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Cranes — Requirements for mechanisms —

Part 5: Bridge and gantry cranes

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

Partie 5: Ponts et portiques roulants

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Foreword

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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 10972-5 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 9, *Bridge and gantry cranes*.

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

- *Part 1: General*
- *Part 3: Tower cranes*
- *Part 4: Jib cranes*
- *Part 5: Bridge and gantry cranes*

Cranes — Requirements for mechanisms —

Part 5:
Bridge and gantry cranes

1 Scope

This part of ISO 10972 establishes the particular requirements relating to mechanisms for bridge and gantry 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) the general layout and design of mechanisms;

b) the selection and/or design requirements of components;

c) the instructions for manufacturing, mounting, installation and testing.

Rules for proof of competence calculations 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 10245-5, *Cranes — Limiting and indicating devices — Part 5: Overhead travelling and portal bridge cranes*

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

ISO 12210-1, *Cranes — Anchoring devices for in-service and out-of-service conditions — Part 1: General*

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

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 apply.

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 Load control

Requirements relating to limiting and indicating devices as provided in ISO 10245-5 shall be incorporated, as applicable.

In the case where the malfunctioning of the rated capacity limiter could cause the loss of stability of the crane, the reliability of the system shall be ensured in at least one of the following ways:

a) by duplication of the critical components of the rated capacity limiter and systems or by a back-up limiter, or

b) by automatic checking of the functioning of the system, or

c) by other fail-safe devices or mechanisms, or

d) by instructions to the user to arrange frequent regular checks of the system. The system should 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 hook and slings).

4.1.3 Rope spooling control

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

4.1.4 Overspeed control

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

4.1.5 Service brakes

The service brake shall maintain its capability to stop the motion despite heating, taking into account

a) the number of brake operations in a given period;

b) the type of drive control;

c) the kinetic energy of all rotating parts like those of motor, brake, coupling and gear;

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

e) the difference of potential energy of the lowered masses during braking;

f) dynamic load testing;

g) interruption of power or emergency stop category 0 (see IEC 60204-32).

If 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 a 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.

If 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 for disassembly of the unit (if necessary, just removing protective covers). It shall be possible to check the brake system, to re-adjust 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 lowering speed does not exceed 1,3 times the rated lowering speed.

4.2.2 Dual hoist grabbing mechanism

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

Either separate speed change gear reducers or speed change gears built in the main gear enclosure may be used. In both cases, there shall be a mechanical locking means and/or brakes between the speed change gear and the hoist rope capable of holding the mass of the lifting attachments or, alternatively, the mass of the lifting attachments plus a specified load, while the gear is switched from one speed to another.

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

When the speed change is manual, adequate 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 Travel and traverse mechanism

4.3.1 Traction limits

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

4.3.2 In-service brake

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

4.3.3 Travel and traversing by a crane bridge or crab

The travel and traverse mechanism and slope of the supporting media shall be such that the position of bridge/crab can be controlled.

In small and manually-operated cranes, travel and traversing may take place by the operator pushing the load. In such cases, 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.

4.3.4 Anchoring devices in out-of-service conditions

Anchoring devices shall be fitted in accordance with ISO 12210-1.

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 uplift of one end of the bogie.

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

4.3.5 Wheels and bodies

Wheels and bodies shall take account of ISO 12488-1.

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.