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Rolling bearings — Load ratings for hybrid bearings with rolling elements made of ceramic —

Part 1: Dynamic load ratings

Roulements — Charges de base pour roulements hybrides avec éléments roulants en céramique —

Partie 1: Charges dynamiques de base

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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/directives).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 8, *Load ratings and life*.

A list of all parts in the ISO 20056 series can be found on the ISO website.

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Introduction

Hybrid bearings are rolling bearings with raceways consisting of commonly used steel rolling bearings and rolling elements made from silicon nitride (for definitions, see ISO 5593). Due to the higher modulus of elasticity of the ceramic rolling elements, hybrid bearings have a noticeably smaller contact ellipse at the same load than rolling bearings with rolling elements made of rolling bearing steel. This will lead theoretically to a reduction of the dynamic load-carrying capacity.

In practice, hybrid bearings are used in numerous industrial applications, where these bearings show at least the same service life as conventional rolling bearings with steel rolling elements. Thus for the typical range of application of hybrid bearings, the theoretical reduction of the dynamic load rating is not observed in actual applications. The smaller contact ellipse and the material combination of ceramic-steel will lead to noticeably lower surface shear stress in the rolling contact, which again will lead to a higher load-carrying ability. This is reflected by defining a higher b_m factor compared to steel bearings, which compensates for the higher contact stress under the same load.

Therefore, the formulae specified in this document give the same dynamic load ratings as defined per ISO 281 for rolling bearings with identical internal geometry and rolling elements made of steel.

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Rolling bearings — Load ratings for hybrid bearings with rolling elements made of ceramic —

Part 1: Dynamic load ratings

1 Scope

This document specifies methods of calculating the dynamic load ratings for hybrid bearings with bearing rings made of contemporary, commonly used, high quality hardened bearing steel, in accordance with good manufacturing practice and rolling elements made from silicon nitride in contemporary, commonly used, high material and manufacturing quality and surface finish. For balls, ISO 26602[6] together with ISO 3290-2[2] are applicable. For rollers, ISO 12297-2[3] is applicable and ISO 26602[6] is applicable in an analogous way.

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 281, *Rolling bearings — Dynamic load ratings and rating life*

ISO 5593, *Rolling bearings — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5593 and ISO 281 apply.

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

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

— IEC Electropedia: available at http://www.electropedia.org/

4 Symbols

For the purpose of this document, the following symbols apply.

b_m	rating factor for contemporary, commonly used, high quality hardened bearing steel in accordance with good manufacturing practice, the value of which varies with bearing type and design
C_a	basic dynamic axial load rating, in N
C_r	basic dynamic radial load rating, in N
C_u	fatigue load limit, in N (see Annex A)
D_{pw}	pitch diameter of ball or roller set, in mm
D_w	nominal ball diameter, in mm

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