SLOVENSKI STANDARD
SIST EN 12609:2021

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Mešalec za beton (tovornjak) - Varnostne zahteve

Truck mixers - Safety requirements

Fahrmischer - Sicherheitsanforderungen

Bétonnières portées - Prescriptions de sécurité

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Truck mixers - Safety requirements

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Fahrmischer - Sicherheitsanforderungen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Page

European foreword

This document (EN 12609:2021) 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of an identical text or by endorsement, at the latest by July 2021, and conflicting national standards shall be withdrawn at the latest by July 2021.

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 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.

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:

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

b) 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:

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

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

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

d) 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

1.1 This document specifies the safety requirements for truck mixers.

This document also covers the interface between the mixing unit and the truck or trailer (but not the truck or trailer itself).

NOTE 1 Truck or trailer constructed primarily for the carriage of goods as classified according to directive 2007/46/EC, category N3 or O4.

This document does not cover:

a) additional equipment (conveyor belt, mortar pump, concrete pump, concrete-placing boom);

b) requirements for operation in tunnels;

c) truck or self-propelled mixers equipped with self-loading systems;

d) front-discharge mixers;

e) mixing units with articulated steering;

f) truck mixer drum cleaning systems;

g) energy source(s).

This document does not deal with carrier vehicles, e.g. trucks, tractors, construction machinery and mobile industrial handling equipment or other self-propelled vehicles.

This document does not include requirements which are covered in directives related to the construction of vehicles or national road regulations.

NOTE 2 The use in public road traffic is governed by the national regulations.

1.2 This document deals with all significant hazards, hazardous situations and events relevant to truck mixers when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex D). This document specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards during transportation, assembly, dismantling, disabling, scrapping, operation and maintenance of the truck mixer.

1.3 This document is not applicable to machines which are manufactured before the date of publication of this document by CEN.

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 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005)*

EN 61000-6-2:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity standard for industrial environments (IEC 61000-6-2:2005)*

EN 61000-6-2:2005/AC:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic Standards — Immunity standard for industrial environments (IEC 61000-6-2:2005)*

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 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 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 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

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 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 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

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

3 Terms, definitions, symbols and abbreviated terms

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:

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

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

3.1
mixing unit
assembly of components including rotary drum-type mixer designed for charging, mixing, temporary storage and discharging of concrete, mortars and mineral building materials with a maximum specific weight of 2 500 kg/m^3

Note 1 to entry: The main components of the mixing unit are defined in 3.3.

3.2
truck mixer
mixing unit mounted on a commercial truck or trailer

3.3
mixing unit components

3.3.1
basic frame
structure connecting the front and the rear support of the mixer drum

3.3.2
mixer drum
main element of the mixer, rotating during operation, that contains fins, for mixing charging and discharging

3.3.3
mixer drum opening
opening for charging and discharging the mixer drum

3.3.4
front support
structure supporting the mixer drum at its closed side (front side)

3.3.5
rear support
structure supporting the mixer drum at the side of the mixer drum opening

Note 1 to entry: The charging hopper and discharge components are located at the rear support.

3.3.6
charging hopper
structure to charge the mixer drum

3.3.7
discharge components
components to direct and distribute the material being discharged from the mixer drum, e.g. discharge hopper, swivel chute, flip-over chute; extension chute (see Figure A.1)

3.3.8
mixer drum drive
energy transmission for the rotation of the mixer drum, excluding the energy source(s), e.g. truck engine, auxiliary engine, batteries

3.3.9
water system
installation for adding water and for cleaning, e.g. consisting of a water tank, distribution line system, valves, and a water meter

Note 1 to entry: The water system is optional and usually powered pneumatically or pressurized by a water pump.

3.3.10
control station
unit with control devices for operating the functions of the truck mixer (e.g. rotation direction of mixer drum, rotating speed, stop function of the mixer drum)

Note 1 to entry: The control station can be a remote-control station with cable or cable-less.

3.3.11
work station
place where the main control station of the mixer drum drive is arranged, normally at the rear of the truck mixer

Note 1 to entry: The work station is for operating the charging, mixing and discharging. The operator is either standing on ground level (see Figure A.1) or on the tread at the rear underrun protective device. Additional control stations can be provided, e.g. in the cabin of the truck.

3.3.12
platform
elevated stand at the charging hopper of the truck mixer for cleaning and inspection (see Figure A.1)

3.3.13
mixer drum closure system
device to cover the mixer drum opening partly or completely to prevent spilling of concrete, mortars or mineral building materials

Note 1 to entry: The mixer drum closure system is optional.

3.3.14
supporting arms
superstructure for carrying the charging hopper and discharge components and the platform (see Figure A.1)

3.3.15
rear splash guard
device below the mixer drum preventing the mixer drum from getting dirty (see Figure A.1)

3.4
rated capacity of the truck mixer
maximum volume of concrete, mortars and mineral building materials the truck mixer is designed for, with a maximum specific weight of 2 500 kg/m^3

3.5
interface
all connections that allow the transfer of physical forces, energies, commands and/or information (e.g. mechanical, hydraulic, pneumatic, electrical, electronical) between the mixing unit and the truck or trailer on which it is mounted

3.6
operator
person authorised and trained to operate a truck mixer

Note 1 to entry: In general, the mixer operator is also the driver of the truck mixer.

3.7
normal operation
operation of the machine with all systems in function

3.8
emergency operation
operation of the machine with a system failure

Note 1 to entry: An example for an emergency operation: In case of energy source(s) or control system failure, a separate hydraulic power pack is connected, and the mixing unit is operated by manual valve actuation under circumvention of the emergency-stop system.

3.9
visual aid
system that provides visual information without warning

Note 1 to entry: The system generally includes a monitor and camera.

3.10
visibility test rectangle (VTR)
rectangle located on the plane ground as reference, aligned symmetrically to the longitudinal axis of the truck mixer in order to test the visual aid (see Figure A.15)

3.11
truck mixer drum cleaning system
separate machine to remove residual concrete from the inside of the mixer drum

4 Safety requirements and/or protective measures

4.1 General requirements

4.1.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause.

In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for hazards that are relevant, but not significant, and which are not dealt with by this document (e.g. sharp edges).

4.1.2 Mechanical hazards

4.1.2.1 Risk of slipping

The surface of means of access, e.g. platform, has to be slip-resistant according to EN ISO 2867:2011.

4.1.2.2 Risk of entanglement, crushing, shearing

To protect the operator from the risk of entanglement, crushing and shearing, fixed guards shall be provided in accordance with EN ISO 14120:2015 and EN ISO 13857:2008. Due to functional restrictions, the following exceptions to EN ISO 13857:2008, Table 3 and Table 4, will be applied.

For the empty truck mixer standing on level ground, the following minimum clearances between the mixer drum and non-moving parts are defined, with the hazard zone situated at a distance W (see Table 1 below) from an imaginary vertical plane parallel to the longitudinal axis of the vehicle intersecting the most outer point of the vehicle (reference plane):

Table 1 — Minimum clearance 'a' depending on the distance 'W' to the reference plane (see Figure A.4)

W	Minimum clearance, a
≥ 800 mm	≥ 20 mm
< 800 mm	≥ 50 mm

Besides the general minimum clearances of Table 1, further exceptions are defined in Table 2.

Table 2 — Clearances for specific entanglement points

	Entanglement points	Clearance
1	mixer drum roller cover - mixer drum track ring	max. 10 mm (Figure A.7)
2	mixer drum - supporting arm	min. 20 mm (Figure A.8)
3	mixer drum - charging hopper bracket	min. 20 mm (Figure A.9)
4	mixer drum - discharge hopper	min. 20 mm (Figure A.10)
5	mixer drum - guard rail at platform	min. 50 mm (Figure A.11)
6	mixer drum closure system - discharge hopper	min. 20 mm (Figure A.12)
7	mixer drum - additional equipment	min. 20 mm (Figure A.13 a), A.13 b) and A.13 c))
8	mixer drum - rear splash guard	min. 20 mm (Figure A.14)

The hazard zones shall be indicated by decals and the residual risk shall be described (see 6.3.2).

4.1.2.3 Risk of impact, risk of injection

The hydraulic system shall be designed in accordance with EN ISO 4413:2010.

The pneumatic system shall be designed in accordance with EN ISO 4414:2010.

NOTE The hydraulic system and the pneumatic system of the truck or trailer are not covered.

The interface specified by the truck or trailer manufacturer shall be applied.

4.1.3 Electrical hazards

Electrical installations shall comply with EN 60204-1:2006.

The interface specified by the truck or trailer manufacturer shall be applied.

4.1.4 Thermal hazards

Thermal guarding shall be provided to prevent contact with metallic surfaces (painted or coated) that reach temperatures > 75 °C under normal operating conditions and which are within reach from the work station.

4.1.5 Noise

4.1.5.1 Noise reduction at the design stage

Machinery shall be designed and constructed in such a way that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

When designing machinery, the available information and the technical measures to reduce noise at the source given in EN ISO 11688-1:2009 shall be taken into account.

NOTE EN ISO 11688-2:2000 gives useful information on noise-generation mechanisms in machinery.

Main noise sources are the power source(s), mixer drum drive and the mixer drum with its content. The power source on the truck is the main source of noise.

In case the truck is purchased by the truck mixer manufacturer, the truck mixer manufacturer is recommended to ask for a low-noise truck.

Noise reduction is possible e.g. with the choice of low-noise hydraulic components, gears, auxiliary engine if any, reduction of vibration transmitted from drive to other parts of construction and design of the construction that prevents the arising of resonance.

NOTE See also Annex B.

4.1.5.2 Information on noise emission

Information on noise emission shall be given in the information for use (see 6.2.2).

4.1.6 Electromagnetic compatibility (EMC)

Truck mixers with combustion engine shall comply with the requirements of electromagnetic compatibility as specified in EN ISO 13766-1:2018 and EN ISO 13766-2:2018).