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Cranes — Requirements for mechanisms —

Part 2: Mobile cranes

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

Partie 2: Grues mobiles

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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 10972-2 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 6, *Mobile 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*

Cranes — Requirements for mechanisms —

Part 2:
Mobile cranes

1 Scope

This part of ISO 10972 establishes requirements specific to the mechanisms of mobile cranes, in addition to the general requirements for cranes given in ISO 10972-1.

These additional requirements concern

a) the arrangement, features and characteristics of the crane mechanisms, and

b) the minimum requirements for certain mechanism components.

Rules for the 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 4301-2, *Cranes — Classification — Part 2: Mobile cranes*

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

ISO 4306-2, *Cranes — Vocabulary — Part 2: Mobile cranes*

ISO 4308-2, *Cranes and lifting appliances — Selection of wire ropes — Part 2: Mobile cranes — Coefficient of utilization*

ISO 8087, *Mobile cranes — Drum and sheave sizes*

ISO 10245-1, *Cranes — Limiting and indicating devices — Part 1: General*

ISO 10245-2, *Cranes — Limiting and indicating devices — Part 2: Mobile cranes*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1 and 4306-2 apply.

4 Specific requirements for hoisting mechanisms on mobile cranes

4.1 Boom hoist mechanism

Limiting and indicating devices per the requirements of ISO 10245-1 and ISO 10245-2 shall be incorporated as applicable. Also refer to ISO 4301-2 for winch classification.

The boom hoist may use a rope drum for its drive or hydraulic cylinder(s) and the supporting structure may be a gantry or the same hydraulic cylinder(s) used to elevate the boom.

The boom hoist shall be capable of elevating and controlling the boom with its rated load (for wire rope boom hoists, when reeved according to the manufacturer's specifications) and shall be capable of supporting the boom and rated load without action by the operator.

In a wire rope supporting and elevating arrangement, boom lowering shall be done only under power control. Free-fall lowering of the boom shall not be permitted.

The boom hoist drum shall have sufficient wire rope capacity so that the boom can be operated in all positions, from the lowest permissible to the highest recommended, when using the manufacturer's recommended reeving and wire rope size. When the wire rope is anchored to the drum with a wedge type anchor, no less than three full wraps of wire rope shall remain on the drum, with the boom lowered to the level of the supporting surface. When anchors consist only of set screws clamping the rope, no less than five full wraps shall remain on the drum. The end of the wire rope shall be anchored to the drum by an arrangement specified by the winch manufacturer.

The boom hoist drum(s) and sheaves shall have wire rope pitch diameters in accordance with ISO 8087.

On machines with wire rope supported booms, a braking mechanism and an additional holding device which has a braking capability of at least one and one-half the maximum drive of the winch shall be provided to prevent inadvertent lowering of the boom.

An integrally mounted holding device (such as a load check valve) shall be provided with boom support hydraulic cylinder(s) to prevent uncontrolled lowering of the boom in the event of a hydraulic system failure (e.g. supply hose rupture).

Where multiple hydraulic cylinders are used for the boom hoist, all cylinders shall be hydraulically connected. The connection shall have a safety factor of at least four against the maximum pressure induced with rated loads.

Where two cylinders need to be connected for synchronous movement, the connection shall be designed to avoid sudden loss of pressure, the resulting drop of the boom and the possible subsequent overload of one of the cylinders.

4.2 Load hoist mechanism

Limiting and indicating devices per the requirements of ISO 10245-1 and ISO 10245-2 shall be incorporated as applicable. Also refer to ISO 4301-2 for winch classification.

The hoist mechanism may consist of a drum or hydraulic cylinder(s) with necessary wire rope reeving.

The load hoist mechanism shall have power and operational characteristics sufficient to perform all load lifting and lowering functions required in crane service when operated under recommended conditions.

An integrally mounted holding device (such as a load check valve) shall be incorporated with load hoist hydraulic cylinder(s) to prevent uncontrolled lowering of the load in the event of a hydraulic system failure (e.g. supply hose rupture).

Where brakes and clutches are used to control the motion of the load hoist drums, they shall be of a size and thermal capacity sufficient to control all rated crane loads with minimum recommended reeving. Where maximum rated loads are being lowered with near maximum boom length, or operations involving long lowering distances, power controlled lowering is recommended to reduce demand on the load brake. Brakes and clutches shall be provided with adjustments where necessary to compensate for lining wear and to maintain force in springs, where used. Free-fall lowering may be prohibited by national legislation.

Where free fall is provided and permitted, a means controllable from the operator's station shall be provided to hold the drum and prevent it from rotating in the lowering direction and able to hold the rated load without further action by the crane operator. A means of positive free-fall control shall be provided to ensure that inadvertent disengagement of the lockout is not possible. Foot-operated brakes having a continuous mechanical linkage between the actuating and braking means, capable of transmitting full braking force and equipped with a positive mechanical means to hold the linkage in the applied position, meet this requirement.

Load hoist drums shall have wire rope capacity with the recommended wire rope size and reeving sufficient to perform crane service within the range of boom lengths, operating radii and vertical lifts specified by the crane manufacturer.

When the wire rope is anchored to the drum with a wedge type anchor, no less than three full wraps of wire rope shall remain on the drum with the boom lowered to the level of the supporting surface. When anchors consist of only set screws clamping the rope, no less than five full wraps shall remain on the drum. The end of the wire rope shall be anchored to the drum by an arrangement specified by the winch manufacturer.

The drum flange shall extend a minimum of one to one-and-a-half times the wire rope diameter over the top layer of the wire rope at all times when performing lifting operations.

The load hoist drum(s) and sheaves shall have wire rope pitch diameters in accordance with ISO 8087.

Drum rotation indicators should be provided and located to afford sensing by the operator.

When power-operated load hoist brakes having no continuous mechanical linkage between the actuating and braking means are used for controlling loads, an automatic means shall be provided to set the brake to prevent the load from falling in the event of loss of brake control power.

When foot-operated, load hoist brakes shall be constructed so that the operator's feet, when in the proper position, will not slip off and a means shall be provided for holding the brakes in the applied position without further action by the crane operator.

Power-controlled lowering systems shall be capable of handling rated loads and speeds as specified by the manufacturer, such systems being recommended to assist in precision lowering and to reduce the demand on the load brake.

Winch classifications shall be in accordance with ISO 4301-2.

5 Specific requirements for boom telescoping mechanisms

Extension and retraction of boom sections may be accomplished through hydraulic, mechanical, electrical or manual means.

Sheaves, if used in the mechanism, shall have pitch diameters in accordance with ISO 8087. Sheaves used in boom telescoping mechanisms shall meet the requirements of ISO 10972-1, other than for the groove angle and depth.

Access for inspection of telescoping wire ropes shall be provided, wire rope selection shall be according to ISO 4308-2.

The powered retract function shall be capable of controlling any rated load which can be retracted.

An integrally mounted holding device (such as a load check valve) shall be provided with telescopic cylinder(s) to prevent uncontrolled retraction of the boom in the event of a hydraulic system failure (e.g. supply hose rupture).

6 Specific requirements for swing mechanisms

6.1 Swing bearing mounting

The structural mounting support for the bearing shall be of adequate strength and stiffness, as well as flat and smooth. The bearing shall also be adequately secured to take account of tension and shear (axial, radial and tangential) forces.

6.2 Swing control

The swing mechanism shall start and stop with controlled acceleration and deceleration.

6.3 Swing braking means and locking device

A braking means with holding power in both directions shall be provided to restrict the movement of the rotating superstructure, when desired during normal operation. The braking means shall be capable of being applied in the holding position and remaining so without further action by the operator.

6.4 Swing locking pawl

A swing locking pawl or other device, such as a boom support, shall be provided to prevent the boom and superstructure from rotating when in transit or under out-of-service conditions. It shall be designed to prevent inadvertent engagement or disengagement. It shall be capable of withstanding a torque moment of at least 25 % above that torque required for holding the acting torque derived from out of service wind loads combined with any gradient inclination permitted by the manufacturer.

7 Crane travel requirements

7.1 Travel controls

On all crane types with a single control station, the controls for the travel function shall be located at the operator's station.

On all wheel-mounted multiple control station cranes, the travel controls shall be located in the carrier cabin. Auxiliary travel controls may also be provided in the crane cabin. If there is an operator in the crane cabin when the crane is travelling, appropriate means of communication (e.g. audible signals) shall be provided between the cabins unless driving is not possible simultaneously from both control stations and one of the control stations has priority over the other.

7.2 Travel mechanism

On crawler cranes, the travel and steering mechanism shall be arranged so that it is not possible for both crawlers to freewheel without operator control.

For mobile cranes adapted for railway use, when the travel mechanism must be temporarily deactivated in the normal course of the requirements of the user, provision shall be made to disengage the travel mechanism from the cabin or outside the crane body.

The steering system should be in accordance with ISO 5010.

7.3 Travel brakes and locks

On crawler cranes, brakes or other locking means shall be provided to hold the machine stationary during working cycles on a level grade or while the machine is standing on the maximum gradient recommended for travel. Such brakes or locks shall be arranged to remain in engagement in the event of loss of operating pressure or power.

For mobile cranes adapted for railway use, brakes shall be provided to bring the crane to a stop while descending the maximum gradient recommended for travel. In addition, manual brake engagement means shall be provided to hold the machine stationary on the maximum grade recommended for travel. Such means shall be arranged to remain in engagement in the event of loss of operating pressure or power.

On wheel-mounted cranes, means shall be provided to control completely the crane carrier travel when descending maximum gradients specified by the manufacturer under maximum loading conditions. Brakes shall be provided to bring the machine to a stop on level ground within a distance specified by national legislation. Where long or steep gradients are to be negotiated, a retarder or similar device should be provided. Means shall be provided to hold the machine stationary on the maximum grade for travel recommended by the manufacturer. Where travel brakes are operated by air pressure, means shall be provided for manually or automatically stopping the vehicle when the operating pressure falls below the specified minimum level.

Travel brakes should be in accordance with SAE J1977.

8 Service brakes

Linings for service brakes in all of the above functions shall not contain asbestos. The properties and coefficient of friction of the linings shall be suitable for their intended purpose during normal operation under the effect of atmospheric conditions and temperature fluctuations.