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Obratovanje cestnih strojev - Varnost - 1. del: Splošne zahteve

Road operation machinery - Safety - Part 1: General requirements

Maschinen für den Straßenbetriebsdienst - Sicherheit - Teil 1 Grundlegende Sicherheitsanforderungen

Machines d'exploitation des routes - Sécurité - Partie 1 : Exigences générales

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Road operation machinery - Safety - Part 1: General requirements

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

European foreword

This document (EN 17106-1:2021) 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of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.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 EN 13019:2001+A1:2008, EN 13021:2003+A1:2008, EN 13524:2003+A2:2014.

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 17106:2021 consists of the following parts under the general title “Road operation machinery – Safety”:

— Part 1: General requirements

— Part 2: Specific requirements for road surface cleaning machines

— Part 3-1: Winter service machines - Specific requirements for snow clearing machines with rotating tools and snow ploughs

— Part 3-2: Winter service machines - Specific requirements for spreading machines

— Part 4: Road service area maintenance machines - Specific requirements for grass and brush cutting machines

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 12100:2010.

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 road operation machinery.

This document deals with the significant hazards (see Annex A) common to road operation machinery, when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer associated with the whole lifetime of the machine (transportation, travel and work mode mounting and dismounting of equipment/attachments in service, routine maintenance, and storage), excluding dismantling, disabling and scrapping.

NOTE 1 The requirements specified in this document are common to two or more families of road operation machinery.

This document gives general safety requirements for all types of road operation machinery and shall be used in conjunction with parts 2 to 4. These machine specific parts do not repeat the requirements from part 1 but supplement, supersede or modify the requirements for the type of road operation machinery in question.

This document applies to:

a) road surface cleaning machines (as defined in 3.7 and EN 15429-1:2007);

b) winter maintenance equipment (as defined in groups 1 and 2 of EN 15144:2007);

c) road service area maintenance machines for grass and/or brush cutting (as defined in EN 15436-1:2008).

This document deals with:

— equipment permanently mounted on carrier vehicles;

— interchangeable equipment;

— self-propelled machinery with an integrated specially designed chassis;

— trailed machines;

— interfaces.

This document does not deal with:

— carrier vehicles, e.g. trucks, tractors, construction machinery, mobile industrial handling equipment;

NOTE 2 These requirements are covered in directives related to the construction of vehicles.

— demountable bodyworks on carrier vehicles (e.g. load platforms, boxes);

— risks associated with the operation of machines in potentially explosive atmospheres;

— pedestrian controlled and hand-held machines;

— remote controlled machines, except for the risks related to the working equipment only;

— lawn and garden equipment;

— machines for the maintenance of sports grounds;

— machines for agriculture, horticulture and forestry;

— earth-moving and mobile road construction machinery according to EN 474-1:2006+A6:2019 and EN 500-1:2006+A1:2009;

— road surface treatment machines according to EN 13020:2015;

— snow-grooming equipment according to EN 15059:2009+A1:2015;

— machines or components which are solely designed for clearing rails such as rail/tram-line sweepers or blowers;

— sweeping/cleaning equipment according to EN 60335-2-72;

— pit and sewer cleaning vehicles/-machines;

— refuse-collecting vehicles;

— airport machines and equipment;

— snow throwers according to ISO 8437-1.

This document does not include requirements which are covered in directives related to the construction of vehicles or national road regulations. Requirements of road safety regulations take precedence over the requirements of this document.

NOTE 3 For specific directives and/or road regulations, see the bibliography.

The use in public road traffic is governed by the national regulations.

This document does not deal with significant hazards associated with electromagnetic compatibility (EMC).

This document does not deal with significant hazards associated with vibration.

This document is not applicable to road operation machinery manufactured before the date of its publication.

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 15431:2008, *Winter and road service area maintenance equipments - Power system and related controls - Interchangeability and performance requirements*

EN 15432-1:2011, *Winter and road service area maintenance equipments - Front-mounted equipments - Part 1: Fixed front mounting plates*

EN 15432-2:2013, *Winter and road service area maintenance equipments - Front-mounted equipments - Part 2: Interchangeability on lifting systems*

EN 16330:2013, *Winter and road service area equipment - Power system and related controls - Power hydraulic system and electric interfaces*

EN 60204-1:2018, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code)*

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 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 4254-1:2015, *Agricultural machinery - Safety - Part 1: General requirements (ISO 4254-1:2013)*

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

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

EN ISO 7010:2020, *Graphical symbols - Safety colours and safety signs - Registered safety signs (ISO 7010:2019, Corrected version 2020-06)*

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 11202:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11204:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

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)*

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

EN ISO 14118:2018, *Safety of machinery - Prevention of unexpected start-up (ISO 14118:2017)*

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)*

ISO 730:2009, *Agricultural wheeled tractors — Rear-mounted three-point linkage - Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4*

ISO 3600:2015, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Operator's manuals - Content and format*

ISO 3767 (all parts), *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays*

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 4253:1993, *Agricultural tractors - Operator's seating accommodation - Dimensions*

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

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

ISO 7000:2019, *Graphical symbols for use on equipment - Registered symbols*

ISO 8759-1:2018, *Agricultural tractors - Front-mounted equipment - Part 1: Power take-off: Safety requirements and clearance zone around PTO*

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

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

ISO 10998:2008, *Agricultural tractors - Requirements for steering*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Safety signs and hazard pictorials - General principles*

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

ISO 15077:2020, *Tractors and self-propelled machinery for agriculture - Operator controls - Actuating forces, displacement, location and method of operation*

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

ISO 25119-1:2018, *Tractors and machinery for agriculture and forestry - Safety-related parts of control systems - Part 1: General principles for design and development*

ISO 26262-2:2018, *Road vehicles - Functional safety - Part 2: Management of functional safety*

3 Terms and definitions

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

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

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

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

NOTE Additional illustrations are provided in Annex C.

3.1
interface
device mounted on a machine to allow the installation of attachments and/or equipment

Note 1 to entry: This can be mechanical, pneumatic, hydraulic or electric couplings.

3.2
interchangeable equipment
attachment which is intended by design is assembled or dismounted with a carrier vehicle (e.g. machine, tractor, truck) by the operator himself in order to change its function or attribute a new function, in so far as this equipment is not a tool

3.3
self-propelled machine
specially designed machine, where the working attachments are integrated and propelled by its own power source

Note 1 to entry: The self-propelled machine can be a ride-on machine, operator-assisted machine, pedestrian controlled machine fitted with a seat or a sulky or a remote-controlled machine.

3.4
trailed machine
vehicle which is designed to be towed by a self-propelled vehicle or tractor, permanently incorporates an implement or is designed to process materials

Note 1 to entry: This vehicle may include a load platform designed and constructed to receive any tools and appliances needed for those purposes and to store temporarily any materials.

3.5
equipment permanently mounted
device which is fixed assembled with the machine and which cannot be changed by the operator

3.6
demountable bodywork
specially designed frame with superstructure that can be easily mounted on, removed from and transported by a suitable vehicle, e.g. flexible swap bodies, trailers and container chassis for combined transport by road, rail or ship

3.7
road surface cleaning machine
machine for removal of spoil on traffic areas, where the machine is permanently fixed or demountable from a carrier vehicle or specially designed chassis

3.8
winter maintenance equipment
3.8.1
snow plough
machine to remove snow from the traffic area by pushing aside

3.8.2
snow clearing machine with rotating tool
self-propelled and attached machine with which snow can be removed from traffic areas by rotating means, accelerated and ejected, e.g. snow cutter, snow blower, snow cutter-blower and snow sweeper

3.8.2.1
snow cutter
machine for snow clearing with the rotary tools set at a right angle to the longitudinal axis of the vehicle

3.8.2.2
snow blower
machine for snow clearing with the rotary tools set parallel to the longitudinal axis of vehicle

3.8.2.3
snow cutter blower
combination of a snow cutter and snow blower; snow is collected by the cutter and expelled by the blower

3.8.2.4
snow sweeper
machine for snow clearing with rotating brushes

3.8.3
spreading machine
machine for distribution of de-icing material

Note 1 to entry: This can be for example a spreader or a sprayer.

3.8.3.1
spreader
machine for defined application of substances to traffic areas to maintain or to improve the skid resistance of the traffic area

3.8.3.2
sprayer
machine able to spray liquid de-icing material on the traffic area

3.9
traffic area
paved area on which there is vehicular and/or pedestrian traffic; not included are rail tracks which are solely for rail-mounted traffic, as well as traffic areas inside buildings and underground

3.10
demountable equipment
equipment that is able to be demounted from and remounted to the carrier vehicle

3.11
lashing point
point or device (e.g. ring device) at the machine or at the demountable equipment which allows its lifting by an appropriate lifting device

3.12
operator
person controlling the equipment while operating and/or driving the machine

3.13
operator's station
area from which an operator controls the travel and/or work functions of the machine

3.14
normal operation
use of the machine for the purpose intended by the manufacturer by an operator familiar with the machine characteristics

3.15
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

3.16
positive engagement (form locked engagement)
engagement system which retains the attachment in the normal working position by a system of at least two components that engage each other perpendicular to the working forces such that the working forces do not tend to cause disengagement (e.g. pin in shear)

3.17
lifting point
device fitted on, or incorporated into, a road operation machine, used for lifting the machine or disassembled unit

4 Safety requirements and/or protective/risk reduction measures

4.1 Safety requirements and/or protective/risk reduction measures applicable to all machines

4.1.1 General

Road operation shall comply with the safety requirements and/or protective/risk reduction measures of this clause, unless modified by requirements of the relevant specific part of the standard series. In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

4.1.2 Noise

4.1.2.1 Noise reduction by design

4.1.2.1.1 Noise reduction at source

Machines shall be so designed and constructed that risks resulting from the emission of airborne noise are reduced to the lowest possible level, taking account of technical progress and the availability of means of reducing noise, in particularly, at source.

The available information and technical measures for reducing noise at source (see for example EN ISO 11688-1:2009) shall be taken into account in the design.

NOTE 1 EN ISO 11688-2 provides useful information on noise generation mechanisms in machinery.

NOTE 2 Noise generation may vary considerably between machinery types. Noise reduction measures are therefore dealt with in product specific standards.

4.1.2.1.2 Noise reduction by protective measures

The following measures - if practicable - are among those that are suitable:

— a cab;

— encapsulation of the engine(s);

— exhaust silencer.

NOTE Guidelines for the design of enclosures can be found in EN ISO 15667.

4.1.2.2 Noise reduction by information

The operating instructions shall contain information on residual risks associated with noise (see 6.3.2).

4.1.2.3 Noise measurement and declaration

In order to quantify the residual risk for noise, the measurement of the sound power and the emission sound pressure level at the operator's position shall be carried out in accordance with Annex B and the results shall be stated in the operator’s manual.

4.1.3 Visibility

4.1.3.1 General

Visibility from the operating positions shall be such that the operator can operate the machine safely when used in its foreseen conditions and its intended use with regard to themselves and other persons and operating positions adjacent to the machine.

When it is necessary to aid visibility of the working area and equipment, additional visual aids shall be provided.

Appropriate illumination of the working area shall be provided, either by integrated lighting system or by lighting system installed on the carrier vehicle.

4.1.3.2 Closed circuit television system

If a closed-circuit television system (CCTV) is fitted, it shall meet the following requirements:

The minimum size of the monitor screen sector for the rear view shall be 12,7 cm (approx. 5 inches) diagonal (for example 4:3 or 16:9 format). The screen sector can be used for other purposes, but in the case of driving backwards the screen sector shall show only the view to the back.

NOTE 1 Requirements for the installation of the monitor are given in the road safety regulations and truck cabin manufacturer guidelines.

NOTE 2 The described CCTV systems are not related to road safety requirements.

4.1.3.3 Visibility measurement

The field of vision shall be verified according to the measurement procedure of ISO 5006:2017.

For visibility measurements according to ISO 5006:2017, the travel mode as defined by the manufacturer shall be used.

It is sufficient to measure the machine with the most challenging standard attachment within the limits of the intended use.

Specific testing conditions and acceptance criteria are provided in parts 2 to 4 of this series.

4.1.4 Controls and displays

4.1.4.1 General

Controls shall comply with EN ISO 6682:2008 and ISO 10968:2020, except the following clauses:

— 5.1.5;

— 5.1.8 last sentence.

NOTE ISO 15077 contains equivalent requirements to ISO 10968:2020 (e.g. minimum forces for actuating controls).

The minimum distance between finger, hand- and foot-operated controls, or between these types of control and other machine parts, shall be as in Table 1:

Table 1 — Minimum distance between centre line of two adjacent controls

Type of control	Minimum distance
Hand operated controls	40 mm
Finger operated controls	19 mm without divider
Finger operated controls	15 mm with divider
For keys located on a touch screen or buttons on a lever	14 mm
Foot operated controls	50 mm

The location of controls and displays shall comply with the visibility requirements in relevant specific parts of this document.

The location of controls and displays shall not obstruct or impair the access to the operator's station, to emergency exits or to emergency controls such as extinguishers, window breakers, PTO emergency stop or other protective devices.

The controls and displays shall not impair the operation of airbags and restrain systems.

The design of controls shall not generate injury, harm or burns.