SLOVENSKI STANDARD
SIST EN 16228-1:2014

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SIST EN 791:2000+A1:2009
SIST EN 996:2000+A3:2009

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

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EUROPEAN STANDARD

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English Version

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

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This European Standard was approved by CEN on 6 March 2014.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 16228-1:2014) 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of an identical text or by endorsement, at the latest by November 2014 and conflicting national standards shall be withdrawn at the latest by November 2014.

This document supersedes 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(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*

— *Part 2: Mobile drill rigs for civil and geotechnical engineering, quarrying and mining*

— *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*

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

Introduction

This European Standard 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 specifies the common safety requirements for drilling and foundation equipment.

Part 1 of this European Standard deals with the significant hazards common to drilling and foundation equipment (see Annex A), 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 (transport, assembly, dismantling, equipment in service and out of service, maintenance, moving on site, storage, disabling and scrapping).

NOTE 1 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 is intended to be used in conjunction with one of parts 2 to 7. These machine specific parts do not repeat the requirements from part 1 but supplement or modify the requirements for the type of drilling and foundation equipment in question.

For multipurpose machinery, the parts of the standard that cover the specific functions and applications are used, e.g. a drilling machine also used as a piling machine will use the relevant requirements of EN 16228-1, EN 16228-2, and EN 16228-4.

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

— tunnelling machines, unshielded tunnel boring machines and rodless shaft boring machines for rock according to prEN 16191;

— raise boring machines;

— drill rigs used in oil and gas industry.

NOTE 2 Specific requirements for offshore applications are not covered by this European Standard.

Where a drilling or foundation equipment of fixed configuration that is not intended to be separated is assembled using a carrier based on earth-moving equipment, agricultural equipment, or a crane, then the completed assembly will conform to the requirements specified in this drilling and foundation equipment standard.

Drilling and foundation equipment within the scope of EN 16228 parts 1 to 6 may include interchangeable auxiliary equipment within the scope of EN 16228-7, either as an integral part of its construction or as interchangeably fitted equipment.

If drilling and foundation equipment is intended to be used in a potentially explosive atmosphere, additional requirements will need to be met which are not covered by this standard.

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 474-1:2006+A4:2013, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 474-5:2006+A3:2013, *Earth-moving machinery — Safety — Part 5: Requirements for hydraulic excavators*

EN 795:2012, *Personal fall protection equipment — Anchor devices*

EN 953:1997+A1:2009, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

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

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*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*[1)]

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

EN ISO 2867:2011, *Earth-moving machinery — Access systems (ISO 2867:2011)*

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)*

EN ISO 3450:2011, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems (ISO 3450:2011)*

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

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3747:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering/survey methods for use in situ in a reverberant environment (ISO 3747:2010)*

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 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 Amd 1:1989)*

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

[1)] This document is impacted by a Corrigendum issued in 2010.

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

EN ISO 9614-2:1996, *Acoustics — 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 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13856-1:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

EN ISO 13856-2:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars (ISO 13856-2:2013)*

EN ISO 13856-3:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 3: General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices (ISO 13856-3:2013)*

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 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *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 14122-4:2010, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2004)*[2)]

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*[3)]

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 4309:2010, *Cranes — Wire ropes — Care and maintenance, inspection and discard*

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

[2)] This document is impacted by stand-alone Amendment 1 published in 2010.

[3)] This document is impacted by stand-alone Amendment 1 published in 2010.

ISO 6405-1:2004, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*[4)]

ISO 7000:2012, *Graphical symbols for use on equipment — Registered symbols*

ISO 9533:2010, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*

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

ISO 10532:1995, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*

ISO 10567:2007, *Earth-moving machinery — Hydraulic excavators — Lift capacity*

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

ISO 12117-2:2008, *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2: Roll-over protective structures (ROPS) for excavators of over 6 t*

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

ISO 15817:2012, *Earth-moving machinery — Safety requirements for remote operator control systems*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.1
drilling and foundation equipment
integrated machine, interchangeable equipment and machine equipped with interchangeable equipment designed for one or more of the following applications:

— preparing holes into soil and rock, for construction, exploration, water wells, soil investigation, or

— preparing, installing or retracting of longitudinal elements for foundations, retaining-walls, slurry-walls, soil improvement, or

— preparing and installing contiguous panels for retaining-walls and cut-off walls, or

— installing elements for ground improvement as drainage or injection, or

— installing elements for soil or rock nailing

Note 1 to entry: If drilling and foundation equipment will be used for different applications, it may consist of an assembly of machines and components (see Annex A and EN 16228 parts 2 to 7).

3.2
drill rig
machine for drilling in soil or rock utilising either percussive, rotary or vibration principles (or a combination of principles) which may involve the addition of drill rods, tubes, casings or augers etc, normally threaded, as the hole extends

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[4)] This document is impacted by stand-alone Amendment 1, *Additional Symbols*, published in 2010.

3.3
percussive drill rig
drill rig using percussive drilling methods

3.4
non-percussive drill rig
drill rig using non-percussive drilling methods

3.5
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 1 to entry: The carrier is part of the drilling and foundation equipment in integrated machines.

Note 2 to entry: 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.

3.6
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 1 to entry: 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.

3.7
piling rig
carrier machine complete with leader attachment and leader but without pile installation and other equipment

3.8
piling equipment
assembly of machines and components used for installation or extraction of pile elements

3.9
diaphragm walling rig
carrier machine and cutting tools to cut panels for diaphragm walls

3.10
jetting, grouting and injection equipment
machine for mixing, pumping or injecting grout, cement, concrete and drilling fluids

3.11
interchangeable auxiliary equipment
separate equipment that can be attached to a carrier machine to allow it to be used for drilling and foundation operations

3.12
kelly bar
transmission part constituted with a specific steel bar or tube designed for transferring torques and forces onto the drilling tool

Note 1 to entry: A kelly bar may be telescopic with an interlockable function. Tools are attached to the lower end of the Kelly.

3.13
mast/leader
structure mounted to the carrier machine guiding the installation and extracting equipment

3.14
boom
structure for positioning of the mast, leader, feed beam or working platform or directly supporting an excavating tool

3.15
working platform for lifting personnel
platform used for raising or lowering personnel and materials, independently guided by the mast/leader to enable operational work or maintenance to be carried out

3.16
movable platform
platform attached to leader guided parts of drilling and foundation equipment, e.g. drill head, to enable operational work or maintenance to be carried out

Note 1 to entry: The platform can be a temporary or permanent attachment.

Note 2 to entry: Persons may enter and stay on the platform only when it is stationary.

3.17
assistant
person who assists with the drilling or foundation operation but is not responsible for control of the drilling or foundation equipment

3.18
driver (for transport movement)
person controlling and moving drilling and foundation equipment while operating

3.19
operator
person controlling the drilling and foundation equipment while operating

Note 1 to entry: The operator may also be the driver of the rig.

3.20
user
person or company who brings the drilling and foundation equipment into operation for the application of drilling and foundation techniques

Note 1 to entry: The user who is assembling different parts or changing the original configurations or functions of the equipment which departs from the manufacturer's instructions will be considered as the manufacturer according to the Machinery Directive.

3.21
working area
area near a machine in which its tools are moved in order to carry out work

3.22
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