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Cranes — Design calculation for wheel/rail contacts and associated trolley track supporting structure

Part 1: General

Appareils de levage à charge suspendue — Calcul de conception des contacts galets/rails et de la structure ~~porteuse des rails~~ de support du chariot ~~—~~ de roulement —

Partie 1: Généralités

A model document of an International Standard (the Model International Standard) is available at: https://www.iso.org/drafting-standards.html

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directiveswww.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.htmlwww.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 10, *Design principles and requirements*.

This second edition cancels and replaces the first edition (ISO 16881-1:2005), which has been technically revised.

The main changes are as follows:

— — many improvements in Annex Bwere made to Annex B (local stresses);

— — new tables in Annex C forwere added to Annex C to cover American, Chinese, and Japanese steels.

A list of all parts in the ISO 16881 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.htmlwww.iso.org/members.html.

Introduction

This document 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 ~~will ensure fulfilment of~~ ensures that essential safety requirements are met and that the components have an adequate service life ~~of components.~~. Deviation from these rules ~~normally~~ can ~~lead to increased risks~~increase risk or ~~reduction of~~reduce service life~~, but it is acknowledged that~~. However, new technical innovations~~,~~ and materials~~, etc. can enable new~~ provide solutions that result in equal or improved safety and durability.

Cranes — Design calculation for wheel/rail contracts contacts and associated trolley track supporting structure — —

Part 1: General

1 Scope

This document gives the specifies requirements for the selection of selecting the size for of iron or steel wheels and. It also presents the formulae for the to determine local stresses in crane structures due to the effects of the wheel loads.

This document covers requirements for steel and cast-iron wheels and is applicable for. It applies to metallic contacts only.

This document does not apply to roller bearings.

This document is used together with the classification of the ISO 4301 series and the loads and load combinations of the ISO 8686 series.

ItThis document is based upon on the limit state method (see ISO 8686-1:2012).

This document is for design purposes only and. It is not a guarantee of actual performance.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 (all parts), *Cranes — Classification*

ISO 4302, *Cranes — Wind load assessment*

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

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 8686 (all parts), *Cranes — Design principles for loads and load combinations*

ISO 11031, *Cranes — Principles for seismically resistant design*

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

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

ISO 20332, *Cranes — Proof of competence of steel structures*

3 Terms and definitions

3.1 General

For the purposes of this document, the terms and definitions given in ISO 4306-1, ISO 12100 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

3.2 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations given in ~~Table 1~~Table 1 apply.

Table 1 — Symbols and abbreviations

Symbols, abbreviations	Description
b	~~Load~~load-bearing width
b_r, b_w	~~Effective~~effective contact widths of rail and wheel
D_w	~~Wheel~~wheel diameter
E_m	~~Equivalent~~equivalent modulus of elasticity
E_r	~~Modulus~~modulus of elasticity of the rail or track
E_w	~~Modulus~~modulus of elasticity of the wheel
F	~~Wheel~~wheel load
$F_{Rd,f}$	~~Limit~~limit design contact force for fatigue
$F_{Rd,s}$	~~Limit~~limit design contact force
$F_{Sd,f}$	~~Design~~design contact force for fatigue
$F_{Sd,f,i}$	~~Design~~design contact force in contact i
$F_{Sd,s}$	~~Design~~design contact force
F_u	~~Reference~~reference contact force
f_f	~~Factor~~factor of further influences in fatigue
f_{f1}	~~Decreasing~~decreasing factor for edge pressure in fatigue
f_{f2}	~~Decreasing~~decreasing factor for non-uniform pressure distribution in fatigue
f_{f3}	~~Decreasing~~decreasing factor for skewing in fatigue
f_{f4}	~~Materials~~materials factor in fatigue
f_{f5}	~~Decreasing~~decreasing factor for driven wheels in fatigue
f_y	~~Yield~~yield point
f_1	~~Decreasing~~decreasing factor for edge pressure
f_2	~~Decreasing~~decreasing factor for non-uniform pressure distribution
HBW	Brinell ~~Hardness~~hardness
HB*	~~Unit~~unit-consistent hardness
i	~~Index~~index of one rolling contact with ~~F_{Sd}~~$f_{sd,f,i}$