

Specification for

Static load ratings for rolling bearings

[ISO title: Rolling bearings — Static load ratings]

ICS 21.100.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Machinery and Components Standards Committee (MCE/-) to Technical Committee MCE/7, upon which the following bodies were represented:

- Advanced Manufacturing Technology Research Institute
- Ball and Roller Bearing Manufacturers' Association
- Engineering Equipment and Materials Users' Association
- Institution of Mechanical Engineers
- Institution of Production Engineers
- Ministry of Defence
- North East Coast Institution of Engineers and Shipbuilders
- Society of British Aerospace Companies Limited

This British Standard, having been prepared under the direction of the Machinery and Components Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 September 1987

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First published October 1978
First revision September 1987

The following BSI references relate to the work on this standard:
Committee reference MCE/7
Draft for comment 86/70516 DC

ISBN 0 580 16140 4

Amendments issued since publication

Amd. No.	Date of issue	Comments
10879	July 2000	
13259 Tech Corr. No. 1	July 2001	Indicated by a sideline

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National foreword

This British Standard has been prepared under the direction of the Machinery and Components Standards Committee and supersedes BS 5645:1978 which is withdrawn. It is identical with the revised International Standard ISO 76:1987 *“Rolling bearings — Static load ratings”* prepared by Technical Committee ISO/TC 4, *Rolling bearings*, of the International Organization for Standardization (ISO). The standard is one of a series implementing corresponding international standards in the development of which the United Kingdom has played an active part.

As compared with the previous edition, this revision of BS 5645 introduces factors which depend on the geometry of the bearing components and on the applicable stress level. The formulae and factors for the calculation of the basic static load ratings are based on contact stresses for different types of bearing derived from tests carried out in various countries.

The standard is a companion to BS 5512 *“Specification for rolling bearings — Dynamic load ratings and rating life” — Part 1: “Calculation methods”* which is identical with ISO 281/1:1977.

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

Wherever the words “international standard” appear, referring to this standard, they should be read as “British Standard”.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Foreword to ISO 76:1987/Amd 1:1999

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.

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.

Amendment 1 to ISO 76:1987 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 8, *Load ratings and life*. It constitutes a possibility of more accurately calculating and comparing static load ratings for radial and thrust angular contact ball bearings.

Amendment 1 to ISO 76:1987 comprises Annex A to ISO 76:1987 and is for information only.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 11 and a back cover.

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Sidelining in this document indicates the most recent changes by amendment.

Introduction

Permanent deformations appear in rolling elements and raceways of rolling bearings under static loads of moderate magnitude and increase gradually with increasing load.

It is often impractical to establish whether the deformations appearing in a bearing in a specific application are permissible by testing the bearing in that application. Other methods are therefore required to establish the suitability of the bearing selected.

Experience shows that a total permanent deformation of 0,000 1 of the rolling element diameter, at the centre of the most heavily loaded rolling element/raceway contact, can be tolerated in most bearing applications without the subsequent bearing operation being impaired. The basic static load rating is, therefore, given a magnitude such that approximately this deformation occurs when the static equivalent load is equal to the load rating.

Tests in different countries indicate that a load of the magnitude in question may be considered to correspond to a calculated contact stress of:

- 4 600 MPa¹⁾ for self-aligning ball bearings,
- 4 200 MPa for all other ball bearings, and
- 4 000 MPa for all roller bearings,

at the centre of the most heavily loaded rolling element/raceway contact. The formulae and factors for the calculation of the basic static load ratings are based on these contact stresses.

The permissible static equivalent load may be smaller than, equal to or greater than the basic static load rating, depending on the requirements for smoothness of operation and friction, as well as on actual contact surface geometry. Bearing users without previous experience of these conditions should consult the bearing manufacturers.

1 Scope and field of application

This international standard specifies methods of calculating the basic static load rating and the static equivalent load for rolling bearings within the size ranges shown in the relevant international standards, manufactured from good quality hardened steel, in accordance with good manufacturing practice and basically of conventional design as regards the shape of rolling contact surfaces.

Calculations carried out in accordance with this international standard do not yield satisfactory results for bearings in which, because of application conditions and/or because of internal design, there is a considerable truncation of the area of contact between the rolling elements and the ring raceways. The same limitation applies where application conditions cause deviations from a normal load distribution in the bearing, for example misalignment, preload or extra large clearance. Where there is reason to assume that such conditions prevail, the user should consult the bearing manufacturer for recommendations and evaluation of static equivalent load.

This international standard is not applicable to designs where the rolling elements operate directly on a shaft or housing surface, unless that surface is equivalent in all respects to the bearing surface it replaces.

Double-row radial bearings and double-direction thrust bearings are, when referred to in this international standard, presumed to be symmetrical.

2 Definitions

For the purposes of this international standard, the following definitions apply.

2.1

static load

the load acting on a bearing when the speed of rotation of its rings in relation to each other is zero

¹⁾ 1 MPa = 1 N/mm²