SLOVENSKI STANDARD
SIST EN 474-1:2022

01-maj-2022

Nadomešča:
SIST EN 474-1:2007+A6:2019

Stroji za zemeljska dela - Varnost - 1. del: Splošne zahteve

Earth-moving machinery - Safety - Part 1: General requirements

Erdbaumaschinen - Sicherheit - Teil 1: Allgemeine Anforderungen

Engins de terrassement - Sécurité - Partie 1 : Prescriptions générales

Ta slovenski standard je istoveten z: **EN 474-1:2022**

ICS:		
53.100	Stroji za zemeljska dela	Earth-moving machinery

SIST EN 474-1:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 474-1

March 2022

ICS 53.100

Supersedes EN 474-1:2006+A6:2019

English Version

Earth-moving machinery - Safety - Part 1: General requirements

Engins de terrassement - Sécurité - Partie 1 : Prescriptions générales

Erdbaumaschinen - Sicherheit - Teil 1: Allgemeine Anforderungen

This European Standard was approved by CEN on 14 February 2022.

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.

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

This document (EN 474-1:2022) 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 September 2022, and conflicting national standards shall be withdrawn at the latest by March 2024.

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 EN 474-1:2006+A6:2019.

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).

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

EN 474 “Earth-moving machinery — Safety” comprises the following parts:

— Part 1: General requirements

— Part 2: Requirements for tractor-dozers

— Part 3: Requirements for loaders

— Part 4: Requirements for backhoe-loaders

— Part 5: Requirements for hydraulic excavators

— Part 6: Requirements for dumpers

— Part 7: Requirements for scrapers

— Part 8: Requirements for graders

— Part 9: Requirements for pipelayers

— Part 10: Requirements for trenchers

— Part 11: Requirements for earth and landfill compactors

— Part 12: Requirements for cable excavators

— Part 13: Requirements for rollers

To confer a presumption of conformity with the relevant essential requirements of Directive 2006/42/EC, this standard (providing general/common requirements for a whole machine family) has to be applied together with one of those standards as specified in the scope (providing specific requirements for a particular category of machinery within this family), once this standard is cited in the Official Journal of the European Communities under Directive 2006/42/EC.

The main differences between this document and EN 474-1:2006+A6:2019 are as follows:

a) safety-related functions of control systems (excluded);

b) requirements for demolition machinery (deleted);

c) requirements for attachments, multi-purpose and derivative machinery (deleted);

d) normative references (updated);

e) cab requirements for non-compact machines (added);

f) lifting requirements and fitness for purpose (added);

g) recovery, TARP, tying down lifting and transporting requirements (modified);

h) electrical and electronic systems requirements (modified);

i) quick couplers requirements (modified);

j) verification methods table (Clause 5) (added);

k) requirements for no-text safety signs (deleted);

l) requirements for moveable operator's station (modified);

m) requirements for rollers, addressed in a new part 13 (added);

n) list of significant hazards (Annex A) (modified);

o) Annex ZA (modified).

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.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

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

1 Scope

This document specifies the general safety requirements for earth-moving machinery, hereinafter also referred to as machines, described in EN ISO 6165:2012, except horizontal directional drills.

NOTE 1 Horizontal directional drills are covered by EN 16228-1 and EN 16228-3.

This document gives the common safety requirements for earth-moving machinery families (see EN ISO 6165:2012, 3.4) and is intended to be used in conjunction with relevant parts of EN 474-2 to EN 474-13. These machine specific parts (EN 474-2 to EN 474–13) do not repeat the requirements from EN 474-1:2022 but supplement or modify the requirements for the family in question.

NOTE 2 The requirements specified in this part of the standard are common to two or more families of earth-moving machinery.

This document does not provide requirements for main electrical circuits and drives of machinery when the primary source of energy is an external electrical supply.

This document does not provide performance requirements for safety related functions of control system(s).

This document does not deal with towing of trailers.

This document does not deal with demolition machinery.

This document deals with significant hazards, hazardous situations and events relevant to earth-moving machinery, when used as intended and under conditions foreseen but also taking into account any reasonably foreseeable misuse thereof (see Annex A).

The following significant and relevant hazards are not covered in this document:

— Laser;

— Lightning.

This document specifies the appropriate technical measures to reduce risks arising from the significant hazards, hazardous situations and events during the whole foreseeable lifecycle of the machinery as described in EN ISO 12100:2010, 5.4.

This document is not applicable to earth-moving machinery which are manufactured before the date of publication of this document by CEN.

NOTE 3 For travelling on public roads, national traffic regulations apply (e.g. braking, steering, lighting, towing, etc.) until harmonized requirements are available.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 286-2:1992, *Simple unfired pressure vessels designed to contain air or nitrogen — Part 2: Pressure vessels for air braking and auxiliary systems for motor vehicles and their trailers*

EN 1677-2:2000+A1:2008, *Components for slings — Safety — Part 2: Forged steel lifting hooks with latch, Grade 8*

EN 1679-1:1998+A1:2011, *Reciprocating internal combustion engines — Safety — Part 1: Compression ignition engines*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A1:1999)*

EN 60529:1991/A2:2013, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A2:2013)*

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 3164:2013, *Earth-moving machinery — Laboratory evaluations of protective structures — Specifications for deflection-limiting volume (ISO 3164:2013)*

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

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

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

EN ISO 5010:2019, *Earth-moving machinery — Wheeled machines — Steering requirements (ISO 5010:2019)*

EN ISO 5353:1998, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point (ISO 5353:1995)*

EN ISO 6165:2012, *Earth-moving machinery — Basic types — Identification and terms and definitions (ISO 6165:2012)*

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

EN ISO 6683:2008, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests (ISO 6683:2005)*

EN ISO 7010:2020, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2019)*

EN ISO 7096:2020, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2020)*

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

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 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

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

EN ISO 18752:2016, *Rubber hoses and hose assemblies — Wire- or textile-reinforced single-pressure types for hydraulic applications — Specification (ISO 18752:2014)*

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

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2:2016, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 3864-4:2011, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*

ISO 5006:2017, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 6011:2003, *Earth-moving machinery — Visual display of machine operation*

ISO 6014:1986, *Earth-moving machinery — Determination of ground speed*

ISO 6016:2008, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

ISO 6395:2008, *Earth-moving machinery — Determination of sound power level — Dynamic test conditions*

ISO 6396:2008, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Dynamic test conditions*

ISO 6396:2008/Cor. 1:2009, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Dynamic test conditions; Technical Corrigendum 1*

ISO 6405-1:2017[1], *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2:2017[2], *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Symbols for specific machines, equipment and accessories*

ISO 6750-1:2019, *Earth-moving machinery — Operator's manual — Content and format*

ISO 8643:2017, *Earth-moving machinery — Hydraulic excavator and backhoe loader lowering control device — Requirements and tests*

ISO 9244:2008, *Earth-moving machinery — Machine safety labels — General principles*

ISO 9244:2008/AMD 1:2016, *Earth-moving machinery — Machine safety labels — General principles; Amendment 1*

---

[1] As impacted by ISO 6405-1:2017/AMD1:2022.

[2] As impacted by ISO 6405-2:2017/AMD1:2022.

ISO 9247:1990, *Earth-moving machinery — Electrical wires and cables — Principles of identification and marking*

ISO 9247:1990/AMD 1:1998, *Earth-moving machinery — Electrical wires and cables — Principles of identification and marking — Amendment 1*

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

ISO 10261:2021, *Earth-moving machinery — Product identification numbering system*

ISO 10263-2:2009, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter element test method*

ISO 10263-3:2009, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*

ISO 10263-4:2009, *Earth-moving machinery — Operator enclosure environment — Part 4: Heating, ventilating and air conditioning (HVAC) test method and performance*

ISO 10263-5:2009, *Earth-moving machinery — Operator enclosure environment — Part 5: Windscreen defrosting system test method*

ISO 10264:1990, *Earth-moving machinery — Key-locked starting systems*

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 10532:1995/AMD 1:2004, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements; Amendment 1*

ISO 10533:1993, *Earth-moving machinery — Lift-arm support devices*

ISO 10533:1993/AMD 1:2005, *Earth-moving machinery — Lift-arm support devices; Amendment 1*

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

ISO 10968:2020, *Earth-moving machinery — Operator's controls*

ISO 11112:1995, *Earth-moving machinery — Operator's seat — Dimensions and requirements*

ISO 11112:1995/AMD 1:2001, *Earth-moving machinery — Operator's seat — Dimensions and requirements, Amendment 1*

ISO 11862:1993, *Earth-moving machinery — Auxiliary starting aid electrical connector*

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

ISO 12509:2004, *Earth-moving machinery — Lighting, signalling and marking lights, and reflex-reflector devices*

ISO 13031:2016, *Earth-moving machinery — Quick couplers — Safety*

ISO 13333:1994, *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*

ISO 13459:2012, *Earth-moving machinery — Trainer seat — Deflection limiting volume, space envelope and performance requirements*

ISO 14396:2002, *Reciprocating internal combustion engines — Determination and method for the measurement of engine power — Additional requirements for exhaust emission tests in accordance with ISO 8178*

ISO 14401-2:2009, *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 2: Performance criteria*

ISO 14990-1:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 1: General requirements*

ISO 14990-3:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 3: Particular requirements for self-powered machines*

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*

ISO 17063:2003, *Earth-moving machinery — Braking systems of pedestrian-controlled machines — Performance requirements and test procedures*

ISO 17398:2004, *Safety colours and safety signs — Classification, performance and durability of safety signs*

ISO 21507:2010, *Earth-moving machinery — Performance requirements for non-metallic fuel tanks*

3 Terms and definitions

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

Earth-moving machinery and their families are defined in EN ISO 6165:2012.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
earth-moving machinery
self-propelled or towed machine on wheels, crawlers or legs, having equipment and/or attachment, primarily designed to perform excavating, loading, transporting, spreading, compacting or trenching of earth, rock or similar materials

Note 1 to entry: Earth-moving machinery can be of a type either directly controlled by an operator riding or not riding on the machine, or can be remotely controlled by wired or wireless means.

Note 2 to entry: The basic function of earth-moving machinery can be changed by the installation of attachments (see 3.2). EN 474 still applies in event of intended change to the basic function.

3.1.1
compact machine
earth-moving machinery having an operating mass (see ISO 6016:2008) of 4 500 kg or less, or in the case of excavator or crawler loader having an operating mass (see ISO 6016:2008) of 6 000 kg or less

[SOURCE: EN ISO 6165:2012, 3.1.1]

3.2
attachment
component or assembly of components, which can be mounted onto the base machine or equipment (see ISO 6746-1:2003, ISO 6746-2:2003 and ISO 6016:2008) for a specific use

Note 1 to entry: Attachments might be, in the meaning of the Machinery Directive 2006/42/EC, either interchangeable equipment or tools. The term 'attachments' is used in this document to cover both.

3.3
quick coupler
device mounted on an earth-moving machine to allow the quick interchange of attachments

Note 1 to entry: Quick couplers are also commonly referred to under many different names, including "quick hitch" and "attachment bracket". For the purposes of this document, only the term "quick coupler" is used.

[SOURCE: ISO 13031:2016, 3.1]

3.4
lifting operation
raising or lowering of unit loads

Note 1 to entry: Raising and lowering includes changes of level in an upright vertical direction as well as at an inclined angle.

Note 2 to entry: Movement of loose bulk materials by earth-moving machinery is not considered as lifting operations.

3.5
unit load
objects or quantities of bulk material that are held together by means such as pallet, strapping, bag, making them suitable for raising and lowering as a unit, and are moved as single items

3.6
maximum rated operating/lift capacity in lifting operation
maximum capacity which can be lifted at least in one position of the working range as specified by the manufacturer (e.g. on the rated lift capacity table) in the most stable configuration (e.g. outriggers down)

Note 1 to entry: The term "rated operating capacity" is defined in ISO 14397-1:2007 and used in EN 474-3 and EN 474-4. The term "rated lift capacity" is defined in ISO 10567:2007 and used in EN 474-5. Both terms are equivalent.

3.7
base machine
machine with a cab or canopy and operator protective structures if required, without equipment or attachments but possessing the necessary mountings for such equipment and attachments

[SOURCE: ISO 6016:2008, 3.1.1]

3.8
operator's station
area on a ride-on machine from which an operator controls the functions of the machine

3.9
operator's cab
enclosure on a ride-on machine from which an operator controls the travel and work functions of the machine

3.10
routine maintenance
maintenance that is specified in the periodic maintenance schedule of the operator's manual for performing scheduled daily/weekly/monthly maintenance on the machine

3.11
hold-to-run control
control device which initiates and maintains machine functions only as long as the manual control (actuator) is actuated

[SOURCE: EN ISO 12100:2010, 3.28.3]

3.12
ride-on machine
self-propelled direct-controlled machine where the control devices are located on the machine and the machine is controlled by a seated or standing operator

[SOURCE: EN ISO 6165:2012, 3.2.1]

3.13
non-riding machine
self-propelled direct-controlled machine where the control devices are located on the machine and the machine is controlled by an operator (neither seated nor standing on the machine)

[SOURCE: EN ISO 6165:2012, 3.2.2]

3.14
remote-controlled machine
self-propelled earth-moving machinery where the machine can be controlled by the transmission of signals from a control box (transmitter) that is not located on the machine to a receiving unit (receiver) located on the machine

3.15
FOPS
falling-object protective structure
system of structural members arranged in such a way as to provide operators with reasonable protection from falling objects (trees, rocks, small concrete blocks, hand tools, etc.)

3.16
ROPS
roll-over protective structure
system of structural members whose primary purpose is to reduce the possibility of a seat-belted operator being crushed in the event the machine should roll-over

Note 1 to entry: Structural members include any subframe, bracket, mounting, socket, bolt, pin, suspension or flexible shock absorption used to secure the system to the machine frame, but exclude mounting provisions that are integral with the machine frame.

3.17
load capacity indicator
device that warns the operator of a change to the load handling geometry which would increase the longitudinal load moment, beyond pre-determined limit(s)