

---

---

**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*  
**(standards.iteh.ai)**

[ISO 14728-1:2004](https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004)

<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 14728-1:2004](#)

<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

© ISO 2004

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

**Contents**

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Symbols</b> .....	<b>7</b>
<b>5 Basic dynamic load ratings</b> .....	<b>8</b>
<b>5.1 Linear ball bearings</b> .....	<b>8</b>
<b>5.2 Linear roller bearings</b> .....	<b>11</b>
<b>6 Dynamic equivalent load</b> .....	<b>12</b>
<b>7 Basic rating life</b> .....	<b>12</b>
<b>Bibliography</b> .....	<b>14</b>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 14728-1:2004](#)

<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

## 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.

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 14728-1 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 8, *Load ratings and life*.

ISO 14728 consists of the following parts, under the general title *Rolling bearings — Linear motion rolling bearings*:

- *Part 1: Dynamic load ratings and rating life* [ISO 14728-1:2004](https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004)
- *Part 2: Static load ratings* <https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

## 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<sup>[1]</sup> and Palmgren<sup>[2]</sup>.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 14728-1:2004](https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004)

<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 14728-1:2004

<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

# Rolling bearings — Linear motion rolling bearings —

## Part 1: Dynamic load ratings and rating life

### 1 Scope

This part of ISO 14728 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 part of ISO 14728 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.

iTeh STANDARD PREVIEW

### 2 Normative references (standards.iteh.ai)

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 281:1990, *Rolling bearings — Dynamic load ratings and rating life*

ISO 5593:1997, *Rolling bearings — Vocabulary*

ISO 15241:2001, *Rolling bearings — Symbols for quantities*

### 3 Terms and definitions

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

#### 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

See Figure 1.

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

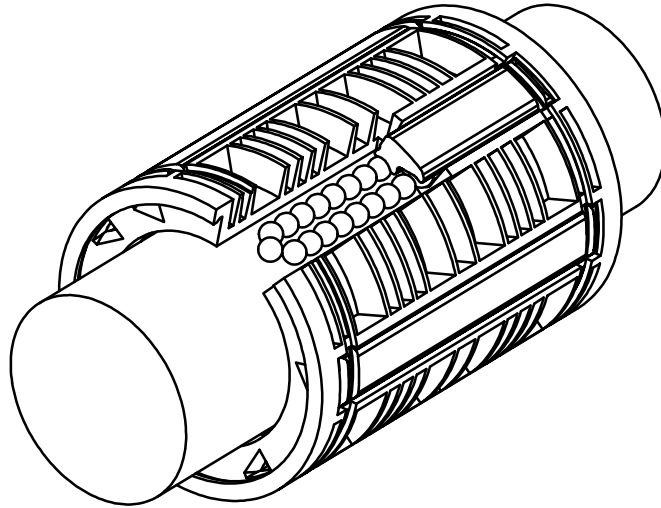


Figure 1 — Recirculating linear ball bearing, sleeve type

**3.2**  
**recirculating linear ball [roller] bearing, linear guideway type**

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

(standards.iteh.ai)

See Figure 2.

ISO 14728-1:2004  
<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

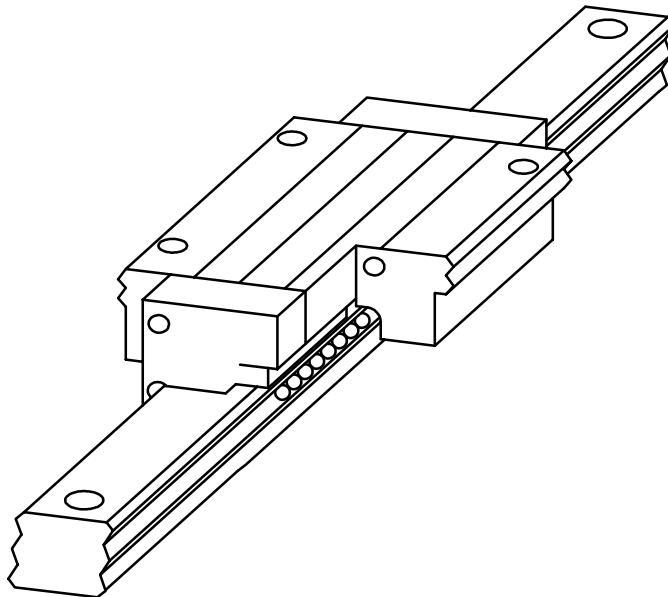


Figure 2 — Recirculating linear ball [roller] bearing, linear guideway type



**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

See Figure 3.

NOTE The cross-sectional radii of the raceway grooves in the two guideways are equal and may lie between  $0,52 D_w$  and infinity.

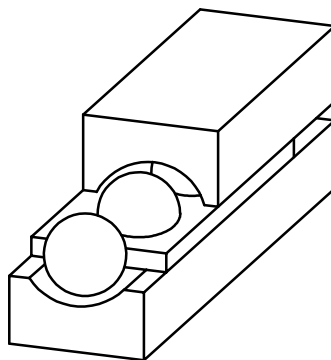


Figure 3 — Non-recirculating linear ball bearing, linear guideway, deep groove type

**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

See Figure 4.

NOTE 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.

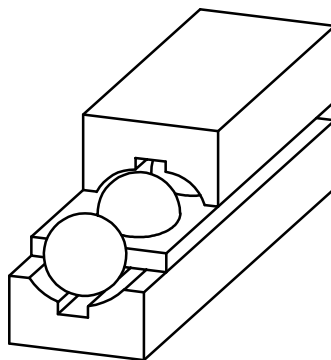


Figure 4 — Non-recirculating linear ball bearing, linear guideway, four-point-contact type

**3.5****non-recirculating linear roller bearing, linear guideway, flat type**

linear bearing with needle rollers or cylindrical rollers as rolling elements

See Figure 5.

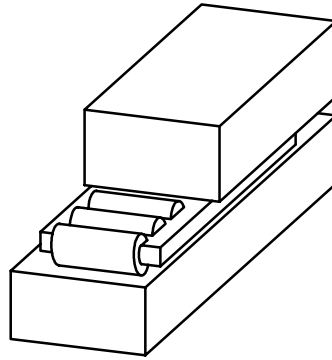


Figure 5 — Non-recirculating linear roller bearing, linear guideway, flat type

**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

See Figure 6.

NOTE Needle rollers or cylindrical rollers are used as rolling elements.

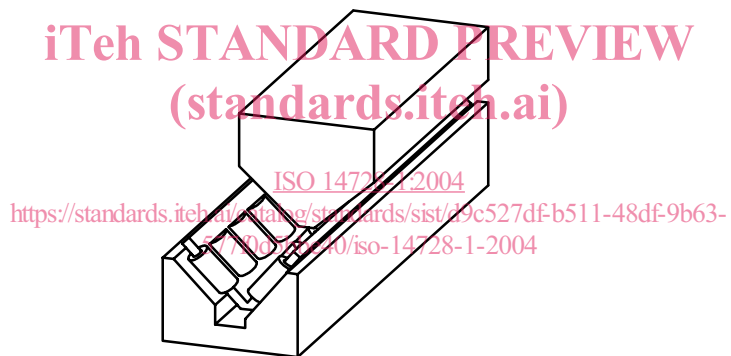


Figure 6 — Non-recirculating linear roller bearing, linear guideway, V-angle type

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

See Figure 7.

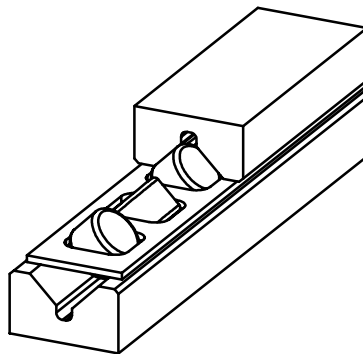


Figure 7 — Non-recirculating linear roller bearing, linear guideway, crossed roller type

**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 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 If a basic rating life of  $5 \times 10^4$  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 ball guided systems:

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

ISO 14728-1:2004  
<https://standards.iteh.ai/catalog/standards/sist/d9c527df-b511-48df-9b63-577f0d5bbe40/iso-14728-1-2004>

— for basic dynamic load rating of roller guided systems:

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

**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 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.