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Second edition
2017-02

Rolling bearings — Linear motion rolling bearings —

Part 1: Dynamic load ratings and rating life

Roulements — Roulements à mouvement linéaire —

Partie 1: Charges dynamiques de base et durée nominale

Reference number
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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols **7**
5 Basic dynamic load ratings **8**
5.1 Linear ball bearings 8
5.1.1 Recirculating linear ball bearings, sleeve type with raceway grooves 8
5.1.2 Recirculating linear ball bearings, sleeve type without raceway grooves 9
5.1.3 Recirculating linear ball bearings, linear guideway, carriage type 9
5.1.4 Non-recirculating linear ball bearings, linear guideway, deep groove and four-point-contact types 10
5.2 Linear roller bearings 11
5.2.1 Recirculating linear roller bearings, linear guideway, carriage type 11
5.2.2 Non-recirculating linear roller bearings, linear guideway, flat, V-angle and crossed roller types 11
6 Dynamic equivalent load **12**
7 Basic rating life **12**
Bibliography **14**

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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 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*.

This second edition cancels and replaces the first edition (ISO 14728-1:2004), of which it constitutes a minor revision with the following changes:

— improvement of Figures 2, 4, 8 and 9;

— correction of terms and definitions (change of ball/roller guide systems to linear ball/roller bearings);

— correction of font (ϕ changed to φ);

— alignment with the latest drafting rules.

A list of parts in the ISO 14728 series can be found on the ISO website.

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Introduction

It is often impractical to establish the suitability of a linear motion rolling bearing selected for a specific application by testing. The following procedures have proved to be an appropriate and convenient substitute for testing:

— life calculation with dynamic load (ISO 14728-1);

— static load safety factor calculation with static load (ISO 14728-2).

The life of a linear motion bearing is given by the distance which one of the raceways moves, in relation to the other raceway, before the first evidence of fatigue develops in the material of one of the raceways or one of the rolling elements.

The formulae for calculating the basic dynamic load ratings are derived from the theory of Lundberg[7] and Palmgren[8].

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Rolling bearings — Linear motion rolling bearings —

Part 1:
Dynamic load ratings and rating life

1 Scope

This document specifies methods of calculating the basic dynamic load rating and basic rating life for linear motion rolling bearings manufactured from contemporary, commonly used, high quality, hardened bearing steel in accordance with good manufacturing practice and basically of conventional design as regards the shape of the rolling contact surfaces. The life of linear motion rolling bearings is defined and the conditions are established for reliable life calculations.

This document is not applicable to designs where the rolling elements operate directly on the slide surface of the machine equipment, unless that surface is equivalent in all respects to the raceway of the linear motion rolling bearing component it replaces.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
recirculating linear ball bearing, sleeve type, with or without raceway grooves
basically cylindrical sleeve provided with a number of closed loops of recirculating balls designed to achieve linear rolling motion along a hardened cylindrical shaft

Note 1 to entry: See Figure 1.

Note 2 to entry: The raceways in the sleeve can be designed cylindrical as well as steel inserts with raceway grooves parallel to the axis.

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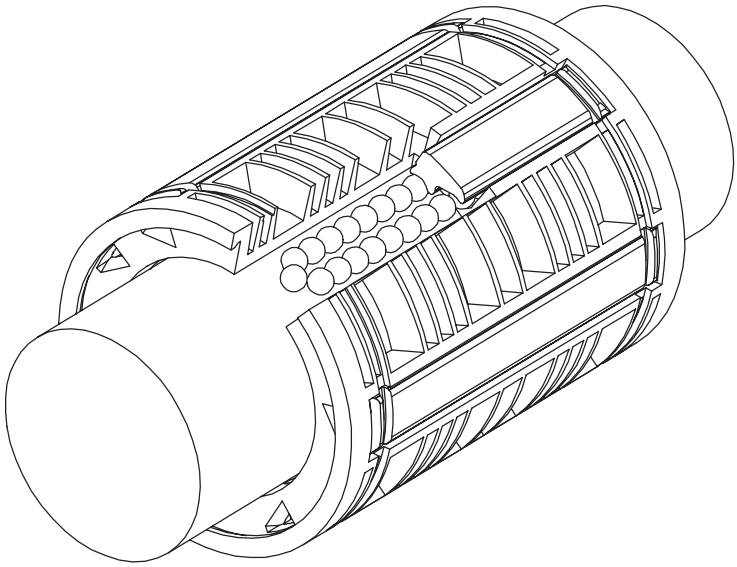


Figure 1 — Recirculating linear ball bearing, sleeve type

3.2
recirculating linear ball (or roller) bearing, linear guideway, carriage type
linear ball (or roller) bearing provided with a number of symmetrically arranged, closed loops of recirculating balls (or rollers) designed to achieve linear rolling motion along a hardened guideway furnished with adequate raceways

Note 1 to entry: See Figure 2.

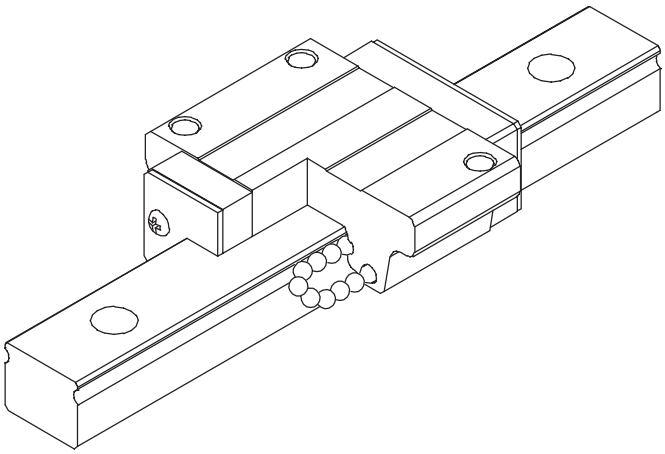


Figure 2 — Recirculating linear ball (or roller) bearing, linear guideway, carriage type

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3.3
non-recirculating linear ball bearing, linear guideway, deep groove type
linear bearing with balls as rolling elements, each ball having two points of contact

Note 1 to entry: See Figure 3.

Note 2 to entry: The cross-sectional radii of the raceway grooves in the two guideways are equal and may lie between 0,52 D_w and infinity.

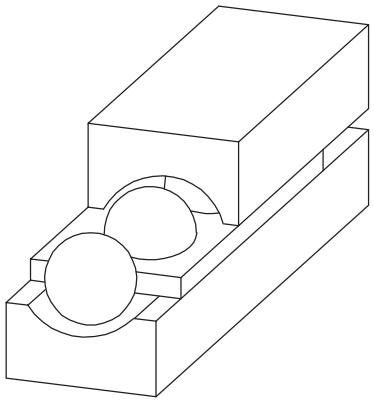


Figure 3 — Non-recirculating linear ball bearing, linear guideway, deep groove type

3.4
non-recirculating linear ball bearing, linear guideway, four-point-contact type
linear bearing with balls as rolling elements, each ball having four points of contact

Note 1 to entry: See Figure 4.

Note 2 to entry: The cross-sectional radii of the raceway grooves for the four points of contact in the two guideways are equal and may lie between 0,52 D_w and infinity.

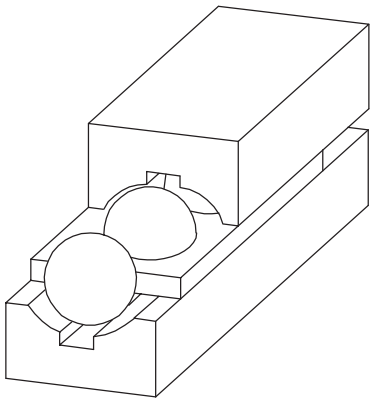


Figure 4 — Non-recirculating linear ball bearing, linear guideway, four-point-contact type

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3.5
non-recirculating linear roller bearing, linear guideway, flat type
linear bearing with needle rollers or cylindrical rollers as rolling elements

Note 1 to entry: See Figure 5.

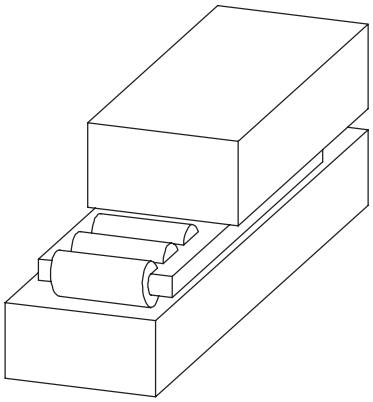


Figure 5 — Non-recirculating linear roller bearing, linear guideway, flat type

3.6
non-recirculating linear roller bearing, linear guideway, V-angle type
linear bearing with guideways designed as parts of a V with a 90° angle

Note 1 to entry: See Figure 6.

Note 2 to entry: Needle rollers or cylindrical rollers are used as rolling elements.

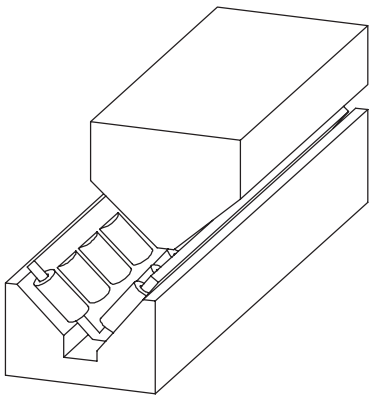


Figure 6 — Non-recirculating linear roller bearing, linear guideway, V-angle type

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3.7
non-recirculating linear roller bearing, linear guideway, crossed roller type
linear bearing with cylindrical rollers arranged in a crossed roller construction

Note 1 to entry: See Figure 7.

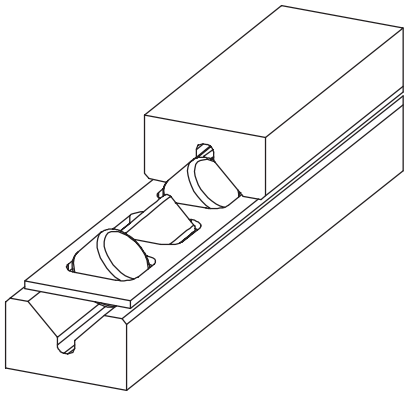


Figure 7 — Non-recirculating linear roller bearing, linear guideway, crossed roller type

3.8
life
<for an individual linear motion rolling bearing> distance one of the raceways moves in relation to the other raceway before the first evidence of fatigue develops in the material of one of the raceways or one of the rolling elements

3.9
reliability
<for a group of apparently identical linear motion rolling bearings operating under the same conditions> percentage of the group that is expected to attain or exceed a specified life

Note 1 to entry: The reliability of an individual linear motion rolling bearing is the probability that the bearing will attain or exceed a specified life.

3.10
basic rating life
<for an individual linear motion rolling bearing or a group of apparently identical linear motion rolling bearings operating under the same conditions> life associated with 90 % reliability, with contemporary, commonly used material and manufacturing quality and under conventional operating conditions

3.11
basic dynamic load rating of a linear motion rolling bearing
constant stationary load that a linear motion rolling bearing could theoretically endure for a basic rating life of 10^5 m

Note 1 to entry: If a basic rating life of 5×10^4 m is used to define the basic dynamic load rating, then a conversion factor should be used as shown below:

— for basic dynamic load rating of linear ball bearings:

$$C_{100\mathrm{B}} = \frac{C_{50\mathrm{B}}}{1,26}$$

— for basic dynamic load rating of linear roller bearings:

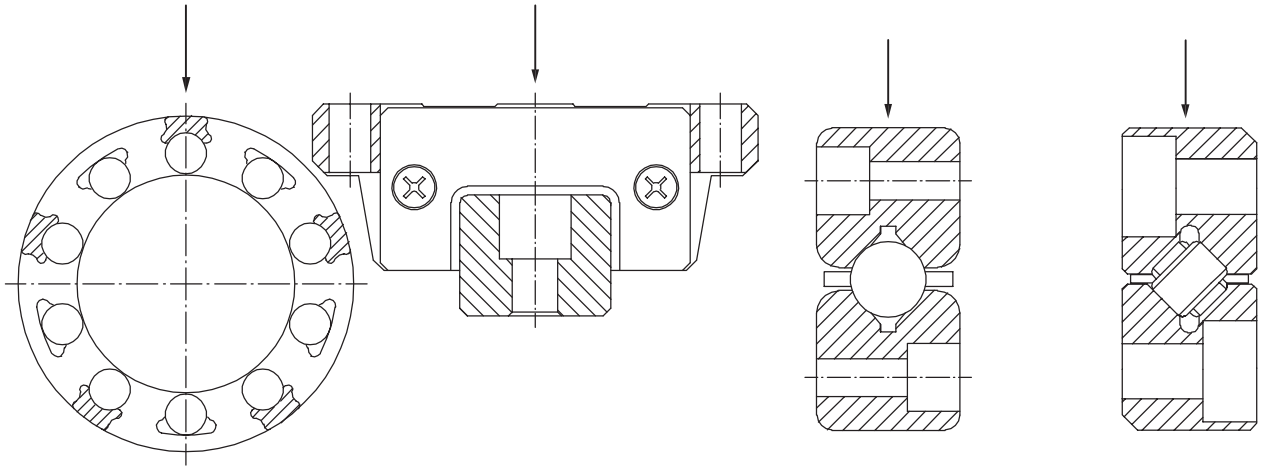
$$C_{100\mathrm{R}} = \frac{C_{50\mathrm{R}}}{1,23}$$

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3.12
dynamic equivalent load
constant stationary load under the influence of which a linear motion rolling bearing would have the same life as it would attain under the actual load conditions

3.13
direction of load
direction of load applied for load rating calculation

Note 1 to entry: For calculation of basic dynamic load ratings, the direction of the load is defined for all linear motion bearings as shown by the arrows in Figure 8.



Rolling bearing defined in			
3.1	3.2	3.4	3.7

Figure 8 — Direction of load

3.14
pitch diameter
<of recirculating linear ball bearing, sleeve type> diameter of the circle containing the centres of the balls in contact with the raceways, in a plane perpendicular to the bearing axis

3.15
nominal contact angle
angle between the direction of load on the linear bearing and the nominal line of action of the resultant of the forces transmitted by a bearing raceway member to a rolling element

Note 1 to entry: See Figure 9.

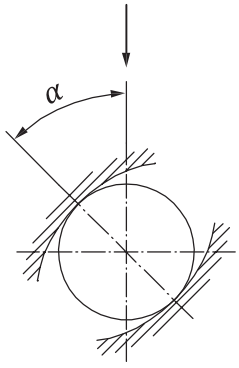


Figure 9 — Nominal contact angle

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