# Execution of special geotechnical works - Micropiles

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD



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|---|---|
| See Eesti standard EVS-EN 14199:2015 sisaldab Euroopa standardi EN 14199:2015 ingliskeelset teksti. | This Estonian standard EVS-EN 14199:2015 consists of the English text of the European standard EN 14199:2015. |
| 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 20.05.2015. | Date of Availability of the European standard is 20.05.2015. |
| 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.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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# EN 14199

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Supersedes EN 14199:2005

English Version

# Execution of special geotechnical works - Micropiles

Exécution des travaux géotechniques spéciaux - Micropieux

Ausführung von Arbeiten im Spezialtiefbau - Mikropfähle

This European Standard was approved by CEN on 12 March 2015.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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# Foreword

This document (EN 14199:2015) has been prepared by Technical Committee CEN/TC 288 “Execution of special geotechnical works”, the secretariat of which is held by 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 November 2015, and conflicting national standards shall be withdrawn at the latest by November 2015.

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 supersedes EN 14199:2005.

The technical changes in comparison to EN 14199:2005 are:

— Driven piles are excluded from EN 14199 and transferred to EN 12699;

— sections describing concrete and testing have been minimised;

— EN 14199:2015 has been harmonized with EN 1536.

The general scope of CEN/TC 288 is the standardization of the execution procedures for geotechnical works, including testing and control methods, and the required material properties. WG 16 has been charged with the subject area of micropiles.

This document has been prepared to stand alongside EN 1997-1. Clause 7 of this Standard covers design aspects of micropiles.

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

# 1 Scope

**1.1** This European Standard establishes general principles for the execution of micropiles.

They are for drilled piles constructed using a drilling tool with a diameter less than 300 mm.

NOTE 1 This European Standard is not applicable to driven piles, the execution of which is governed by EN 12699.

NOTE 2 For a definition of shaft diameter see 3.3.

**1.2** Micropiles are structural members to transfer actions to the ground and can contain bearing elements to transfer directly or indirectly loads and or to limit deformations. For examples of micropiles see Figure 1, Figure 2 and Figure 3. Their shaft and base resistance can be improved (mostly by grouting) and they can be constructed with (see Figure 4):

— uniform cross section (straight shaft); or

— telescopically changing shaft dimensions;

— shaft enlargements; and/or

— base enlargement.

**1.3** Other than practical considerations, there are no limitations regarding, length, inclination (definition of inclination, see Figure 5), slenderness ratio or shaft and base enlargements.

**1.4** The provisions of this European Standard apply to (see Figure 6):

— single micropiles;

— micropile groups;

— reticulated micropiles;

— micropile walls.

**1.5** The material of micropiles covered by this European Standard can be:

— steel or other reinforcement materials;

— grout, mortar or concrete;

— a combination of above.

**1.6** Micropiles can be used for:

— working under restricted access and/or headroom conditions;

— foundations of new structures (particularly in very heterogeneous soil or rock formations);

— reinforcing or strengthening of existing structures to increase the capacity to transfer load to depth with acceptable load settlement characteristics, e.g. underpinning works;

— reducing settlements and/or displacements;

— forming a retaining wall;

— reinforcing of soil to form a bearing and/or retaining structure;

— improving slope stability;

— securing against uplift;

— other applications where micropile techniques are appropriate.

**1.7** Deep mixing columns according to EN 14679 are not included in this European Standard. Columns constructed by jet grouting are covered by EN 12716. Ground anchors are covered by EN 1537.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 206:2013, *Concrete - Specification, performance, production and conformity*

EN 445, *Grout for prestressing tendons - Test methods*

EN 447:2007, *Grout for prestressing tendons - Basic requirements*

EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labelling*

EN 1090-2, *Execution of steel structures and aluminium structures — Part 2: Technical requirements for steel structures*

EN 1536:2010, *Execution of special geotechnical work - Bored piles*

EN 1990, *Eurocode - Basis of structural design*

EN 1991 (all parts), *Eurocode 1: Actions on structures*

EN 1992-1-1, *Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings*

EN 1993 (all parts), *Eurocode 3: Design of steel structures*

EN 1994-1-1, *Eurocode 4: Design of composite steel and concrete structures — Part 1-1: General rules and rules for buildings*

EN 1997-1:2004, *Eurocode 7: Geotechnical design - Part 1: General rules*

EN 1997-2, *Eurocode 7 - Geotechnical design - Part 2: Ground investigation and testing*

EN 10025 (all parts), *Hot-rolled products of non-alloy structural steels*

EN 10080, *Steel for the reinforcement of concrete - Weldable reinforcing steel - General*

prEN 10138-4:2001, *Prestressing steels — Part 4: Bars*

EN 10210 (all parts), *Hot finished structural hollow sections of non-alloy and fine grain structural steels*

EN 10219 (all parts), *Cold formed welded structural hollow sections of non-alloy and fine grain steels*

EN 12390-3, *Testing hardened concrete - Part 3: Compressive strength of test specimens*

EN 16228 (all parts), *Drilling and foundation equipment — Safety*

EN ISO 2560, *Welding consumables - Covered electrodes for manual metal arc welding of non-alloy and fine grain steels - Classification (ISO 2560)*

EN ISO 4063, *Welding and allied processes - Nomenclature of processes and reference numbers (ISO 4063)*

EN ISO 5817, *Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817)*

EN ISO 9692-1, *Welding and allied processes - Types of joint preparation - Part 1: Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels (ISO 9692-1)*

EN ISO 9692-2, *Welding and allied processes - Joint preparation - Part 2: Submerged arc welding of steels (ISO 9692-2)*

EN ISO 11960, *Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells (ISO 11960)*

EN ISO 14341, *Welding consumables - Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels - Classification (ISO 14341)*

EN ISO 15630-3, *Steel for the reinforcement and prestressing of concrete - Test methods - Part 3: Prestressing steel (ISO 15630-3)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1)*

EN ISO 17632, *Welding consumables - Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels - Classification (ISO 17632)*

EN ISO 17660-1, *Welding - Welding of reinforcing steel - Part 1: Load-bearing welded joints (ISO 17660-1)*

EN ISO 18276, *Welding consumables - Tubular cored electrodes for gas-shielded and non-gas-shielded metal arc welding of high-strength steels - Classification (ISO 18276)*

prEN ISO 22477-1:2014, *Geotechnical investigation and testing — Testing of geotechnical structures — Part 1: Pile load test by static axially loaded compression (ISO/DIS 22477-1:2014)*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**micropile**
**fr: micropieu**
**de: Mikropfahl**
drilled piles which have a diameter smaller than 300 mm

**3.2**
**enlarged base**
**fr: base élargie**
**de: Fußaufweitung**
base of the micropile formed to have a cross section greater than that of its shaft