



SLOVENSKI STANDARD

SIST EN 12999:2003

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Dvigala (žerjavi) – Nakladalna dvigala

Cranes - Loader cranes

Krane - Ladekrane

Appareils de levage à charge suspendue - Grues de chargement

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Ta slovenski standard je istoveten z: **EN 12999:2002**

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Cranes

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English version

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This European Standard was approved by CEN on 8 March 2001.

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

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Foreword

This document (EN 12999:2002) 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of an identical text or by endorsement, at the latest by March 2003 and conflicting national standards shall be withdrawn at the latest by March 2003.

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 document: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This European Standard is a harmonised standard to provide one means for loader cranes to conform to the essential health and safety requirements of the Machinery Directive 98/37/EEC.

This European Standard is a type C standard as stated in EN 1070.

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard.

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1 Scope

This European Standard specifies minimum requirements for design, calculation, examinations and tests of hydraulic powered loader cranes and their mountings onto vehicles or static foundations.

This standard does not apply to loader cranes used on board ships or floating structures and to articulated boom system cranes which are designed as total integral parts of special equipment such as forwarders.

The hazards covered by this standard are identified in clause 4.

This standard does not cover hazards related to the lifting of persons.

This standard applies to loader cranes (including timber handling cranes) which are manufactured after the date of approval by CEN of this standard.

NOTE 1 Winches will be covered by a special standard being in preparation by CEN/TC 147.

NOTE 2 The use of cranes for the lifting of persons may be subject to specific national regulations.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to apply (including amendments).

EN 292-1:1991, *Safety of machinery – Basic concepts – General principles for design – Part 1: Basic terminology, methodology*

EN 292-2:1991 + A1:1995, *Safety of machinery – Basic concepts – General principles for design – Part 2: Technical principles and specifications*

EN 294:1992, *Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs.*

EN 349:1993, *Safety of machinery – Minimum distances to avoid crushing of parts of the human body.*

EN 811:1996, *Safety of machinery – Safety distances to prevent danger zones being reached by the lower limbs.*

EN 954-1:1996, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

EN 982:1996, *Safety requirements for fluid power systems and components - Hydraulics*

EN 1070:1998, *Safety of machinery - Terminology*

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

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

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

prEN 13557:1999, *Cranes - Controls and control stations*

EN 12999:2002 (E)

prEN 13586:1999, *Cranes - Access*

EN 50081-2:1993, *Electromagnetic compatibility – Generic emission standard – Part 2: Industrial environment*

EN 50082-2:1995, *Electromagnetic compatibility – Generic immunity standard – Part 2: Industrial environment*

EN 60204-32:1998, *Safety of machinery - Electrical equipment of machines - Part 32: Requirements for hoisting machines.*

EN 61000-6-2:1999, *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards – Immunity for industrial environments (IEC 61000-6-2:1999)*

EN ISO 5353:1998, *Earth-moving machinery and tractors and machinery for agriculture and forestry — Seat index point (ISO 5353:1995)*

ISO 4302:1981, *Cranes — Wind load assessment*

3 Terms and definitions

3.1 Definitions

For convenience of reference the definitions are - with the exception of 3.1.1 loader crane - grouped in alphabetical order in the English version.

For the purposes of this standard, the definitions given in EN 1070:1998 apply, together with the following:

3.1.1

loader crane

powered crane comprising of a column, which slews about a base, and a boom system which is attached on to the top of the column. The crane is usually fitted on a vehicle (including trailer) and is designed for loading and unloading the vehicle.

NOTE 1 A crane, as defined above, installed on a static foundation is still considered a loader crane.

NOTE 2 Annex A give examples of configuration and mountings.

3.1.2

articulated

movement of boom members pivoting about a pin joint

3.1.3

base

housing incorporating anchoring points and bearings for the slewing column

3.1.4

boom

structural member in the boom system of the loader crane

3.1.5

boom extension, hydraulic

part of the boom which is capable of hydraulic telescopic movement to vary its length

3.1.6

boom extension, manual

part of the boom which can be manually extended or retracted

3.1.7

boom system

complete system, consisting of booms, boom extensions and cylinders

3.1.8**column**

structural member which supports the boom system

3.1.9**control system**

interface between the operating levers and the actuating components which provide movements of the loader crane

3.1.10**control station**

position from which the loader crane may be operated

3.1.11**danger zone**

any zone within and/or around the machinery in which a person is exposed to risk of injury or damage to health. (EN 1070:1998)

3.1.12**dead loads**

forces due to the masses of the fixed and movable crane parts which act permanently on the structure while the crane is being used

3.1.13**dynamic pressure**

pressure in a hydraulic system component or part of hydraulic system caused by dynamic forces on actuators when handling the load

3.1.14**fixed load lifting attachment**

equipment from which the net load may be suspended and which is fitted directly to the boom head as an integral part of the crane. This comprises e.g. hooks, grabs,

3.1.15**flow sensitive check valve**

valve which stops the flow when a pre-set pressure drop level is exceeded

3.1.16**gross load**

sum of payload, lifting attachments and if applicable a portion of the hoist rope

3.1.17**high seat**

control station connected to the column, consequently rotating with the crane

3.1.18**hydraulic line rupture**

failure of a hydraulic line which results in a loss of pressure in the line

3.1.19**load holding valve**

valve which is normally closed and is opened by an external force to allow the flow of fluid out of a hydraulic actuator

3.1.20**main relief valve**

valve which limits the pressure supplied to the hydraulic system of the crane

3.1.21**maximum working pressure**

maximum pressure in pump circuit or individual working function

3.1.22

net lifting moment

rated capacity multiplied by outreach

3.1.23

non-fixed load lifting attachment

interchangeable equipment which can be fitted directly or indirectly to the hook or any other coupling device of a crane by the user without affecting its integrity

3.1.24

outreach

the horizontal distance between the axis of rotation of the boom/boom system/jib in a vertical plane and point of load attachment.

3.1.25

outreach, hydraulic

outreach which can be obtained with hydraulically actuated parts of the boom system

3.1.26

payload

load, which is lifted by the crane and suspended from the non-fixed load-lifting attachment(s) or, if such an attachment is not used, directly from the fixed load-lifting attachment(s)

3.1.27

port relief valve

valve which limits the pressure supplied to a hydraulic actuator

3.1.28

pressure relief valve

valve which automatically relieves the hydraulic oil to the tank when the pressure exceeds a specified value

3.1.29

raised control station

control station at a height above the ground level, i.e. a high seat attached to the column of the loader crane or a platform positioned above the base of the loader crane (see annex K)

3.1.30

rated capacity

load that the crane is designed to lift for a given operating condition (e.g. configuration, position of the load)

3.1.31

rated capacity indicator

device which gives, within specified tolerance limits, at least a continuous indication that the rated capacity is exceeded, and another continuous indication (on certain crane types) of the approach to the rated capacity

3.1.32

rated capacity limiter

device that automatically prevents the crane from handling loads in excess of its rated capacity, taking into account the dynamic effects during normal operations use

3.1.33

setting-up function

crane function used to prepare the crane for lifting

3.1.34

sink rate

distance in a given time at which the load lowers due to internal leakage of hydraulic components

3.1.35

slewing

rotational movement of the column and boom system about a vertical axis

3.1.36**stabilizer**

aid to the supporting structure connected to the base of the crane or to the vehicle to provide stability, without lifting the vehicle from the ground

3.1.37**stabilizer extension**

part of the stabilizer capable of extending the stabilizer leg laterally from the transport position to the operating position

3.1.38**stabilizer leg**

part of a stabilizer capable of contacting the ground to provide the required stability

3.1.39**static foundation**

fixed support incorporating mounting points for a crane

3.1.40**timber handling crane**

loader crane specifically designed, manufactured and equipped with a grapple for loading/unloading of unprepared timber (e.g. tree trunks, branches). The operator controls the crane from a high seat or from a cabin.

3.1.41**total lifting moment**

sum of net lifting moment and the moment produced by dead loads.

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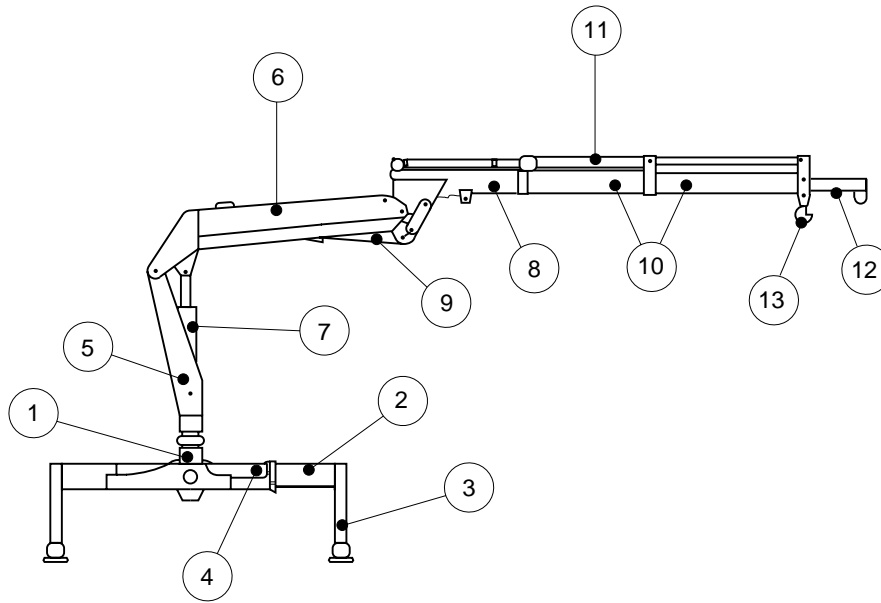
3.2 Terminology

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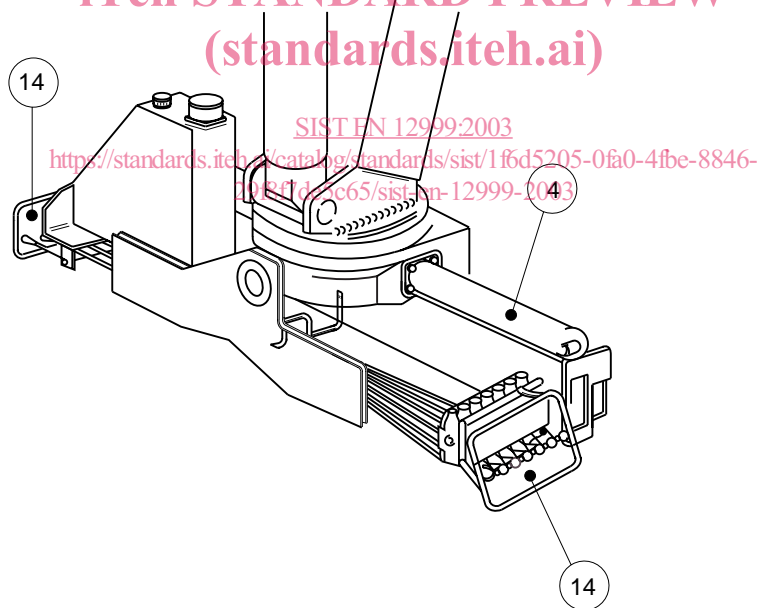
The terms which are used in this standard for the main parts of a loader crane are indicated in figure 1.

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Boom system consists of items 6-12.



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- Key
- | | | | |
|----------------------|-------------------------------|-------------------------|----------------------------|
| 1. Base | 2. Stabilizer extension | 3. Stabilizer leg | 4. Slewing mechanism |
| 5. Column | 6. 1st boom | 7. 1st boom cylinder | 8. 2nd boom |
| 9. 2nd boom cylinder | 10. Boom extension, hydraulic | 11. Extension cylinders | 12. Boom extension, manual |
| 13. Hook | 14. Controls | | |

Figure 1 — Main parts of a loader crane

4 List of significant hazards

Table 1 shows a list of significant hazardous situations and hazardous events that could result in risks to persons during normal use and foreseeable misuse. It also contains corresponding cross-references to certain Parts of EN 292, and the relevant clauses in this standard that are necessary to reduce or eliminate the risks associated with those hazards.

Table 1 — List of significant hazards and associated requirements

No.	Hazards	Annex A of EN 292-2: 1991/A1:1995	Relevant clause(s) in this standard
Hazards, hazardous situations and hazardous events			
1	Mechanical hazards due to:	1.3, 1.4	
	- Inadequacy of mechanical strength of the crane and its parts	4.1.2.3/4/5, 4.2.1.4	5.1, 5.2, 5.3, 5.5.1, 5.5.4, 5.5.5, 5.5.8, 5.5.9, 5.8.2.1, 5.8.2.2, 5.10.2.1, 5.10.2, 7.2.3.7.
1.1	Crushing hazard	1.3, 1.3.4, 1.3.7	5.8.1, 5.8.2.2, 5.8.2.3, 5.10.2.3
1.2	Shearing hazard		
1.3	Cutting or severing hazard		
1.4	Entanglement hazard		
1.5	Drawing-in or trapping hazard		
1.6	Impact hazard		
1.7	Stabbing or puncture hazard		
1.8	Friction or abrasion hazard		
1.9	High pressure fluid injection or ejection hazard	1.3.2	5.5.1, 5.5.5, 5.10.7, 7.2.3.5, 7.2.4.2
1.10	Ejection of parts	1.3.3	5.4.1.1, 5.4.1.2, 5.4.1.3, 5.4.2, 5.4.3
1.11	Loss of stability	1.5.4	5.6.1, 5.6.2, 5.6.4, 5.6.5, 5.6.6.2, 5.10.3
1.12	Slip, trip, fall	1.6.2, 4.2.3	5.8.2.2, 5.8.2.3, 5.8.2.4, 5.10.8
2	Electrical hazards due to:		
2.1	Contact of persons with live parts (direct contact)	1.5.1, 1.6.3	5.6.1.3, 5.9, 5.10.6, 7.2.3.1d)
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	1.5.1	
2.3	Approach to live parts under high voltage	1.5.1, 1.6.3	
2.4	Electrostatic phenomena	1.5.2	

Table 1 — List of significant hazards and associated requirements (continued)

No	Hazards	Annex A of EN 292-2: 1991/A1:1995	Relevant clause(s) in this standard
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc	1.5.1, 1.5.5	
3	Thermal hazards, resulting in:		
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	1.5.5, 1.5.6, 1.5.7	5.5.5, 5.10.2.3, 7.2.4.1
3.2	Damage to health by hot or cold working environment	1.5.5	7.2.3.7
4	Hazards generated by noise	1.5.8, 1.7.4 f)	"Not significant for cranes that do not include the power source. See 7.2.3.8 regarding information on noise".
5	Hazards generated by vibration	1.5.9	5.10.5
7	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery		5.10.2.3
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	1.1.3, 1.5.13, 1.6.5	7.2.4.1
8	Hazards generated by neglecting ergonomic principles in machinery design, as e.g. hazards from:		
8.1	Unhealthy postures or excessive effort	1.1.2 d), 1.1.5, 1.6.2, 1.6.4	5.4.1.3, 5.4.2, 5.4.3, 5.7, 5.8, 5.10.8
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	1.1.2d), 2.2	5.7, 5.8
8.3	Neglected use of personal protection equipment	1.1.2e)	7.2.4.1
8.4	Inadequate local lighting	1.1.4	5.8.1, 7.2.4.1, 7.2.3.6d)
8.6	Human error, human behaviour	1.1.2 d), 1.2.2, 1.2.5, 1.2.8, 1.5.4, 1.7	5.6, 5.7.1, 5.7.2, 7.2.3, 7.2.4

Table 1 — List of significant hazards and associated requirements (continued)

No	Hazards	Annex A of EN 292-2: 1991/A1:1995	Relevant clause(s) in this standard
8.7	Inadequate design, location or identification of manual controls	1.2.2	5.4.1.3, 5.4.3, 5.7, 5.8
8.8	Inadequate design or location of visual display units	1.7.1	
9	Combination of hazards		5.2.3, 5.2.4
10	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:		
10.1	Failure/disorder of the control system	1,2,6, 1,6,3	5.5.6.1, 5.5.6.2, 5.5.7, 5.6.6, 5.6.8,5.7.1
11	Hazards caused by missing and/or incorrectly positioned safety related measures/ means		
11.1	Guards	1.2.5, 1.4.2.2, 1.4.3	5.5.5, 5.7.1, 5.8.2.2, 5.8.2.3, 5.10.2.3
11.2	Safety related (protection) devices	1.2.5, 1.4.2.2, 1.4.3	5.4.1, 5.4.3, 5.6.3, 5.6.6, 5.6.7
11.4	Safety signs, signals, symbols	1.7.1, 1.7.2	5.4.1.3, 5.6.7, 5.7.2, 7.2.3.5, 7.3.4, 7.3.5
11.5	Information or warning devices	1.7.0, 1.7.1	5.6.1, 5.6.2, 5.6.4, 5.6.7, 7.1, 7.2, 7.3
11.6	Visibility	3.2.1, 4.1.2.7	5.4.3, 5.8.1, 7.3.4.1
11.7	Emergency devices	1.2.4	5.6.3, 5.6.8
15	Assembly errors	1.5.4	7.2.2, 7.2.4
18	Loss of stability/overturning of machine	1.3.1	5.4.1, 5.6.1, 5.6.2, 5.6.4, 5.6.5, 5.6.6, 5.10.3
Additional hazards, hazardous situations and hazardous events due to lifting			
27	Mechanical hazards and hazardous events		
27.1	From load falls, collisions, machine tipping caused by:		
27.1.1	Lack of stability	4.1.2.1	5.10.3, 6.2.5
27.1.2	Uncontrolled loading – overloading – overturning moments exceeded	4.2.1.4, 4.3.3, 4.4.2a)	5.5.4, 5.6.1, 5.6.2, 5.6.3, 5.6.4, 5.6.5