



SLOVENSKI STANDARD
SIST EN 15011:2011+A1:2014
01-marec-2014

Nadomešča:
SIST EN 15011:2011

Žerjavi - Mostni in portalni (kozičasti) žerjavi (vključno z dopolnilom A1)

Cranes - Bridge and gantry cranes

Krane - Brücken- und Portalkrane

Appareils de levage à charge suspendue - Ponts roulants et portiques
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ICS:

53.020.20 Dvigala Cranes

SIST EN 15011:2011+A1:2014 **en,fr,de**

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15011:2011+A1

February 2014

ICS 53.020.20

Supersedes EN 15011:2011

English Version

Cranes - Bridge and gantry cranes

Appareils de levage à charge suspendue - Ponts roulants et portiques

Krane - Brücken- und Portalkrane

This European Standard was approved by CEN on 18 December 2010 and includes Amendment 1 approved by CEN on 19 November 2013.

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.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

	Page
Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	7
4 List of significant hazards	8
5 Safety requirements and/or protective measures	12
5.1 General.....	12
5.2 Requirements for strength and stability	13
5.3 Electrotechnical equipment.....	26
5.4 Non-electrotechnical equipment.....	28
5.5 Limiting and indicating devices	33
5.6 Man-machine interface.....	37
5.7 Equipment for warning.....	40
6 Verification of safety requirements and/or protective measures	41
6.1 General.....	41
6.2 Types of verification	41
6.3 Fitness for purpose testing	44
7 Information for use	46
7.1 General.....	46
7.2 Operator's manual.....	46
7.3 User's manual	46
7.4 Marking of rated capacities	48
Annex A (informative) Guidance for specifying the operating duty according to EN 13001-1	50
Annex B (informative) Guidance for specifying the classes P of average number of accelerations according to EN 13001-1	58
Annex C (informative) Calculation of dynamic coefficient $\phi_n(t)$.....	59
Annex D (normative) Loads caused by skewing	62
Annex E (informative) Local stresses in wheel supporting flanges	70
Annex F (normative) Noise test code.....	75
Annex G (informative) Actions on crane supporting structures induced by cranes	83
Annex H (informative) Selection of a suitable set of crane standards for a given application	85
Annex ZA (informative) Relationship between this European standard and the Essential Requirements of EU Directive 2006/42/EC	86
Bibliography	87

Foreword

This document (EN 15011:2011+A1:2014) 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 August 2014, and conflicting national standards shall be withdrawn at the latest by August 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15011:2011.

This document includes Amendment 1 approved by CEN on 2013-11-19.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A_1}$ $\boxed{A_1}$.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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EN 15011:2011+A1:2014 (E)**Introduction**

This European Standard has been prepared to be a harmonised 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 European Standard that all the relevant information relating to the use and operating environment of the crane has been exchanged between the manufacturer and 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 standard 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 European Standard.

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.

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1 Scope

A1 This European Standard 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. **A1**

This European Standard 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 European Standard does not include requirements for the lifting of persons.

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

This European Standard is applicable to bridge and gantry cranes manufactured after the date of its publication as an EN.

2 Normative references

The following referenced documents are indispensable for the application 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, *Safety rules for the construction and installation of lifts — Special lifts for the transport of persons and goods - Part 43: Lifts for cranes*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 795, *Protection against falls from a height — Anchor devices — Requirements and testing*

EN 894-1, *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, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

A1 EN 1993-6 **A1**, *Eurocode 3 - Design of steel structures - Part 6: Crane supporting structures*

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

EN 12385-4, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

EN 12644-1, *Cranes — Information for use and testing — Part 1: Instructions*

EN 12644-2, *Cranes — Information for use and testing — Part 2: Marking*

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

A1 EN 13001-2 **A1**, *Crane safety — General design — Part 2: Load **A1** actions **A1***

A1 EN 13001-3-1 **A1**, *Cranes — General Design — Part 3-1: Limit States and proof competence of steel structures*

EN 15011:2011+A1:2014 (E)

CEN/TS 13001-3-2, *Cranes - General design — Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*

EN 13135, *Cranes — Safety — Design — Requirements for equipment*

EN 13155, *Cranes — Safety — Non-fixed load lifting attachments*

EN 13157, *Cranes — Safety — Hand powered cranes*

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

EN 13586, *Cranes — Access*

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

EN 60204-11, *Safety of machinery — Electrical equipment of machines — Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV (IEC 60204-11:2000)*

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, *Low-voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock (IEC 60364-4-41:2005, mod.)*

EN 60825-1, *Safety of laser products — Part 1: Equipment classification and requirements (IEC 60825-1:2007)*

EN 60947-5-5, *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 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, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 11201, *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 11203:2009, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

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

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

EN ISO 13732-1, *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 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

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

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

ISO 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

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

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

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

3 Terms and definitions

^[A1] For the purposes of this document, the terms and definitions given in EN ISO 12100, EN ISO 3744, EN ISO 11202, EN ISO 11203, EN ISO 11204 and the following apply. ^[A1]

3.1

bridge crane

^[A1] crane able to move along rails or runways having at least one primarily horizontal girder and equipped with at least one hoisting mechanism ^[A1]

NOTE Building structures, where hoists are mounted, are not regarded as bridge cranes.

3.2

gantry crane

^[A1] 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 ^[A1]

NOTE 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

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

3.5

hoist medium

part of the hoisting mechanism, either rope, belt or chain, by which the fixed load lifting attachment is suspended

EN 15011:2011+A1:2014 (E)

3.6

underhung crane

bridge crane suspended from the lower flange of the crane track

3.7

direct acting rated capacity limiter

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

NOTE Those limiters can be, for example, friction torque limiters, pressure limiting valves. Directing acting rated capacity limiters generally have no response delay.

3.8

indirect acting capacity 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, hazardous situations and events, as far as they are dealt with in this European Standard, 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 (as listed in EN 1050:1996)	Relevant clause(s) in this European Standard
1	Mechanical hazards	
1.1	Generated by machine parts or work pieces, e.g. by: https://standards.iteh.ai/catalog/standards/sist/89411207-2d9d-45cb-a42a-7ea6117ec2ca/sist-en-15011-2011a1-2014	
1.1.2	relative location	5.6.2
1.1.3	mass and stability	5.2
1.1.4	mass and velocity	5.2, 5.3.6, 5.4.4, 5.6.1
1.1.5	inadequacy of mechanical strength	5.2
1.2	Accumulation of energy inside the machinery, e.g. by:	
1.2.2	fluids under pressure	5.4.1
1.3	Elementary forms of mechanical hazards	
1.3.1	Crushing	5.1, 5.6.2, 7.2
1.3.2	Shearing	5.6.2.4
1.3.3	Cutting or severing	
1.3.5	Drawing-in or trapping hazard - moving transmission parts	5.6.2.5, 5.6.2.6
1.3.6	Impact	5.5.3.1, 7.2
1.3.9	High pressure fluid injection or ejection hazard	7.3.3
2	Electrical hazards due to:	5.3
2.1	Contact of persons with live parts (direct contact)	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	5.3
2.4	Electrostatic phenomena	5.3.1
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short-circuits, overloads, etc.	5.1
3	Thermal hazards, resulting in:	
3.1	burns and scalds, by possible contact of persons with objects or materials with an extreme temperature, by flames, by radiation, etc.	5.4.8.1, 7.3.3
3.2	Hot or cold working environment	5.6.1
4	Hazards generated by noise, resulting in:	
4.1	Hearing losses	5.6.4
4.2	Interference with speech communication, signals	5.6.4, 7.3.1
5	Hazards generated by vibration	
5.2	Whole body vibration, particularly when combined with poor postures	5.2.2.6, 5.6.1
6	Radiation	
6.0	External radiation	See Introduction
6.5	Lasers	5.4.8.2
7	Processed materials and substances, used materials, fuels	
7.1	Hazards from contact with harmful fluids, gases, mists, fumes and dusts	5.4.8.4 See Introduction
7.2	Fire or explosion hazard	5.4.8.3 See Introduction
8	Neglected ergonomic principles in machine design, e.g. hazards from:	
8.1	Unhealthy postures or excessive efforts	5.6.1
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	5.6.1
8.3	Neglected use of personal protection equipment	7.3.3
8.4	Inadequate local lighting	5.6.3
8.6	Human errors, human behaviour	5.5.2

EN 15011:2011+A1:2014 (E)

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	5.7
10	Unexpected start-up, unexpected overrun/over speed (or any similar malfunction) from:	
10.1	Failure/disorder of control systems	5.3.4
10.3	External influences on electrical equipment	5.3.5.3, 5.4.2
10.4	Other external influences (gravity, wind, etc.)	5.3.5.3, 5.3.6, 5.4.2, 5.5.2.2, 5.5.4 b) and c)
10.5	Errors in the software	5.3.4, 5.3.5.3, 5.4.2
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see No. 8.6)	5.3.5.3, 5.4.2
11	Impossibility of stopping the machine in the best possible conditions	5.4.4.1, 5.4.5.1, 5.5.2.2
13	Failure of the power supply	5.3, 5.4.2
14	Failure of the control circuit	5.3, 5.6.1, 5.4.2
16	Break-up during operation	5.2, 5.4.3.6.1, 7.3.3
16.1	Thermal effect on the crane	5.3
17	Falling or ejected object or fluid	5.4.1, 7.3.3
18	Loss of stability / overturning of machinery	5.2.3
19	Slip, trip and falling of persons (related to machinery)	5.6.2
20	Relating to the travelling function	
20.2	Movement without an operator at the driving position	5.3.5.3, 5.3.6, 5.6.1
20.4	Excessive speed of pedestrian controlled machinery	5.6.1
20.5	Excessive oscillations when moving	5.4.4.3, 5.5.4 e), 7.2
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilized	5.4.3.6.1, 5.4.4, 5.5.2.2, 7.2
20.7	From derailment due to travelling	5.4.4.5
21	Linked to the work position (including driving station) on the machine	
21.1	Fall of persons during access to (or at/from) the work position	5.6.2
21.2	Exhaust gases / lack of oxygen at the work position	5.4.8.4.1

21.3	Fire (flammability of the cab, lack of extinguishing means)	5.4.8.3, 5.6.1
21.4	Mechanical hazards at the work position - contact with the wheels - fall of objects, penetration by object - contact of persons with machine parts or tools (pedestrian control)	5.6.2.5, 5.6.1
21.5	Insufficient visibility from the working position	5.6.1
21.6	Inadequate lighting	5.6.3
21.7	Inadequate seating	5.6.1
21.8	Noise at the driving position	5.6.4
21.9	Vibration at the driving position	5.6.1
21.10	Insufficient means of evacuation/emergency exit	5.6.2, 5.4.8.3
22	Due to the control system	5.6.1
22.1	Inadequate location of controls /control devices	5.6.1
22.2	Inadequate design of the actuation mode and/or action mode of controls	5.6.1
23	From handling the machine (lack of stability)	5.4.4.3
25	From/to third persons	
25.1	Unauthorized start-up/use	
25.2	Drift of a part away from its stopping position	5.4.5.2
25.3	Lack or inadequacy of visual or acoustic warning means	5.7
26	Insufficient instructions for the driver / operator	
26.1	Movement into prohibited area	5.5.3.1, 7.2
26.2	Tipping - Swinging	7.2
26.3	Collision: machines-machine	5.5.3.1, 5.5.3.3, 5.5.4 e), 7.2
26.4	Collision: machines-persons	5.5.3.1, 5.5.4 e), 7.2
26.5	Ground conditions	7.3.1
26.6	Supporting conditions	7.3.1
27	Mechanical hazards and events	
27.1	from load falls, collision, machine tipping caused by:	
27.1.1	lack of stability	5.2.3, 5.4.8.5
27.1.2	Uncontrolled loading - overloading – overturning moment exceeded	5.2.1.5, 5.2.1.6, 5.4.3.1 to 5.4.3.4, 5.4.8.5, 5.5.1, 5.5.2.1, 5.5.4 a)
27.1.3	Uncontrolled amplitude of movements	5.5.3.3, 7.2
27.1.4	Unexpected/unintended movement of loads	5.3.4, 5.4.1, 5.4.2, 5.4.3.1, 5.6, 7.2
27.1.5	Inadequate holding devices / accessories	5.4.1, 7.2

EN 15011:2011+A1:2014 (E)

27.1.6	Collision of more than one machine	5.5.3.1, 5.5.3.3
27.1.7	Two-block of hook to hoist	5.4.3.1, 5.5.3.2
27.2	From access of persons to load support	7.2
27.3	From derailment	5.4.4.5, 5.4.4.6
27.4	From insufficient mechanical strength of parts Loss of mechanical strength, or inadequate mechanical strength	5.2, 5.4.3, 5.4.5.3, 5.4.6, 5.4.7, 7.3.3
27.5	From inadequate design of pulleys, drums	5.2, 5.4.1, 5.4.3.1
27.6	From inadequate selection/ integration into the machine of chains, ropes, lifting accessories	5.2, 5.4.1, 5.4.3.1, 5.4.3.6.2, 7.2
27.7	From lowering of the load by friction brake	5.4.1
27.8	From abnormal conditions of assembly / testing / use / maintenance	5.4.3.6.3, 5.5.4 d)
27.9	Load-person interference (impact by load)	5.6.1, 5.7, 7.2, 7.3.1
28	Electrical hazard	
28.1	from lightning	7.3.3
29	Hazards generated by neglecting ergonomic principles	
29.1	insufficient visibility from the driving position	5.6.1, 5.6.3

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5 Safety requirements and/or protective measures

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5.1 General

Bridge and gantry cranes shall comply with the safety requirements and/or protective measures of Clause 5. In addition, these cranes shall be designed according to the principles of A1 EN ISO 12100 A1 for relevant but not significant hazards, which are not dealt with by this European Standard.

Bridge and gantry cranes shall be in accordance with the following standards as amended by this European Standard:

- EN 13001-1, *Cranes — General design — Part 1: General principles and requirements*;
- EN 13001-2, *Cranes — General design — Part 2: Load A1 actions A1* ;
- A1 EN 13001-3-1 A1 , *Cranes — General Design — Part 3-1: Limit States and proof competence of steel structures*;
- CEN/TS 13001-3-2, *Cranes — General design — Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*;
- A1 EN 13135, *Cranes — Safety — Design — Requirements for equipment*; A1
- EN 13155, *Cranes — Safety — Non-fixed load lifting attachments*;
- EN 13157, *Cranes — Safety — Hand powered cranes*;
- EN 13557, *Cranes — Controls and control stations*;

- EN 12077-2, *Cranes safety — Requirements for health and safety — Part 2: Limiting and indicating devices*;
- EN 13586, *Cranes — Access*;
- EN 12644-1, *Cranes — Information for use and testing — Part 1: Instructions*;
- EN 12644-2, *Cranes — Information for use and testing — Part 2: Marking*;
- EN 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines* (IEC 60204-32:2008).

The requirements of this European Standard are not applicable to power driven hoist units, designed in accordance with EN 14492-2, and incorporated in a bridge and gantry cranes. These hoist units shall be selected in accordance to the principles depicted within A.4.

5.2 Requirements for strength and stability

5.2.1 Load actions

5.2.1.1 Selection of service conditions

The service conditions that are selected and used as the basis of design, in accordance with EN 13001-1 and EN 13001-2, shall be specified in the technical file of the crane.

For cranes located outdoors, the recurrence period according to EN 13001-2 for out of service wind shall be not less than:

- 25 years for cranes located in coastal areas;
- 10 years for cranes located inland;
- 5 years for indoor cranes which may occasionally work and/or be parked outdoors.

NOTE Guidance for specifying the operation duty is given in Annex A. For information needed for the derivation of classification parameters see also ISO 9374-5.

5.2.1.2 Selection of loads and load combinations

The basic load combinations for the load calculation shall be selected in accordance with **A1** EN 13001-2 **A1**.

Where cranes work in atmospheres contaminated by process debris, such material accumulations deposited upon the upper surfaces of the crane shall be taken into account in the dead load computation.

5.2.1.3 Determination of dynamic factors

5.2.1.3.1 Hoisting and gravity effects acting on the mass of the crane

The masses of the crane shall be multiplied with factor $\phi_1 = 1 + \delta$ when calculating the stresses in load combinations in accordance with EN 13001-2.

A1 For masses with unfavourable gravitational load effect the factors shall be taken as $\delta = 0,10$ and $\phi_1 = 1,10$, and for masses with favourable gravitational load effect as $\delta = -0,05$ and $\phi_1 = 0,95$, unless other values are obtained by measurements or calculations. **A1**