

ICS 21.100.20

CCS J 11



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24611-2020

Replacing GB/T 24611-2009

**Rolling bearings - Damage and failures - Terms, characteristics
and causes**

Issued on: November 19, 2020

Implemented on: June 1, 2021

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Failure mode classification of rolling bearings	2
5 Failure mode	3
5:1 Rolling contact fatigue	3
5:2 Wear	6
5:3 Corrosion	8
5:4 Electric erosion	11
5:5 Plastic deformation	12
5:6 Cracks and fractures	15
Appendix A (informative appendix) Failure analysis, damage legend, explanation of other survey terms	18
Reference	45

Foreword

This standard was drafted in accordance with the rules given in GB/T 1:1-2009:

This standard replaces GB/T 24611-2009 "Rolling bearing damage and failure terms, characteristics and causes", and GB/T 24611-

Compared with:2009, the main technical changes are as follows:

---Clarified the scope (see Chapter 1, Chapter 1 of the:2009 edition);

---Replaced most of the photos and drawings (see the text and Appendix A, the text of the:2009 edition and Appendix A);

---Expanded and revised terms and definitions (see Chapter 3 and A:4, Chapter 3 and A:3 of the:2009 edition);

---Modified the name of the sub-mode "Excessive Voltage" of the "Electro-Erosion" failure mode (see 5:4:2, 5:4:2 of the:2009 edition);

---The damage analysis system program (see Table A:1) and other investigations (see A:3) have been added; the damage cause matrix table has been expanded (see Table A:2,

Table A:1 of the:2009 edition);

--- "Causes of failure and preventive measures" added a large number of examples (see A:2,:2009 edition of A:2):

The translation method used in this standard is equivalent to ISO 15243:2017 "Terms, Features and Causes of Damage and Failure of Rolling Bearings":

The Chinese documents that have a consistent correspondence with the international documents cited in this standard are as follows:

---GB/T 6930-2002 rolling bearing vocabulary (ISO 5593:1997, IDT)

This standard was proposed by China Machinery Industry Federation:

This standard is under the jurisdiction of the National Standardization Technical Committee for Rolling Bearings (SAC/TC98):

Drafting organizations of this standard: Luoyang Bearing Research Institute Co., Ltd., Zhejiang Zhaofeng Mechanical and Electrical Co., Ltd., Renben Group Co., Ltd., Zhejiang Wuzhou Xinchun Group Co., Ltd., Cixing Group Co., Ltd., Xiangyang Automobile Bearing Co., Ltd., Chongqing Changjiang Bearing Co., Ltd:

Company, Shanghai United Rolling Bearing Co., Ltd., Fujian Yongan Bearing Co., Ltd., Shanghai Tianhong Miniature Bearing Co., Ltd., Hangzhou Chi

Chuangshayan Technology Co., Ltd., Jem Bearing Group Co., Ltd:

Introduction

In fact, bearing damage or failure is often the result of several mechanisms acting simultaneously: Failure may be due to transportation, handling, installation or

Caused by improper maintenance, or because the processing quality of the bearing or its adjacent parts does not meet the design requirements: In some cases, failure

It may also be caused by a compromise design that takes into account economic benefits, unforeseen operating conditions and environmental conditions: Due to bearing

Failure is caused by many factors such as design, manufacturing, installation, operation, maintenance, etc: Therefore, it is often very difficult to determine the root cause of failure:

hard:

Note: Attention should be paid to counterfeit bearings circulating in the market: Counterfeit bearings may look like original bearings, but their use often leads to premature damage or failure:

If the bearing is severely damaged or fails suddenly, the evidence may be lost and it is impossible to determine the root cause of the failure: Therefore, shut down in time

It is very important to be prepared for proper bearing damage analysis (see Figure 1): In all cases, understand the actual operating conditions of the bearing and

Maintaining history is crucial:

Note: It begins to peel off immediately after the indentation of the raceway (a); after a period of time, the peeling increases (b, c); if the machine is not shut down in time, the evidence of the root cause of the peeling occurs

Will disappear (d):

Figure 1 Example of bearing damage progression

The classification of bearing failure in this standard is mainly based on the features visible on the contact surface of the rolling elements and other functional surfaces: For accuracy

To determine the root cause of bearing failure, each feature needs to be considered: Since more than one mechanism can cause phases on these surfaces

Therefore, when determining the cause of failure, it is sometimes insufficient to describe only the appearance: At this time, operating conditions need to be considered:

In some cases, if the analyzed damage is too severe and may originate from different main causes, in these cases, look for simultaneous out

There are multiple signs to determine the main cause of failure:

This standard covers bearings with steel rings and rolling elements: Ring damage of ceramic rolling element bearings shows similar failure modes:

In this standard, the bearing life is as described in ISO 281 [1], and ISO 281 gives the calculation formula for bearing life, which takes into account many factors, such as

Bearing capacity, bearing load, bearing type, material, bearing fatigue load limit, lubrication conditions and pollution degree:

Damage and failure of rolling bearings

Terms, characteristics and reasons

1 Scope

This standard classifies the failure modes of rolling bearings made of standard bearing steel in use: For each failure mode

The characteristics, appearance changes and possible root causes are defined and described, which helps to identify various failure modes based on appearance:

For this standard, the following terms are explained as follows:

---"Rolling bearing failure": The bearing cannot meet the predetermined design performance

requirements or sign the end of its service life due to damage;

---"In use": The bearing leaves the manufacturing plant;

---"Visible features": Features that can be observed directly visually or with a magnifying glass or optical microscope, or from photos, but they can only

It is a feature obtained using a lossless method:

This standard only covers characteristic shapes that have a clear appearance and can be attributed to a specific reason with a high degree of certainty:

The formula and failure modes are considered, and the particularly important characteristics that reflect bearing changes and failures are described: Photos for various failure modes

And chart description, and gives the most common reasons:

If the root cause cannot be reliably determined through the inspection and the characteristic description of the visible characteristics given in this standard, then consideration should be given to

Conduct additional investigations: These methods are summarized in A:3 of Appendix A: For example, they may involve the use of destructive methods to obtain cross-sections:

Optical microscope or electron microscope for metallographic analysis and chemical and spectral analysis: These professional methods are beyond the standard

range:

Generally, it is recommended to use the failure mode terminology given in the title of the article, and other suitable expressions or synonyms to describe its sub-modes

It is given and explained in A:4:

Examples of failures of rolling bearings, descriptions of failure causes, and suggested improvement measures are given in A:2:

2 Normative references

The following documents are indispensable for the application of this document: For dated reference documents, only the dated version applies to this article

Pieces: For undated references, the latest version (including all amendments) applies to this document:

ISO 5593 rolling bearing vocabulary (Rollingbearings-Vocabulary)

3 Terms and definitions