



# SLOVENSKI STANDARD

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**Obratovanje cestnih strojev - Varnost - 2. del: Posebne zahteve za stroje za čiščenje cestnih površin**

Road operation machinery - Safety - Part 2: Specific requirements for road surface cleaning machines

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Machines d'exploitation des routes - Sécurité - Partie 2 : Prescriptions spécifiques pour les machines de nettoyage des surfaces routières

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EUROPEAN STANDARD

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## Road operation machinery - Safety - Part 2: Specific requirements for road surface cleaning machines

Machines d'exploitation des routes - Sécurité - Partie 2  
: Prescriptions spécifiques pour les machines de  
nettoieinent des surfaces routières

Maschinen für den Straßenbetriebsdienst - Sicherheit -  
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This European Standard was approved by CEN on 16 August 2021.

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COMITÉ EUROPÉEN DE NORMALISATION  
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## European foreword

This document (EN 17106-2:2021) has been prepared by Technical Committee CEN/TC 151 “Construction equipment and building material machines - Safet”, 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of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.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 and 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.

## EN 17106-2:2021 (E)

### Introduction

This document is a type-C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, to 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 together with EN 17106-1:2021 deals with all significant hazards, hazardous situations and events relevant to road surface cleaning machines (as defined in EN 15429-1:2007 and EN 17106-1:2021, 3.7) when used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex B) associated with the whole lifetime of the machine as described in EN ISO 12100:2010, 5.4.

The requirements of this document are complementary to the common requirements formulated in EN 17106-1:2021. This document does not repeat the requirements from EN 17106-1:2021 but supplements or modifies the requirements for road surface cleaning machines.

This document is not applicable to road surface cleaning machines 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 1829-1:2021, *High pressure water jet machines - Safety requirements - Part 1: Machines*

EN 15429-1:2007, *Sweepers - Part 1: Classification and Terminology*

EN 15429-4:2015, *Sweepers - Part 4: Symbols for operator controls and other displays*

EN 17106-1:2021, *Road operation machinery - Safety - Part 1: General requirements*

EN 60335-2-72:2012, *Household and similar electrical appliances - Safety - Part 2-72: Particular requirements for floor treatment machines with or without traction drive, for commercial use*

EN 60335-2-79:2012, *Household and similar electrical appliances - Safety - Part 2-79: Particular requirements for high pressure cleaners and steam cleaners*

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

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

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

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

ISO 26322-2:2010, *Tractors for agriculture and forestry - Safety - Part 2: Narrow-track and small tractors*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 17106-1:2021, EN 15429-1:2007 and EN ISO 12100:2010 and the following apply.

NOTE Further terminology can be found in Annex A.

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

**3.2 demountable machine**  
machine (e.g. hopper, sweeping gear, washing/flushing system, pick-up system), that may be demounted from and remounted to the carrier vehicle

**3.3 hopper**  
container for the collected sweepings or spoil

**3.4 wander hose**  
manually operated dirt pick-up system

**3.5 water lance**  
manually operated washing/flushing system

**3.6 operator station**  
area from which an operator controls the travel and/or work functions of the machine

Note 1 to entry: For road surface cleaning machines these specific work functions could apply:

- sweeping;
- sucking with wander hose;
- cleaning with hand-held cleaning device (e.g. high-pressure water lance);
- discharge of the hopper, dirt water.

**3.7 washing/flushing system**  
system using water to clean a surface using high velocity jets and/or copious use to move and dislodge spoil from the surface being cleaned; the system may use scrubbing brooms and/or detergents to aid the cleansing function



## 4 Safety requirements and/or protective/risk reduction measures

### 4.1 General

Road surface cleaning machines shall comply with the safety requirements and/or protective/risk reduction measures of this clause. In addition, the machines 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.

Road surface cleaning machines shall comply with the requirements of EN 17106-1:2021, as far as not modified or replaced by the requirements of this part.

### 4.2 Noise reduction at the source at the design stage

EN 17106-1:2021, 4.1.2.1 and 4.1.2.2 applies with the following additions:

The main sources of noise are:

- hydraulic unit;
- internal combustion engine;
- air compressor;
- flow of materials;
- suction fan;
- sweeping units;
- cooling fans.

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NOTE 1 The noise of the carrier vehicle significantly contributes to the overall level of noise emission.

The noise at source shall be minimized as much as possible by design, e.g. by using the following non-exhaustive measures:

- a) reduction of vibrations via the static and dynamic balancing of rotating parts;
- b) reduction of vibrations inside the machine by reducing the weight of mobile parts and their acceleration;
- c) choice of low-noise transmission components, e.g. gear assemblies, pulleys, belts, bearings;
- d) design of machine structures, considering vibration damping and avoiding structural resonance phenomena;
- e) choice of silencers and placement of exhausts;
- f) choice and design of engine supports;
- g) choice of cooling fans with optimized clearances and possible integration of hydraulic or magnetic speed limiters;
- h) reduction of noise from pneumatic exhausts, vibration damping of hydraulic systems;
- i) enclosure of part(s) of the machine.

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NOTE 2 Other measures offering identical or superior noise reduction can be implemented.

**4.3 Noise measurement and declaration**

EN 17106-1:2021, 4.1.2.3 is replaced by the following:

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

**4.4 Controls and displays****4.4.1 General**

EN 17106-1:2021, 4.1.4.1 applies with the following modification:

Symbols for operator controls shall be in accordance with EN 15429-4:2015.

**4.4.2 Starting**

EN 17106-1:2021, 4.1.4.4 applies with the following addition:

In case of road surface cleaning machines these requirements are deemed to be met for intended combinations of sequential and/or simultaneous starting of functions (e.g. the automatic starting of the brush rotation caused by the starting movement of the brush arms, since the starting of the movement of the brush arms is treated as an intended starting).

**4.4.3 Emergency stop**

EN 17106-1:2021, 4.1.4.5.3 applies with the following addition:

There shall be an emergency stop at the driving position.

For the following operator's stations an emergency stop is not required:

- sucking with wander hose;
- cleaning with hand-held cleaning device (e.g. high-pressure water lance);
- discharge of the hopper, dirt water.

The category of stop shall be Category '0' according to EN ISO 13850:2015, 4.1.3.

**4.4.4 Safety and reliability of control systems**

EN 17106-1:2021, 4.1.4.3 applies with the following addition:

The safety related parts of the interlocking system shall be at least required performance level  $PL_r$  c according to EN ISO 13849-1:2015.

**4.5 Guards**

EN 17106-1:2021, 4.1.5 applies with the following additions.

Sweeping gear does not need to be guarded. Warning signs shall be provided in the vicinity of the hazard zone to indicate risk and avoidance measures to operators and third parties.

Inspection doors giving access to moving parts, access shall be interlocked without a guard locking according to EN ISO 14119:2013 in such a way that the respective assemblies inside the hopper (e.g. compaction mechanism and discharge system for the body) become inoperative when opened.

If suction fans are fitted, the outlet shall be fitted with a fixed guard to ensure that the hazardous ejection of parts/particles and fluids to the surrounding area does not occur.

#### 4.6 Access systems

EN 17106-1:2021, 4.1.9 applies with the following modification:

Access systems, where fitted, other than driver's cab shall be in accordance with Table 1.

**Table 1 — Access standard reference**

Machine type	Sub-type	Net Volume Capacity in m <sup>3</sup>	Access systems in accordance with
Truck mounted sweeper	Large	> 4	EN ISO 2867:2011
	Small	≤ 4	EN ISO 2867:2011
Self-propelled sweeper	Maxi-compact sweeper	> 2,5	EN ISO 2867:2011
	Compact sweeper	≤ 2,5	ISO 26322-2:2010
	Midi-compact sweeper	≤ 1	ISO 26322-2:2010
	Mini-compact sweeper	≤ 0,2	ISO 26322-2:2010
Attached sweeping equipment	With hopper	≤ 1	ISO 26322-2:2010

#### 4.7 Minimum space

EN 17106-1:2021, 4.2.1.1 applies with the following modification:

The minimum space available to the operator for self-propelled machines shall comply with ISO 26322-2:2010.

#### 4.8 Fire extinguisher

EN 17106-1:2021, 4.1.13 applies with the following modification:

This requirement does not apply to mini-compact sweeper, midi-compact sweeper and compact sweeper (as defined in Table 1).

#### 4.9 Raising, lowering and slewing mechanisms

Free fall and uncontrolled movements of sweep gear mechanisms shall be prevented. The raising, lowering and slewing shall be in a controlled movement. Orifices, restrictors or specially sized hoses and pipes serving the hydraulic or pneumatic actuator system may be used to effect control.

#### 4.10 Water flushing systems and their components

EN 17106-1:2021, 4.1.14 applies with the following addition:

Water flushing systems and their components with an operating pressure between 2,5 MPa to 35 MPa shall comply with EN 60335-2-79:2012.

Water flushing systems and their components with an operating pressure exceeding 35 MPa shall comply with EN 1829-1:2021.

**EN 17106-2:2021 (E)****4.11 Water tank**

The filling port of the water tank shall be equipped with water back flow prevention system (e.g. valve or air gap).

NOTE National regulations for water backflow prevention systems can apply.

**4.12 Provisions for service and maintenance**

EN 17106-1:2021, 4.1.20 applies with the following addition:

Cabs, hoppers and discharge doors shall be constructed or designed so that any unintentional lowering of the cab/hopper/discharge doors, including lowering resulting from power interruption, shall be prevented.

For example this requirement is met by one of the following means:

- check valves or similar functions within the control valves of hydraulic or pneumatic lifting equipment;
- self-locking actuators or automatically engaging latches;
- mechanical safety mechanisms.

If persons have to enter beneath the elevated or tilted cab/hopper/discharge doors when used as intended and under conditions foreseen by the manufacturer (e.g. maintenance, cleaning, inspection) it is necessary to provide safeguards. For example this requirement is met by one of the following means:

- automatically engaging mechanical safety mechanisms;
- pilot controlled check valves integrated into the lifting cylinder;
- mechanical safety mechanisms that can be operated from outside the hazard zone.

For maintenance, means shall be provided to lower all sweep gear to the lowered ground position and to render all controls and actuation power systems inert. In the case of fluid power systems, all pumps shall be stationary and stored energy expended, pneumatic systems shall be open and vented to atmosphere.

Where power operated systems using fluid power cylinders or pneumatic means are employed, protection against free falling conditions through power failure shall be employed e.g. restrictors, flow controllers, check valves fitted directly to the actuator.

**4.13 Provisions for transport**

EN 17106-1:2021, 4.1.18 applies with the following addition:

A warning device at the driver's position shall indicate that the tipped or elevating hopper is not in the transport position.

**4.14 Provisions for storage**

EN 17106-1:2021, 4.1.20 applies with the following additions:

Suitable devices for storage/supporting disconnected hoses of a hand-held cleaning device shall be provided on the road surface cleaning machine.

If the control unit is removable from the towing vehicle, a storage place/box for the control unit shall be provided at the trailer.