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

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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

Machines de forage et de fondation - Sécurité - Partie 1:
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Teil 1: Gemeinsame Anforderungen

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 foreword

This document (EN 16228-1:2014+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of an identical text or by endorsement, at the latest by June 2022 and conflicting national standards shall be withdrawn at the latest by June 2022.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 16228-1:2014 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 16228-1:2014+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.

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.

EN 16228-1:2014+A1:2021 (E)**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 A1 EN 16191 A1 ;
- raise boring machines;
- drill rigs used in oil and gas industry A1 ;
- specialized mining machinery and equipment for opencast mining (e.g. rock drill rigs, blast hole drills) (under the scope of CEN/TC 196);
- all underground mining machinery and equipment for the extraction of solid mineral substances (e.g. rock drill rigs, raise boring machines, shaft boring machines, mining auger boring machines, jumbos) as well as machinery and equipment for underground mine development (under the scope of CEN/TC 196);
- core drilling machines on stand (covered by EN 12348);
- hand-held machines (in particular machines covered by ISO 11148-5). A1

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 is A1 covered by this A1 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.

A1 If drilling and foundation equipment is intended to be used in a potentially explosive atmosphere, or in case of lightning risk, additional requirements will need to be met which are not covered by this document.

This document is not applicable to drilling and foundation equipment manufactured before the date of its publication. ^{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 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*

^{A1} EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles* ^{A1}

^{A1} EN 795:2016 ^{A1}, *Personal fall protection equipment — Anchor devices*

^{A1} *deleted text* ^{A1}

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

^{A1} *deleted text* ^{A1}

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*

^{A1} *deleted text* ^{A1}

^{A1} EN 13531:2001+A1:2008, *Earth-moving machinery — Tip-over protection structure (TOPS) for compact excavators — Laboratory tests and performance requirements (ISO 12117:1997, modified)* ^{A1}

^{A1} EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2016, modified)* ^{A1}

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)*

^{A1} EN ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3741:2008)* ^{A1}

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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)*

A1 deleted text **A1**

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 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)*

A1 EN ISO 13766-1:2018, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 1: General EMC requirements under typical electromagnetic environmental conditions (ISO 13766-1:2018)*

EN ISO 13766-2:2018, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 2: Additional EMC requirements for functional safety (ISO 13766-2:2018)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

EN ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)* ^(A1)

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)*

^(A1) EN ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)* ^(A1)

^(A1) deleted text ^(A1)

^(A1) EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)* ^(A1)

EN ISO 14122-4:2010, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2004)*¹⁾

^(A1) EN IEC 61000-6-2:2019, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity standard for industrial environments (IEC 61000-6-2:2016)*

EN IEC 61000-6-4:2019, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Immunity standard for industrial environments (IEC 61000-6-4:2018)*

EN IEC 61496-1:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2020)* ^(A1)

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*²⁾

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*

^(A1) deleted text ^(A1)

^(A1) ISO 6405-1:2017, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

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

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

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ISO 6683:2005, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests* [Ⓐ]

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 10570:2004, *Earth-moving machinery — Articulated frame lock — Performance requirements* [Ⓐ]

[Ⓐ] ISO 10968:2020 [Ⓐ], *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*

[Ⓐ] ISO 15818:2017, *Earth-moving machinery — Lifting and tying-down attachment points — Performance requirements* [Ⓐ]

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