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Žerjavi - Mostni in portalni (kozičasti) žerjavi

Cranes - Bridge and gantry cranes

Krane - Brücken- und Portalkrane

Appareils de levage à charge suspendue - Ponts roulants et portiques

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Cranes - Bridge and gantry cranes

Appareils de levage à charge suspendue - Ponts roulants et portiques

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This European Standard was approved by CEN on 9 November 2020.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 15011:2020) has been prepared by Technical Committee CEN/TC 147 “Cranes - Safety”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by June 2021, and conflicting national standards shall be withdrawn at the latest by June 2021.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 supersedes EN 15011:2011+A1:2014.

The major technical changes in this edition compared to EN 15011:2011+A1:2014 are in 5.1, 5.2.1.3.2, 5.2.1.5, 5.2.2.2 and 6.3.2. Moreover, the status of Annex D has been changed from normative to informative.

This document has been prepared under a mandate 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.

For the relationship with other European Standards for cranes, see Annex H.

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 has been prepared to be a harmonized standard to provide one means for bridge and gantry cranes to conform with the essential health and safety requirements of the Machinery Directive, as mentioned in Annex ZA.

As many of the hazards related to bridge and gantry cranes relate to their operating environment and use, it is assumed in the preparation of this document that all the relevant information relating to the use and operating environment of the crane has been exchanged between the manufacturer and the user (as recommended in ISO 9374, Parts 1 and 5), covering such issues as, for example:

— clearances;

— requirements concerning protection against hazardous environments;

— processed materials, such as potentially flammable or explosive material (e.g. coal, powder type materials).

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

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

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 machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This document applies to bridge and gantry cranes able to travel by wheels on rails, runways or roadway surfaces, and to gantry cranes without wheels mounted in a stationary position.

NOTE Light crane systems (assembly of lifting devices, crane bridges, trolleys and tracks; wall-mounted, pillar and workshop jib cranes) are covered by EN 16851.

This document specifies requirements for all significant hazards, hazardous situations and events relevant to bridge and gantry cranes when used as intended and under conditions foreseen by the manufacturer (see Clause 4).

This document does not include requirements for the lifting of persons.

The specific hazards due to potentially explosive atmospheres, ionising radiation and operation in electromagnetic environment beyond the scope of EN 61000-6-2 are not covered by this document.

This document is applicable to bridge and gantry cranes manufactured after the date of its publication as a European standard.

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 81-43:2009, *Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 43: Lifts for cranes*

EN 363:2018, *Personal fall protection equipment - Personal fall protection systems*

EN 894-1:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays*

EN 12077-2:1998+A1:2008, *Cranes safety - Requirements for health and safety - Part 2: Limiting and indicating devices*

EN 12644-1:2001+A1:2008, *Cranes - Information for use and testing - Part 1: Instructions*

EN 12644-2:2000+A1:2008, *Cranes - Information for use and testing - Part 2: Marking*

EN 13001-1:2015, *Cranes - General design - Part 1: General principles and requirements*

EN 13001-2:2014, *Crane safety - General design - Part 2: Load actions*

EN 13001-3-1:2012+A2:2018, *Cranes - General Design - Part 3-1: Limit States and proof competence of steel structure*

EN 13001-3-2:2014, *Cranes - General design - Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*

EN 13001-3-3:2014, *Cranes - General design - Part 3-3: Limit states and proof of competence of wheel/rail contacts*

EN 13001-3-4:2018, *Cranes - General design - Part 3-4: Limit states and proof of competence of machinery - Bearings*

EN 13001-3-5:2016, *Cranes - General design - Part 3-5: Limit states and proof of competence of forged hooks*

EN 13001-3-6:2018, *Cranes - General design - Part 3-6: Limit states and proof of competence of machinery - Hydraulic cylinders*

EN 13135:2013+A1:2018, *Cranes - Safety - Design - Requirements for equipment*

EN 13157:2004+A1:2009, *Cranes - Safety - Hand powered cranes*

EN 13557:2003+A2:2008, *Cranes - Controls and control stations*

EN 13586:2004+A1:2008, *Cranes - Access*

EN 14492-2:2019, *Cranes - Power driven winches and hoists - Part 2: Power driven hoists*

EN IEC 60204-11:2019, *Safety of machinery - Electrical equipment of machines - Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV (IEC 60204-11:2018)*

EN 60204-32:2008, *Safety of machinery - Electrical equipment of machines - Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*

HD 60364-4-41:2017, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41:2005/A1:2017, modified)*

EN 60825-1:2014, *Safety of laser products - Part 1: Equipment classification and requirements (IEC 60825-1:2014)*

EN 60947-5-5:1997, *Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function (IEC 60947-5-5:1997)*

EN 62745:2017, *Safety of machinery - Requirements for cableless control systems of machinery (IEC 62745:2017)*

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 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 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 13854:2019, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body (ISO 13854:2017)*

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

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

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 4306-1:2007, *Cranes - Vocabulary - Part 1: General*

ISO 6336-1:2019, *Calculation of load capacity of spur and helical gears - Part 1: Basic principles, introduction and general influence factors*

ISO 7752-5:1985, *Lifting appliances - Controls - Layout and characteristics - Part 5: Overhead travelling cranes and portal bridge cranes*

ISO 12488-1:2012, *Cranes - Tolerances for wheels and travel and traversing tracks - Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN ISO 3744:2010, EN ISO 11201:2010, ISO 4306-1:2007 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 https://www.iso.org/obp

3.1
bridge crane
crane able to move along rails or runways having at least one primarily horizontal girder and equipped with at least one hoisting mechanism

Note 1 to entry: Light crane systems are defined in EN 16851.

Note 2 to entry: Building structures, where hoists are mounted, are not regarded as bridge cranes.

3.2
gantry crane
crane able to travel by wheels on rails, runways or roadway surfaces, or crane without wheels mounted in a stationary position, having at least one primarily horizontal girder supported by at least one leg and equipped with at least one hoisting mechanism

Note 1 to entry: Building structures, where hoists are mounted, are not regarded as gantry cranes.

3.3
rated capacity
m_{RC}
maximum net load (the sum of the payload and non-fixed load-lifting attachment) that the crane is designed to lift for a given crane configuration and load location during normal operation

Note 1 to entry: The term Safe Working Load (SWL) can differ from rated capacity.

[SOURCE: ISO 4306-1:2007, 6.1.8, modified]

3.4
hoist load
m_H
sum of the masses of the load equal to the rated capacity, the fixed lifting attachment and the hoist medium

Note 1 to entry: This is equivalent to gross load defined ISO 4306-1:2007.

3.5
hoist medium
m_{HM}
part of the hoisting mechanism, either rope, belt or chain, by which the fixed load lifting attachment is suspended

[SOURCE: ISO 4306-1:2007, 6.1.6, modified]

3.6
underhung crane
bridge crane suspended from the lower flange of the crane track

3.7
directly acting lifting force limiter
limiter acting directly in the chain of drive elements and limiting the transmitted force

Note 1 to entry: Those limiters can be, for example, friction torque limiters, pressure limiting valves. Directing acting rated capacity limiters generally have no response delay.

3.8
indirectly acting lifting force limiter
limiter determining the transmitted force by measured signals and switching off the energy supply for the operation and, if required, triggering application of the brake torque

4 List of significant hazards

Table 1 of this clause contains all the significant hazards as listed in CEN Guide 414, hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

Table 1 — List of significant hazards and associated requirements

No.	Hazard	Relevant clause(s) in this document
1	**Mechanical hazards**	
1.1	Inadequacy of mechanical strength of the crane and its parts	5.1, 5.2.1, 5.2.2, 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.4.6, 5.4.7
1.2	Due to kinetic energy of machine parts or work pieces	5.1, 5.4.4.7, 5.5.3
1.3	Due to potential energy of machine parts or work pieces	5.1
1.4	Due to stored energy, fluids under pressure	5.1
1.5	Crushing hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.6	Shearing hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.7	Cutting or severing hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.8	Entanglement hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.9	Drawing-in or trapping hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.10	Impact hazard	5.5.3.1, 5.5.3.3
1.11	Stabbing or puncture hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.12	Friction or abrasion hazard	5.1, 5.6.2.4, 5.6.2.5, 5.6.2.6
1.13	Slipping, tripping and falling	5.6.2
1.14	Ejection of parts or objects	5.1
1.15	Loss of stability	5.1, 5.2.3
2	**Electrical hazards**	
2.1	Contact of persons with live parts (direct contact)	5.1, 5.3.2, 5.3.3
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	5.1
2.3	Approach to live parts under high voltage	5.1, 5.3
2.4	Electrostatic phenomena	5.1, 5.3
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short-circuits, overloads, etc.	5.1, 5.3
2.6	Short-circuit	5.1, 5.3

No.	Hazard	Relevant clause(s) in this document
2.7	Batteries	5.3.7
3	**Thermal hazards**	
3.1	Burns, scalds and other injuries by possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by radiation of heat sources	5.1, 5.4.8.1, 7.3.3
3.2	Damage to health by hot or cold working environment	5.6.1
4	**Noise hazards**	5.6.4
5	**Vibration hazards**	
5.1	Vibrations transmitted to the operator when sitting during operation	5.2.2.6, 5.6.1, 7.3.1
6	**Radiation hazards**	
6.1	Low frequency electromagnetic radiation	
6.2	Radio frequency electromagnetic radiation	
6.3	Optical radiation (infrared, visible and ultraviolet)	
6.4	Lasers	5.4.8.2
7	**Material/substance hazards**	
7.1	Hazards from contact with harmful fluids, gases, mists, fumes and dusts	5.4.8.4
7.2	Fire or explosion hazard	5.4.8.3
8	**Ergonomic hazards**	
8.1	Unhealthy postures or excessive efforts	5.4.4.2
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	5.6.1
8.3	Insufficient means for evacuation/emergency exit	5.4.8.3, 5.6.1, 5.6.2
8.4	Neglected use of personal protection equipment	5.6.2.3, 7.3.3
8.5	Inadequate lighting of working areas	5.6.3
8.6	Human error during operation	5.3.5.3, 5.4.2, 5.4.8.5, 5.5.2, 7.2
8.7	Inadequate design, location or identification of manual controls	5.3.5, 5.6.1
8.8	Inadequate design or location of visual display units	5.6.1, 5.7
8.9	Insufficient visibility from the driving position	5.6.1, 5.6.3
9	**Hazards associated with the environment in which the machine is used**	
9.1	Lightning	5.3, 7.3.3
9.2	Snow, water, wind, temperature	5.2, 5.3.1, 5.2.1.1, 5.5.2.2

No.	Hazard	Relevant clause(s) in this document
10	**Hazards from malfunction of control systems**	
10.1	Failure/disorder of control system and control circuit	5.3.4, 5.4.2, 5.7.4
10.2	Restoration of energy supply after an interruption	5.1, 5.3.5.3
10.3	External influences on electrical equipment	5.3.5.3, 5.4.2
10.4	Errors in the software	5.3.4, 5.3.5.3, 5.4.2
10.5	Failure of the power supply	5.3, 5.3.2, 5.4.2
10.6	Overspeed during operation	5.3.6, 5.4.2
11	**Hazards caused by missing and/or incorrectly positioned safety related measures/ means**	
11.1	Guards	5.6.2
11.2	Safety related (protection) devices	5.1, 5.6.2
11.3	Safety signs, signals, symbols	5.7, 7.1, 7.4
11.4	Information or warning devices	5.7, 7
11.5	Visibility	5.6.1, 5.6.3
11.6	Emergency devices	5.3.5.3
12	**Hazards related to travelling function**	
12.1	Movement when starting the engine	5.7.3, 5.7.5
12.2	Movement without an operator at the driving position	5.3.5.3, 5.3.6, 5.6.1
12.3	Movement without all parts in safe position	5.4.2, 5.5
12.4	Excessive speed of pedestrian controlled machinery	5.3.5.3, 5.3.6, 5.6.1
12.5	Excessive oscillations when moving	5.2.2.6, 5.6.1, 7.2
12.6	Insufficient ability of machinery to be slowed down, stopped and immobilized	5.4.2
12.7	Derailment due to travelling	5.4.4.5, 5.4.4.6
13	**Hazards linked to work position (including driving station) on the machine**	
13.1	Fall of persons during access to (or at/from) the work position	5.6.2.1
13.2	Fire (flammability of the cab, lack of extinguishing means)	5.4.8.3, 5.6.1
13.3	Mechanical hazards at the work position, such as: - contact with the wheels - roll over and overturning - fall of objects, penetration by object - contact of persons with machine parts or tools (pedestrian control)	5.6.1, 5.6.2, 5.7
13.4	Insufficient visibility from the work position	5.6.1, 5.7