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

GB/T 42539-2023

**Rolling bearings - Ceramic bearings balls - Determination of the
strength by notched ball test**

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foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standardization Documents"

drafting:

This document is equivalent to ISO 19843:2018 "Determination of Strength of Ceramic Balls for Rolling Bearings (Notched Ball Test)":

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

To determine the strength of a part, test specimens are usually specially prepared and subjected to a bend test:

The measured value of the standard sample in the ceramic bending test can only be converted into the measured value of the common sample under limited conditions:

Since the surface accuracy of the ceramic ball is not changed, the notched ball test can be used as a part test for quality control: In addition, the processing and

The impact of usage can also be quantified:

This test is applicable to process improvement and material research and development, quality assurance, description and selection of material characteristics, and determination of design parameters: ceramics

The determination of the ball strength value is carried out under the following conditions:

- a) the material has linear elasticity (stress-strain relationship);
- b) The material is homogeneous and isotropic:

This test is carried out in a laboratory with precision processing equipment, measuring instruments and testing machines: The processing of the notch and the measurement of

parameters are performed by experienced

Rich operators do it carefully:

Ceramic balls for rolling bearings

Strength determination (notched ball test)

1 Scope

This document specifies the method for measuring the strength of finished ceramic balls for bearings with a ball diameter of 3 mm to 50 mm: Silicon nitride is preferred for ceramic balls (Si₃N₄) made:

Note 1: The requirements for pretreated ceramic ball silicon nitride materials are given in ISO 26602: The requirements for finished silicon nitride ceramic balls are given in ISO 3290-2:

Note 2: See references for other ceramic ball strength determination methods:

Poisson's ratio has a slight influence on the results of the strength test, so in the calculation, the typical silicon nitride ceramics used as bearing rolling elements are included in the

The Poisson's ratio of the materials used ranged from 0.15 to 0.35:

This test can also be used for ceramic balls made of other ceramic materials, but the previous coefficients in this document may not apply:

Note 3: The method for determining the Poisson's ratio of isotropic materials is given in ISO 17561:

Due to the brittle fracture properties of ceramic materials (affected by imperfections), test results may scatter significantly for a set of nominally identical samples:

Note 4: Further statistical analysis methods are given in ISO 20501:

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text: Among them, dated references

For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

this document:

ISO 463 Geometric product specification (GPS) Design and metrological characteristics of mechanical indicating gauges for dimensional measuring equipment

Note: GB/T 39547-2020 Design and metrological characteristics of mechanical indicators (ISO 463:2006, IDT)

ISO 3290-2 Rolling bearing balls Part 2: Ceramic balls (Rollingbearings-Balls-Part 2: Ceramicballs)

Note: GB/T 308:2-2010 Rolling bearing balls Part 2: Ceramic balls (ISO 3290-2:2008, IDT)

ISO 3611 Geometric product specification (GPS) Dimensional measuring equipment: Design and metrological characteristics of external micrometers [Geomet-

Note: GB/T 6406-2016 Superabrasive particle size inspection (ISO 6106:2013, MOD)

ISO 7500-1:2018 Inspection of static uniaxial testing machines for metallic materials - Part 1: Force measurement by tensile and/or compressive testing machines

machines-Part 1: Tension/compression testing machines-Calibration and verification of the force-measuring system)

Note: GB/T 16825:1-2008 Inspection of static uniaxial testing machines - Part 1: Inspection and calibration of force measuring systems of tensile and (or) compressive testing machines

(ISO 7500-1:2004, IDT)

ISO 20501 Weibull statistical analysis method for strength data of fine ceramics (advanced ceramics, advanced technical ceramics) [Fine

Note: GB/T 40005-2021 Weibull statistical analysis method for strength data of fine ceramics (ISO 20501:2019, MOD)