



SLOVENSKI STANDARD
SIST EN 16228-6:2014+A1:2022

01-marec-2022

Oprema za vrtanje in temeljenje - Varnost - 6. del: Oprema za vpihavanje, nanašanje malte in vbrizgavanje

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

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

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

Ta slovenski standard je istoveten z: EN 16228-6:2014+A1:2021

<http://standards.iteh.ai/catalog/standards/sist/cb0cc000-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>

ICS:

53.100	Stroji za zemeljska dela	Earth-moving machinery
93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works

SIST EN 16228-6:2014+A1:2022 **en,fr,de**

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

SIST EN 16228-6:2014+A1:2022

<https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>

EUROPEAN STANDARD

EN 16228-6:2014+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2021

ICS 93.020

Supersedes EN 16228-6:2014

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.

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.

CEN members are the national standards bodies of 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 United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	3
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 List of additional significant hazards.....	8
5 Safety requirements and/or protective measures	9
5.1 General.....	9
5.2 Components	9
5.2.1 Fluid pumps, hoses and mixers.....	9
5.2.2 Working conditions.....	10
5.2.3 Remote control.....	10
5.2.4 \square_{A1} Remote stopping devices for jet grouting pumps \square_{A1}	10
5.2.5 Hose fastening for jet-grouting	10
5.3 Dust	10
5.4 \square_{A1} Noise \square_{A1}	10
6 Verification of the safety requirements and/or protective measures.....	10
6.1 General.....	10
6.2 Functional test.....	11
7 Information for use	12
7.1 Operator's manual	12
7.2 Maintenance instructions	12
Annex A (normative) Noise test code.....	13
Annex ZA (informative) \square_{A1} Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered \square_{A1}	14
Bibliography.....	17

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*

EN 16228-6:2014+A1:2021 (E)

— *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.

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

SIST EN 16228-6:2014+A1:2022

<https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>

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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 16228-6:2014+A1:2022](https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022)

<https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>

EN 16228-6:2014+A1:2021 (E)

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.

EN 16228-6:2014+A1:2021 (E)

3.3

jetting or jet-grouting

method for producing concrete part in soil, which is normally used for the underpinning of foundations of existing buildings, to produce a dense pit or to densify the pit floor, to stabilize the soil while tunnelling or to erect a dense screen for dams

Note 1 to entry: The pressure of the jetting or high pressure pump is up to 60 MPa, which creates an exit velocity of the jet from the nozzle of more than 100 m/s.

Ⓐ1) *deleted text* Ⓐ1)

4 List of additional significant hazards

Clause 4 of Ⓐ1) EN 16228-1:2014+A1:2021 Ⓐ1) applies with the following additional Table 1.

Table 1 of Ⓐ1) EN 16228-1:2014+A1:2021 Ⓐ1) and the additional Table 1 in this document contain all hazards, (hazardous situations and events), identified by risk assessments as significant for jetting, grouting and injection equipment and which require action to eliminate or reduce risk.

Hazards generally occur under the following conditions:

- a) in transportation to and from the work site;
- b) in rigging and dismantling on the work site;
- c) in service on the work site;
- d) when moving between pile positions on the work site;
- e) out of service on the work site;
- f) in storage at the plant depot or on the work site;
- g) during remote control of the pump, especially if the pump is out of sight of the drill rig operator;
- h) during maintenance.

iTeh STANDARD
PREVIEW
(standards.iteh.ai)

[SIST EN 16228-6:2014+A1:2022](https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022)

<https://standards.iteh.ai/catalog/standards/sist/eb0ccb60-3b69-4e7c-85e1-e9090780d4c9/sist-en-16228-6-2014a1-2022>