INTERNATIONAL STANDARD

ISO 10972-4

First edition
2007-04-01

Cranes — Requirements for mechanisms —

Part 4: Jib cranes

Appareils de levage à charge suspendue — Exigences pour les mécanismes —

Partie 4: Grues à flèche

Reference number
ISO 10972-4:2007(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 10972-4 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 8, *Jib cranes*.

ISO 10972 consists of the following parts, under the general title *Cranes — Requirements for mechanisms*:

— *Part 1: General*

— *Part 2: Mobile cranes*

— *Part 3: Tower cranes*

— *Part 4: Jib cranes*

— *Part 5: Bridge and gantry cranes*

The following part is under preparation:

— *Part 2: Mobile cranes*

Introduction

This part of ISO 10972 establishes requirements and gives guidance and design rules that reflect the present state of the art in the field of crane machine design. The rules given represent good design practice that when applied will ensure the fulfilment of essential safety requirements and adequate service life of components. Deviation from these rules may lead to increased risks or reduction of service life, but it is acknowledged that new technical innovations, materials, etc. can enable new solutions that result in equal or improved safety and durability.

Cranes — Requirements for mechanisms —

Part 4:
Jib cranes

1 Scope

This part of ISO 10972 establishes the particular requirements relating to mechanisms for jib cranes as defined in ISO 4306-1. The general requirements for mechanisms for cranes are given in ISO 10972-1.

These particular requirements concern

a) general layout and design of mechanisms,

b) selection and/or design requirements of components, and

c) instructions for manufacture, mounting, installation and testing.

Rules for proof of competence calculation regarding different limit states (yield strength, fatigue, wear) are excluded from this part of ISO 10972.

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.

ISO 4306-1, *Cranes — Vocabulary — Part 1: General*

ISO 10245-4, *Cranes — Limiting and indicating devices — Part 4: Jib cranes*

ISO 10972-1, *Cranes — Requirements for mechanisms — Part 1: General*

ISO 12210-4, *Cranes — Anchoring devices for in-service and out-of-service conditions — Part 4: Jib cranes*

ISO 12488-4, *Cranes — Tolerances for wheels and travel and traversing tracks — Part 4: Jib cranes*

IEC 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1 and the following apply.

3.1
spooling
manner in which a rope is coiled onto a drum

4 Requirements

4.1 General design and layout

4.1.1 General

The mechanisms shall meet the requirements of ISO 10972-1, as applicable.

4.1.2 Rope driven jib hoist

The layout of the jib and its supporting structures and rope drives shall be such that the luffing motion to increase the outreach is able to operate even in the maximum in-service head wind with the crane loaded or unloaded.

4.1.3 Load control

Limiting and indicating devices in accordance with ISO 10245-4 shall be incorporated as applicable.

In cases where the malfunctioning of the rated capacity limiter would cause the loss of stability of the crane, the reliability of the system shall be ensured in one of the following ways:

— by duplication of the critical components of the load limiter and systems or by a back-up limiter;

— automatic checking of the functioning of the system;

— other fail safe device or mechanism;

— instructions to the user to arrange frequent regular checks of the system; the system shall be checked, in particular, each time the operation of the crane is switched from constant capacity (e.g. grab use) to outreach-dependant capacity (e.g. hoisting by the hook and slings).

4.1.4 Rope spooling control

Where it is possible that a rope could incorrectly spool, a control system or other means for guarding the correct spooling of the rope onto the winding drum shall be provided.

4.1.5 Overspeed control

When the closure of a back-up brake is actuated by a detected overspeed, the speed detector shall not be mounted on the shaft between the back up brake and the driving motor.

4.1.6 Service brakes

The service brake shall maintain its capability of stopping the motion despite heating, taking into account the following:

— the number of brake operations in a given period;

— the type of drive control;

— the kinetic energy of all rotating parts (e.g. motor, brake, coupling and gear);

— the kinetic energy of all moving masses (e.g. hoisted mass, structural masses);

— the difference of potential energy of the lowered masses during braking;

— dynamic load testing;

— any interruption of power or emergency stop of category 0 in accordance with IEC 60204-32.

When the braking force is supplied by pre-stressed springs, the braking system shall continue to be capable of stopping the motion in the case of the breakage of any spring. This requirement can be fulfilled, for example, by a spring system of the compression types (helical or plate). The springs shall be secured at their ends and guided to avoid buckling and loss of broken spring parts.

When helical springs are used, they shall be such that in the event of a wire breakage, the spring parts shall not screw in and the brake shall retain an effective pressure.

Brake linings shall not contain asbestos. The properties and coefficient of friction shall be suitable for the purpose during normal operation under the effect of atmospheric conditions and temperature variations.

It shall be possible to check the wear of the brake linings without the need to dismantle the unit, other than removing protective covers. It shall be possible to check the brake system, to readjust the brake and to renew the brake linings. The connection between the brake lining and the brake lining carrier shall not become loosened unintentionally. In order to fulfil this requirement, bonding and riveting of brake linings shall be in accordance with national standards.

4.2 Hoist mechanism

4.2.1 Service brakes

For hoisting motions, only power-released brakes shall be used, and the braking system shall be such that in the case of loss or failure of the energy supply the brake shall arrest and sustain the load.

Any time delay of the braking system shall be such that the braking effect shall safely arrest the load.

4.2.2 Dual hoist grabbing mechanisms

When dimensioning the load bearing and powering components of each mechanism, the distribution of the load to each mechanism shall be taken into account. Frequent, continuous and transient load distribution cases, which are dependant upon the mechanical configuration and the control system, shall be considered.

The brakes of each mechanism shall hold at least 125 % of the lowering torque of the total hoist load.

The dual mechanism shall be such that each brake can be tested separately.

4.2.3 Speed change gear

Where speed change gears are used (e.g. separate speed change gear reducer or speed change gears built in the main gear enclosure) there shall be a brake or mechanical locking means between the speed change gear and the rope, capable of holding the weight of the lifting attachments while the gear is switched from one speed to another.

When the speed change is remote controlled, it shall be interactive with the load measuring system.

When the speed change is manual, instructions regarding braking, locking and permissible load shall be provided.

When the speed change is made by moving a pair of gear wheels axially or by a coupling device, provision shall be made to prevent power engagement of the hoist motor in an intermediate gear position.

When the speed change is made by rotating clutches, the speed selection shall automatically set the permissible load of the mechanism. Switching to a higher speed while the mechanism is loaded over the permissible load of that speed shall be prevented.

4.3 Luffing mechanism

4.3.1 Brakes

The luffing mechanism shall be equipped with a backup brake, if

— the moment of the jib, loaded and unloaded is not balanced within ±5 % of the moment, and/or

— the height difference of the highest and the lowest point of the load path is more than 2 % of the length of the luffing range.

The primary or the backup brake shall be able to stop the jib lowering motion with any operational speed and permissible load.

4.3.2 Protection from environment

With screw-drive luffing mechanisms the screw shall be shielded from ingress of foreign particles, debris and weather elements.

4.3.3 Traversing by a crab

The traverse drive mechanism and the slope of the jib shall be such that the position of the crab can be controlled.

Where traversing takes place by the operator pushing or pulling the load, the force required to overcome friction and slope shall not exceed 250 N. No horizontal force shall be required to hold the position of the load.

4.4 Slew mechanism

4.4.1 Braking and parking

When a hydraulic or mechanical brake is used, an interlocking system shall be provided to switch off simultaneous electrical braking.

When the structure is required to be locked, the forces due to the torque from the slewing structure in the maximum out-of-service wind conditions shall be carried either by the brakes or by a mechanical locking device. However, the performance shall not rely upon the combination of the two. When a self-closing electrical parking brake is not provided with the mechanical or hydraulic brake, the actuator shall be mechanically locked while the driver locks the slewing by a pin or other positive locking device.

4.4.2 Slew bearing

The structural mounting support for the slew bearing shall be of adequate strength and stiffness, level and flat, and present a smooth surface for the bearing. The bearing shall also be secured to take account of tension and shear (axial, radial and tangential) forces.

When a slewing ring is used, its manufacturer's instructions for the tightening control of the mounting bolts and bearing maintenance shall be complied with. Inspection methods and intervals, as well as the criteria for replacement of the mounting bolts and slewing ring, shall be given in the maintenance instructions.

4.4.3 Manual slewing

Where slewing takes place by the operator pushing or pulling the load, the force required to overcome friction shall not exceed 250 N. No horizontal force shall be required to hold the position of the load.

4.5 Travel mechanism

4.5.1 Traction limits

The distribution of wheel loads between the corners of the crane shall be considered both in the driving and braking capacity of the wheels. In the technical assessment for steel wheels and rails, the traction capacity of the wheels shall be limited to 0,14 times the wheel pressure force in its relevant load combination.

4.5.2 In-service brake

The brakes shall be able to stop the crane in the maximum in-service tail wind over a distance that is not more than 1,5 times the power controlled braking distance when travelling with rated load at maximum speed without wind.

4.5.3 Anchoring devices in out-of-service conditions

Anchoring devices shall be fitted in accordance with ISO 12210-4.

The holding of the crane in out-of-service conditions shall be based on rail clamps, friction related devices, or positive locking devices, such as ground pins or tie-downs.

The rail clamps or ground pins shall not be mounted on a bogie in such a way that there is a risk of the anchoring device disengaging due to up lift of one end of the bogie.

Tie-downs may be used to avoid the crane falling over in out-of-service conditions.

4.5.4 Wheels and bogies

Wheels and bogies shall be in accordance with ISO 12488-4.

The bogie arrangement shall be such that no more than one bogie needs to be removed when a wheel or one of its components is repaired or replaced.

Jacking points shall be marked on the crane and shown in the maintenance manual.

Open gears in wheel drives which constitute a hazard under normal operating conditions shall be shielded to prevent access by a person to the danger area.

ICS 53.020.20

Price based on 5 pages