



**SLOVENSKI STANDARD**  
**SIST ISO 3290-2:2015**

**01-april-2015**

**Nadomešča:**  
**SIST ISO 3290-2:2009**

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**Kotalni ležaji - Kroglice - 2. del: Keramične kroglice**

Rolling bearings - Balls - Part 2: Ceramic balls

**iTeh STANDARD PREVIEW**  
Roulements - Billes - Partie 2: Billes de roulement en céramique  
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STANDARD

ISO  
3290-2

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2014-09-01

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**Rolling bearings — Balls —  
Part 2:  
Ceramic balls**

*Roulements — Billes —*

*Partie 2: Billes de roulement en céramique*

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## ISO 3290-2:2014(E)

## 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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 4, *Rolling bearings*, Subcommittee SC 12, *Ball bearings*.

This second edition cancels and replaces the first edition (ISO 3290-2:2008), which has been technically revised.

ISO 3290 consists of the following parts, under the general title *Rolling bearings — Balls*:

- *Part 1: Steel balls*
- *Part 2: Ceramic balls*

# Rolling bearings — Balls —

## Part 2: Ceramic balls

### 1 Scope

This part of ISO 3290 specifies requirements for finished silicon nitride balls for rolling bearings.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1132-1, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO 5593, *Rolling bearings — Vocabulary*

ISO 12181-1, *Geometrical product specifications (GPS) — Roundness — Part 1: Vocabulary and parameters of roundness*

ISO 15241, *Rolling bearings — Symbols for physical quantities*

ISO 26602, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Silicon nitride materials for rolling bearing balls*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1132-1, ISO 5593, and the following apply.

#### 3.1

##### **ball gauge**

amount by which the mean diameter of ball lot should differ from the nominal ball diameter, this amount being one of an established series

Note 1 to entry: Each ball gauge is a whole multiple of the ball gauge interval established for the ball grade in question.

Note 2 to entry: A ball gauge, in combination with the ball grade and nominal diameter, is considered as the most exact ball size specification to be used by a customer for ordering purposes.

[SOURCE: ISO 5593:1997, 05.04.09, modified — Note 1 and Note 2 to entry have been added.]

#### 3.2

##### **ball gauge interval**

absolute difference of two consecutive ball gauges

**ISO 3290-2:2014(E)****3.3****ball grade**

specific combination of dimensional, form, surface roughness, and sorting tolerances for balls

Note 1 to entry: Ball grade is identified by the letter G and a number, e.g. G 20.

[SOURCE: ISO 5593:1997, 05.04.08, modified — Note 1 to entry has been added.]

**3.4****ball lot**

definite quantity of balls manufactured under conditions presumed uniform and which is considered as an entity

[SOURCE: ISO 5593:1997, 05.04.05]

**3.5****ball subgauge**

amount of an established series of amounts, which is the nearest to the actual deviation from the ball gauge of a ball lot

Note 1 to entry: Each ball subgauge is a whole multiple of the ball subgauge interval established for the ball grade in question.

Note 2 to entry: The ball subgauge, in combination with the nominal ball diameter and the ball gauge, is used by ball manufacturers to denote the mean diameter of a ball lot and is not generally used by customers for ordering purposes.

[SOURCE: ISO 5593:1997, 05.04.11, modified — Notes 1 and 2 to entry have been added.]

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**3.6****ball subgauge interval**

absolute difference of two consecutive ball subgauges

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**3.7****deviation from spherical ball surface**

various types of deviation from the perfect spherical ball surface, uniformly or non-uniformly distributed and repeated around the ball surface

Note 1 to entry: The deviations to which limits can be attributed to are

- deviation from spherical form,
- surface defect,
- surface roughness, and
- waviness.

**3.7.1****deviation from spherical form**

radial distance between the smallest circumscribed sphere and the greatest inscribed sphere, with their centres common to the least squares sphere centre

Note 1 to entry: This definition supersedes ISO 5593:1997, 05.06.03.

**3.7.2****surface defect**

element, irregularity, or group of elements and irregularities of the real surface, unintentionally or accidentally caused during manufacture, storage, handling, or use of the surface

Note 1 to entry: These types of element or irregularity differ considerably from those constituting the surface roughness and are not considered during the measurement of the surface roughness.

Note 2 to entry: The limits for surface defects are not specified in this part of ISO 3290.



**3.7.3****surface roughness**

surface irregularities with relatively small spacings, which usually include irregularities resulting from the method of manufacture being used and/or other influences

Note 1 to entry: These irregularities are considered within the limits that are conventionally defined, e.g. within the limits of the sampling length.

**3.7.4****waviness**

surface irregularities of random or periodical deviation from the ideal spherical form

Note 1 to entry: Waviness shall be evaluated by default as velocity amplitude.

Note 2 to entry: In practice, the waviness components are separated from the real surface by a waviness analyser (filters).

**3.8****deviation of a ball lot from ball gauge**

difference between the mean diameter of a ball lot and the sum of the nominal ball diameter and the ball gauge

[SOURCE: ISO 5593:1997, 05.04.10]

**3.9****hardness**

<rolling bearings> measure of resistance to penetration as determined by a specific test method

Note 1 to entry: For ceramics balls, such a test method is the Vickers hardness test.

**3.10****mean ball diameter**

arithmetical mean of the largest and the smallest of the single diameters of a ball

[SOURCE: ISO 5593:1997, 05.04.03]

**3.11****mean diameter of ball lot**

arithmetical mean of the mean diameters of the largest ball and the smallest ball in a ball lot

[SOURCE: ISO 5593:1997, 05.04.06]

**3.12****nominal ball diameter**

diameter value which is used for the general identification of a ball size

[SOURCE: ISO 5593:1997, 05.04.01]

**3.13****single ball diameter**

distance between two parallel planes tangential to the actual surface of a ball

[SOURCE: ISO 5593:1997, 05.04.02]

**3.14****variation of ball diameter**

difference between the largest and the smallest of the single diameters of a ball

[SOURCE: ISO 5593:1997, 05.04.04]

**ISO 3290-2:2014(E)****3.15****variation of ball lot diameter**

difference between the mean diameters of the largest ball and the smallest ball in a ball lot

[SOURCE: ISO 5593:1997, 05.04.07]

**4 Symbols**

For the purposes of this document, the symbols given in ISO 15241 and the following apply.

The symbols (except those for tolerances) and the values given in [Table 1](#), [Table 2](#), and [Table 3](#) denote nominal dimensions, unless specified otherwise.

|                |  |
|----------------|--|
| $D_w$          | nominal ball diameter  |
| $D_{wm}$       | mean ball diameter   |
| $D_{wmL}$      | mean diameter of ball lot  |
| $D_{ws}$       | single ball diameter   |
| G              | ball grade   |
| $R_a$          | arithmetical mean deviation of surface texture (see ISO 4287[4]) |
| S              | ball gauge   |
| $V_{DwL}$      | variation of ball lot diameter                                   |
| $V_{Dws}$      | variation of ball diameter                                       |
| $\Delta_{RSw}$ | deviation from spherical form                                    |
| $\Delta_S$     | deviation of a ball lot from a ball gauge                        |

NOTE  $\Delta_S = D_{wmL} - (D_w + S)$

**5 Requirements****5.1 Ball size**

The preferred nominal ball diameters are given in [Table 1](#) and, where applicable, the corresponding inch sizes are given for reference purposes only.

**5.2 Quality of geometry and surface**

Requirements for:

- variation of ball diameter (see [Table 2](#));
- deviation from spherical form, (see [Table 2](#));
- waviness (see Note 1);
- surface roughness (see [Table 2](#));
- surface appearance (see Note 2 and Note 3).

Measurement of surface roughness shall be carried out in accordance with ISO 4288.

NOTE 1 Limits and measuring methods for waviness are subject to agreement between the customer and supplier.

NOTE 2 Local inhomogeneities in colour, densification, pressing defects, snowflakes, etc. and cracks inherent to the material and its processing are subject to agreement between the customer and supplier.

NOTE 3 Local defects originating from machining and handling are subject to agreement between the customer and supplier.

### 5.3 Sorting accuracy and ball gauges

[Table 3](#) comprises the applicable values for

- variation of ball lot diameter,
- gauge interval,
- preferred gauges,
- subgauge interval, and
- subgauges.

## 6 Material

The balls shall be manufactured from silicon nitride material in accordance with ISO 26602.

## 7 Dimensions and tolerances

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### 7.1 General

The preferred nominal ball diameters are given in [Table 1](#). Tolerances for form and surface roughness are given in [Table 2](#). Sorting tolerances and ball gauges are given in [Table 3](#).

### 7.2 Shortened formats for nominal diameter identification

#### 7.2.1 Metric option

For purchasing and other general administrative purposes, some users optionally identify nominal metric ball diameters with only three digits following the decimal comma.

This option does not identify the diameter with adequate precision for manufacturing purposes and the full long diameter values given in [Table 1](#) with four or five digits following the decimal comma to precisely identify the size shall always be used for gauge and subgauge sorting purposes to avoid any possibility of ambiguity.

#### 7.2.2 Imperial option

For purchasing and other general administrative purposes, some users optionally continue to identify nominal ball diameters with imperial exact fraction or decimal sizes which carry no risk of ambiguity. Metric equivalents are sometimes also shown but not used as the primary administrative identifier.

If this option is applied, gauge and subgauge diameter tolerances in micrometres shall be added to the imperial nominal reference size or its exact metric equivalent with four or five digits following the decimal comma according to [Table 1](#) of this part of ISO 3290, for sorting purposes during manufacturing procedures.