against ingress and waterproofing;

Filling cracks (method 1.4).

- principle 4 [SS]: Structural strengthening;

Injecting cracks, voids or interstices (method 4.5).

Filling cracks, voids or interstices (method 4.6).

Injection is used to avoid the harmful consequences of voids and cracks in concrete:

- to achieve impermeability and hence watertightness;
- to avoid penetration of aggressive agents that might induce corrosion of steel reinforcement;
- to strengthen the structure by strengthening the concrete.

1 Scope

This part of this document specifies requirements and conformity criteria for the identification, performance (including durability aspects) and safety of injection products for the repair and protection of concrete structures, used for:

- force transmitting filling of cracks, voids and interstices in concrete (category F, see 3.1);
- ductile filling of cracks, voids and interstices in concrete (category D, see 3.1);
- swelling fitted filling of cracks, voids and interstices in concrete (category S, see 3.1).

The performance requirements in this part of this document may not be applicable to highly specialised applications in extreme environmental conditions, e.g. cryogenic use, nor do they cover specialised circumstances such as accidental impact, e.g. due to traffic or ice, or earthquake loading, where specific performance requirements will apply.

This part of this document does not cover:

- the treatment of cracks by widening them and sealing them with an elastomeric sealing compound;
- external filling of cavities, that is the placement of product outside the structure (generally within the surrounding foundation soils, or at the interface between the structure and the soil). This is covered by EN 12715, under contact grouting [1];
- preliminary injection works, if necessary, to temporarily stop water passage during waterproofing injection.

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 196-3, *Methods of testing cement — Part 3: Determination of setting time and soundness.*

EN 196-21, *Methods of testing cement — Part 21: Determination of the chloride, carbon dioxide and alkali content of cement.*

EN 445, *Grout for prestressing tendons — Test methods.*

EN 1240, *Adhesives — Determination of hydroxyl value and/or hydroxyl content.*

EN 1242, *Adhesives — Determination of isocyanate content.*

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.*

EN 1504-8:2004, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 8: Quality control and evaluation of conformity.*

ENV 1504-9:1997, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 9: General principles for the use of products and systems.*

EN 1543, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of tensile strength development for polymers.*

- EN 1767, *Products and systems for the protection and repair of concrete structures — Test methods — Infrared analysis.*
- EN 1771, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of injectability using the sand column test.*
- EN 1877-1, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 1: Determination of epoxy equivalent.*
- EN 1877-2, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 2: Determination of amine functions using the total basicity number.*
- EN 12190, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of compressive strength of repair mortar.*
- EN 12614, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of glass transition temperatures of polymers.*
- EN 12617-2, *Products and systems for the protection and repair of concrete structures — Test methods — Part 2: Shrinkage of crack injection products based on polymer binder: volumetric shrinkage.*
- EN 12618-1, *Products and systems for the protection and repair of concrete structures — Test methods — Part 1: Adhesion and elongation capacity of injection products with limited ductility.*
- EN 12618-2, *Products and systems for the protection and repair of concrete structures — Test methods — Part 2: Determination of the adhesion of injection products, with or without thermal cycling — Adhesion by tensile bond strength.*
- EN 12618-3, *Products and systems for the protection and repair of concrete structures — Test methods — Part 3: Determination of the adhesion of injection products, with or without thermal cycling — Slant shear method.*
- EN 12637-1, *Products and systems for the protection and repair of concrete structures — Test methods — Compatibility of injection products — Part 1: Compatibility with concrete.*
- EN 12637-3, *Products and systems for the protection and repair of concrete structures — Test methods — Compatibility of injection products — Part 3: Effect of injection products on elastomers.*
- EN 13687-3, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of thermal compatibility — Part 3: Thermal cycling without de-icing salt impact.*
- EN 14068, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of watertightness of injected cracks without movement in concrete.*
- EN 14117, *Products systems for the protection and repair of concrete structures - Test methods - Determination of time of efflux of cementitious injection products.*
- EN 14406, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of the expansion ratio and expansion evolution.*
- EN 14497, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of the filtration stability.*
- EN 14498, *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.*
- EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:1993, including Corrigendum 1:1994).*
- EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:1993, including Corrigendum 1:1994).*

EN 1504-5:2004 (E)

EN ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pyknometer method (ISO 2811-1:1997)*.

EN ISO 2811-2, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method (ISO 2811-2:1997)*.

EN ISO 3219, *Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscosimeter with defined shear rate (ISO 3219:1993)*.

EN ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile matter content (ISO 3251:2003)*.

EN ISO 9514, *Paints and varnishes — Determination of the pot life of liquid systems — Preparation and conditioning of samples and guidelines for testing (ISO 9514:1992)*.

ISO 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*.

ISO 13320-1, *Particle size analysis — Laser diffraction methods — Part 1: General principles*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1504-1:1998, EN 1504-8:2004, ENV 1504-9:1997 and the following apply.

3.1 injection products

injection products as defined in 3.2.5 of EN 1504-1:1998 can be classified in three categories, according to the intended use

3.1.1 injection products for force transmitting filling of cracks, voids and interstices in concrete (F)

products able to bond to the concrete surface and transmit forces across them

NOTE Products for injection for force transmitting filling of cracks, voids and interstices can also be used for saturation without receiving a force transmitting bond.

Unless otherwise stated, injection products are intended for filling of cracks, voids and interstices, so that in the following, only the wording injection products for filling of cracks is used

3.1.2 injection products for ductile filling of cracks, voids and interstices in concrete (D)

flexible products which are able to accommodate subsequent movement

3.1.3 injection products for swelling fitted filling of cracks, voids and interstices in concrete (S)

products which are able, in the reacted state, to swell repeatedly by water adsorption, where the water molecules are bonded to the molecules of the injection product

NOTE This category of products, referred to as gels, are only used for waterproofing purposes for cracks and voids in damp, wet and water - flow conditions.

3.2 injection product formulated with reactive polymer binder (P)

product where the hardening is related to the curing of a reactive polymer binder. The reactive part of a polymer binder involved in the hardening of the binder is the functional group

3.3 injection product formulated with hydraulic binder (H)

product where the hardening is related to the hydration reaction of an hydraulic binder