

VAIAPAIGALDUS- JA VUNDAMENDIRAJAMISSEADMED.
OHUTUS. OSA 6: JUGAPUURIMIS-, PINNASVALU- JA
INJEKTSIOONVALUSEADMED

Drilling and foundation equipment - Safety - Part 6:
Jetting, grouting and injection equipment

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16228-6:2014+A1:2021 sisaldab Euroopa standardi EN 16228-6:2014+A1:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 16228-6:2014+A1:2021 consists of the English text of the European standard EN 16228-6:2014+A1:2021.
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 and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 22.12.2021.	Date of Availability of the European standard is 22.12.2021.
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ICS 93.020

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English Version

Drilling and foundation equipment - Safety - Part 6: Jetting, grouting and injection equipment

Machines de forage et de fondation - Sécurité - Partie 6:
Machines pour traitement des sols par injection et
machines pour injection des sols par jet

Geräte für Bohr- und Gründungsarbeiten - Sicherheit -
Teil 6: Geräte für Injektionsarbeiten

This European Standard was approved by CEN on 6 March 2014 and includes Amendment 1 approved by CEN on 22 November 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 16228-6:2014+A1:2021) has been prepared by Technical Committee CEN/TC 151 “Construction equipment and building material machines - Safety”, 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of an identical text or by endorsement, at the latest by June 2022 and conflicting national standards shall be withdrawn at the latest by June 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 16228-6:2014 A1.

This document includes Amendment 1 approved by CEN on 22 November 2021.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

This European Standard is divided into several parts and covers drilling and foundation equipment.

Part 1 contains requirements that are/may be common to all drilling and foundation equipment. Other parts contain additional requirements for specific machines that supplement or modify the requirements of part 1. Compliance with the clauses of part 1 together with those of a relevant specific part of this standard giving requirements for a particular machine provides one means of conforming with the essential health and safety requirements of the Directive concerned.

When a relevant specific part does not exist, part 1 can help to establish the requirements for the machine, but will not by itself provide a means of conforming to the relevant essential health and safety requirements of the Directive.

This European Standard, EN 16228, *Drilling and foundation equipment – Safety*, consists of the following parts:

- *Part 1: Common requirements*
- A1 *Part 2: Mobile drill rigs for civil and geotechnical engineering in soil or soil and rock mixture* A1
- *Part 3: Horizontal directional drilling equipment (HDD)*
- *Part 4: Foundation equipment*
- *Part 5: Diaphragm walling equipment*
- *Part 6: Jetting, grouting and injection equipment*

— *Part 7: Interchangeable auxiliary equipment*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

Introduction

This document is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for drilling and foundation equipment that have been designed and built according to the provisions of this type C standard.

1 Scope

This European Standard, together with part 1, deals with all significant hazards for jetting, grouting and injection equipment when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer associated with the whole life time of the machine (see Clause 4).

The requirements of this part are complementary to the common requirements formulated in A1 EN 16228-1:2014+A1:2021 A1.

This document does not repeat the requirements from A1 EN 16228-1:2014+A1:2021 A1, but adds or replaces the requirements for application for jetting, grouting and injection equipment.

Rigs for drilling, vibrating, pile driving, to be used for preparing holes for these applications are covered by A1 EN 16228-2:2014+A1:2021 A1 and/or A1 EN 16228-4:2014+A1:2021 A1.

Jetting, grouting and injection equipment is used in the preparation, transfer and application of grouting materials used for either:

- the improvement of ground condition; or
- the filling of voids e.g. around piles or ground anchors.

Jetting, grouting and injection equipment are constituted by all equipment and installations, operated by hand or electrically, pneumatically, mechanically or hydraulically powered, necessary for the following:

- mixing, storing, measuring and pumping of substances (cement suspension, mortar or chemical liquids/mixtures);
- jetting, grouting and injection processes (of/into subsoil) with low, medium or high pressure or vacuum systems;
- A1 *deleted text* A1
- all control systems, electrical or mechanical pressure and flow recorders, for monitoring the grouting;
- all jetting, grouting and injection accessories, such as: special tools, lances, rods, sockets, packers, retention clamps and swivel hooks.

A1 This document does not apply to machines and equipment for conveying, spraying and placing concrete and mortar (covered by EN 12001).

This document does not deal with jetting, grouting or injection units intended to use products that generate toxic gases. A1

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 809:1998+A1:2009, *Pumps and pump units for liquids — Common safety requirements*

A1 EN 853:2015, *Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification*

EN 854:2015, *Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification*

EN 856:2015, *Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification*

EN 857:2015, *Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification* ^{A1}

EN 12001:2012, *Conveying, spraying and placing machines for concrete and mortar — Safety requirements*

^{A1} deleted text ^{A1}

^{A1} EN 16228-1:2014+A1:2021 ^{A1}, *Drilling and foundation equipment — Safety — Part 1: General requirements*

^{A1} EN ISO 3949:2020, *Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification (ISO 3949:2020)* ^{A1}

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

^{A1} ISO 3862:2017, *Rubber hoses and hose assemblies — Rubber-covered spiral-wire-reinforced hydraulic types for oil-based or water-based fluids — Specification* ^{A1}

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, ^{A1} EN 16228-1:2014+A1:2021 ^{A1} and the following apply.

3.1

grouting

method for filling boreholes voids

Note 1 to entry: The pressure of the grout pump is up to 0,3 Mpa.

3.2

injection

method for grouting liquid mixtures or resins into voids/pores or for injecting of ground anchors or micro piles

Note 1 to entry: Two different methods can be distinguished: the injection of solid matter in a liquid mixture, like cement or bentonite and the injection of chemicals, like water glass and hardener.

Note 2 to entry: The pressure of the injection pump is up to 11 Mpa.