



SLOVENSKI STANDARD
oSIST prEN 16228-1 rev:2011
01-junij-2011

Oprema za vrtanje in temeljenje - Varnost - 1. del: Splošne zahteve

Drilling and foundation equipment - Safety - Part 1: Common requirements

Geräte für Bohr- und Gründungsarbeiten - Sicherheit - Teil 1: Gemeinsame Anforderungen

Machines de forage et de fondation - Sécurité - Partie 1: Prescriptions communes

Ta slovenski standard je istoveten z: prEN 16228-1 rev

ICS:

93.020 Zemeljska dela. Izkopavanja. Earthworks. Excavations.
Gradnja temeljev. Dela pod Foundation construction.
zemljo Underground works

oSIST prEN 16228-1 rev:2011

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 16228-1 rev

February 2011

ICS 93.020

Will supersede EN 791:1995+A1:2009, EN
996:1995+A3:2009

English Version

Drilling and foundation equipment - Safety - Part 1: Common requirements

Machines de forage et de fondation - Sécurité - Partie 1:
Prescriptions communes

Geräte für Bohr- und Gründungsarbeiten - Sicherheit - Teil
1: Gemeinsame Anforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 151.

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Foreword

This document (prEN 16228-1:2011) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 791:1995+A1:2009, EN 996:1995+A3:2009.

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

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

Part 1: Drilling and foundation equipment – Safety – Common requirements

Part 2: Drilling and foundation equipment – Safety – Mobile drill rigs for civil and geotechnical engineering, quarrying and mining

Part 3: Drilling and foundation equipment – Safety – Horizontal directional drilling equipment (HDD)

Part 4: Drilling and foundation equipment – Safety – Foundation equipment

Part 5: Drilling and foundation equipment – Safety – Diaphragm walling equipment

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

Part 7: Drilling and foundation equipment – Safety – Interchangeable auxiliary equipment

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Introduction

This European Standard is a type C-standard as stated in EN ISO 12100-1.

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 document specifies the common safety requirements for drilling and foundation equipment.

This document deals with all significant hazards pertinent to drilling and foundation equipment, when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex A) associated with the following:

- transport;
- equipment in service and out of service;
- maintenance;
- moving on site;
- storage;
- disabling and scrapping.

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The prEN 16228 series is applicable to drilling and foundation equipment, examples of which are listed in Annex A.

Additional specific requirements for certain types of drilling and foundation equipment are given in parts 2 to 7 of this standard.

NOTE The requirements specified in this part of the standard are common to two or more families of drilling and foundation equipment.

This document gives safety requirements for all types of drilling and foundation equipment and shall be used in conjunction with one of parts 2 to 7. These machine specific parts do not repeat the requirements from part 1 but add to or replace the requirements for the type of drilling and foundation equipment in question.

Machine specific requirements in parts 2 to 7 take precedence over the respective requirements of this standard.

The following machines are excluded from the scope of this standard:

- tunnelling machines according to EN 12336;
- drill rigs used in oil and gas industry.

This document deals with all significant hazards, hazardous situations and events relevant to drilling and foundation equipment, when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

This document specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards, hazardous situations and events during commissioning, operation and maintenance of drilling and foundation equipment.

This document specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards.

If the carrier machine consists of an excavator as defined in EN 474, crane as defined in EN 13000 etc. the carrier shall be covered by its own standards to the extent the requirements as defined in Clause 5 of this standard prEN 16228-1 are not applicable.

If drilling and foundation equipment operates with attachments other than those included in the scope of this standard, the safety standards applying to these attachments shall also be complied with.

If the machine is intended to be used in potentially explosive atmosphere, additional requirements shall be met which are not covered by this standard.

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 3-7:2007, *Portable fire extinguishers Portable fire extinguishers — Part 7: Characteristics, performance requirements and test methods*

EN 474-1:2006+A1:2009, *Earth-moving machinery — Safety — Part 1: General requirements*

prEN 16228-7:2010, *Drilling and foundation equipment — Safety — Part 7: Drilling and foundation equipment – Safety – Interchangeable auxiliary equipment*

<https://standards.iteh.ai> EN 953:1997+A1:2009, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 983:1996+A1:2008, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 1037:1995+A1:2008, *Safety of machinery — Prevention of unexpected start-up*

EN 1993-1-1:2005, *Eurocode 3: Design of steel structures — Part 1-1: General rules and rules for buildings*

EN 13001-1:2004+A1:2009, *Cranes — General design — Part 1: General principles and requirements*

EN 13001-2:2004+A3:2009, *Cranes — General design — Part 2: Load effects*

EN 13309:2010, *Construction machinery — Electromagnetic compatibility of machines with internal power supply*

EN 13411-6:2004+A1:2008, *Terminations for steel wire ropes — Safety — Part 6: Asymmetric wedge socket*

EN 13411-7:2006+A1:2008, *Terminations for steel wire ropes — Safety — Part 7: Symmetric wedge socket*

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EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN ISO 2860:2008, *Earth-moving machinery — Minimum access dimensions (ISO 2860:1992)*

prEN ISO 2867:2009, *Earth-moving machinery — Access systems (ISO 2867:2006, including Cor 1:2008)*

EN ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope (ISO 3411:2007)*

EN ISO 3449:2008, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements (ISO 3449:2005)*

prEN ISO 3450:2009, *Earth-moving machinery — Braking systems of rubber-tyred machines — Systems and performance requirements and test procedures (ISO 3450:1996)*

EN ISO 3457:2008, *Earth-moving machinery — Guards — Definitions and requirements (ISO 3457:2003)*

EN ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3471:2008)*

EN ISO 3744:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 3747:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Comparison method in situ (ISO 3747:2000)*

prEN ISO 4413:2008, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO/DIS 4413:2008)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 6682:2008, *Earth-moving machinery — Zones of comfort and reach for controls (ISO 6682:1986 including Amendment 1:1989)*

EN ISO 7096:2008, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2000)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 9614-2:1996, *Acoustic — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11203:2009, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12001:2009, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code (ISO 2001:1996)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2006, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles (ISO 14121-1:2007)*

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 4302:1981, *Cranes — Wind load assessment*

ISO 4305:1991, *Mobile cranes — Determination of stability*

ISO 4309:2004, *Cranes — Wire ropes — Care, maintenance, installation, examination and discard*

ISO 5006:2006, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 6405-1:2004, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 10570:2004, *Earth-moving machinery — Articulated frame lock — Performance requirements*

ISO 10968:2004, *Earth-moving machinery — Operator's controls*

ISO 10265:2008, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*

ISO 12508:1994, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

ISO 5817:2005, *Earth-moving machinery — Safety requirements for remote operator control*

3 Terms and definitions

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

3.1

danger zone

any zone within and/or around drilling and foundation equipment in which a person is exposed to risk of injury or damage to health

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NOTE For drilling and foundation equipment this means the area in which a person can be reached by an operational movement of the drilling and foundation equipment, by any part involved in the process by swinging or falling parts, pile elements and evacuated spoil.

3.2
working area

an area near a machine in which its tools are moved in order to carry out work

3.3
user

the holder or owner of drilling and foundation equipment

3.4
operator

a person controlling the drilling and foundation equipment while operating. He may also be the driver of the rig

3.5
driver

a person controlling the transport movement of the drilling and foundation equipment

3.6
assistant

a person who assists with the drilling or foundation operation but is not responsible for control of the drilling or foundation equipment

3.7
hook load

the actual load carried by the hook of the bottom block, including the weight of the bottom block and of the running ropes

3.9
tipping lines

a) tipping lines for drilling and foundation equipment, crawler and wheel mounted:

- 1) in the direction of travel, the lines connecting the lowest support points of contact of the idlers, rollers or the drives of the tracks or the front wheels, see Figures 2 to 4;
- 2) in sideward direction (perpendicular to the direction of travel), the lines passing through the centres of the support contact areas on each side of the chassis, see Figures 2 to 4

b) tipping lines for drilling and foundation equipment on support legs:

The lines connecting the centres of the support legs/jacks on each side of the chassis, see Figures 2 and 5

3.10
tipping angle

the angle a machine subjected to a system of loads (own weight, wind, accelerations, working loads) should be raked, starting from max allowed operating slope, in order to become unstable

3.11
stability angle

the minimum among tipping angles relative to all tipping lines within a load case and position, to be found for all load cases, positions and all foreseen combinations of loads

3.12
required stability angle

minimum required value for stability angle. Different values may be required for different load cases (e.g. travelling, working)

3.10**tramming**

short movement of drilling and foundation equipment in operating condition on site

3.11**travelling**

moving of drilling and foundation equipment in non operating condition specified by the manufacturer

3.12**slewing**

rotation of the upper structure of drilling and foundation equipment in relation to a fixed reference frame on the ground

3.13**sweep radius**

a special term for drill rigs with booms, being the outer radius, R , of the turning circle for a drill rig in tramming, see Figure 1

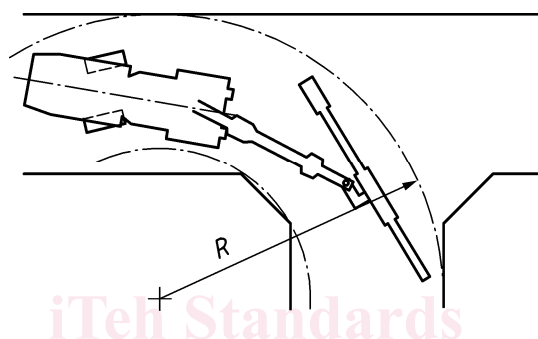


Figure 1 — Sweep radius

3.14**safety factor of a rope**

the ratio between the minimum breaking load of a rope guaranteed by the manufacturer, and maximum pulling load working on that rope

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3.15 working platform for lifting personnel

a working platform used for raising or lowering personnel and materials to enable them to undertake operational work or maintenance, consisting of a guided platform on the mast or leader

3.16**movable platform**

a working platform used for raising or lowering personnel and materials attached to parts of the drilling and foundation equipment other than the mast or leader, e.g. the drill head, which can be moved along the mast or leader. The attachment can be temporary or permanent

NOTE Personnel and material can be moved on this platform and personnel can work from it.

3.17**piling equipment**

assembly of machines and components used for installation or extraction of piles

3.18**piling rig**

carrier machine complete with leader attachment and leader but without pile installation and other equipment

prEN 16228-1:2011 (E)**3.19****pile elements**

foundation element installed in the soil made of concrete (precast or cast in situ), steel (tubes, beams or sheet piles), wood or plastic material. Piles may have an interlocking feature to enable adjacent elements to be joined together

3.20**carrier machine**

machine providing mobility for and supporting the weight of the drilling and foundation equipment, together with the accessories and the load (e.g. pile, excavated soil)

NOTE A carrier machine may also accommodate the necessary power source and controls of the drilling and foundation equipment. Apart from stationary carrier machines, wheel, crawler or rail mounted, together with fixed or movable floating carrier machines can be considered.

3.21**leader**

a structure mounted to the carrier machine guiding the installation and extracting equipment

3.22**horizontal directional drilling (HDD)**

steerable system for the installation of pipes, conduits and cables in shallow arc using a surface or pit launched drilling rig

NOTE Traditionally the term applies to large scale crossings in which a fluid filled pilot bore is drilled by rotating the drill string and this is then enlarged by a wash-over pipe and back reamer to the size required for the product pipe.

3.23**percussive (Percussive and Rotary-Percussive)**

percussive drilling is a method by which the hole is produced by crushing the ground or rock at the bottom of the drill hole by striking it with the drilling tool and removing the cuttings out of the bore hole.

Rotary percussive drilling is performed by a piston striking directly on the bit (down the hole hammer drills) or by percussive energy transmitted via a drill string to the bit. The piston is powered by either hydraulic fluid or compressed air.

At the same time the drill bit is rotated either continuously or intermittently.

The cuttings are continuously removed out of the borehole by a flushing medium, air or fluid which is carried to the drilling tool.

Examples of drill rigs are but not limited to: Tophammer, Tophammer systems, Overburden, Down the hole

3.24**non-Percussive (Rotary and Horizontal Directional Drilling)**

non-percussive i.e. Rotary drilling is a method in which the drilling tool at the bottom of the borehole is rotated and at the same time, a feed load may be applied by a feed system or drill collar. The ground or rock at the bottom of the borehole is crushed or cut by pressure, shear or tensile stress produced by the different drilling tools. The cuttings may be periodically or continuously removed out of the borehole.

Examples of drill rigs are but not limited to: Rotary Rock Drilling, Overburden, Horizontal Directional Drilling, Piling Drilling with Kelly, Piling Drilling with Continuous Flight Auger (CFA), Piling Drilling with Twin Rotary Drive Drilling System for small diameters (FoW), Vibrating Drill Rig, Core Exploration Drill Rigs and (Truck Based) Water Well Drill Riggs