SLOVENSKI STANDARD
oSIST prEN ISO 5463:2023

01-oktober-2023

Specifikacija geometrijskih veličin izdelka - Oprema za merjenje oblike; naprave za merjenje oblike z rotacijsko osjo - Zasnova in meroslovne značilnosti (ISO/DIS 5463:2023)

Geometrical product specifications (GPS) - Form measuring equipment; Rotary axis form measuring instruments - Design and metrological characteristics (ISO/DIS 5463:2023)

Geometrische Produktspezifikationen (GPS) - Formmessgeräte; Formmessgeräte mit Drehachse - Konstruktion und messtechnische Eigenschaften (ISO/DIS 5463:2023)

Spécification géométrique des produits (GPS) - Équipements de mesure de forme ; Instruments de mesure de forme à plateau tournant - Caractéristiques de conception et caractéristiques métrologiques (ISO/DIS 5463:2023)

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17.040.30	Merila	Measuring instruments
17.040.40	Specifikacija geometrijskih veličin izdelka (GPS)	Geometrical Product Specification (GPS)

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Geometrical product specifications (GPS) — Form measuring equipment; Rotary axis form measuring instruments — Design and metrological characteristics

Spécification géométrique des produits (GPS) — Équipements de mesure de forme ; Instruments de mesure de forme à plateau tournant — Caractéristiques de conception et caractéristiques métrologiques

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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).

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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 213.

Introduction

This is a Geometrical Product Specification standard and is to be regarded as a General GPS standard (see ISO 14638). It influences the chain link F of the chains of standards on form, orientation, location and run-out. For more detailed information of the relation of this standard to other standards and the GPS matrix model, see Annex E.

The ISO/GPS matrix model given in ISO 14638 gives an overview of the ISO/GPS system of which this document is a part. The fundamental rules of ISO/GPS given in ISO 8015 apply to this document and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document, unless otherwise indicated; see ISO/TR 14253-6 for additional information on the selection of alternative decision rules.

This document replaces ISO 4291:1985 “Methods for the assessment of departure from roundness – Measurement of variations in radius”. .

There are different types and variants of rotary axis form measuring instrument. The metrological characteristics described in this document apply to all types and variants.

Geometrical product specifications (GPS) — Form measuring equipment; Rotary axis form measuring instruments — Design and metrological characteristics

1 Scope

This document specifies the most important design and metrological characteristics of rotary axis form measuring instruments.

It is not applicable to coordinate measurement systems as defined by the parts of ISO 10360, whether the systems are fitted with a rotary axis or not, except with special agreement.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 9493, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Dial test indicators (lever type) — Design and metrological characteristics*

ISO 12180-1, *Geometrical product specifications (GPS) — Cylindricity — Part 1: Vocabulary and parameters of cylindrical form*

ISO 12180-2, *Geometrical product specifications (GPS) — Cylindricity — Part 2: Specification operators*

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

ISO 12181-2, *Geometrical product specifications (GPS) — Roundness — Part 2: Specification operators*

ISO 12780-1, *Geometrical product specifications (GPS) — Straightness — Part 1: Vocabulary and parameters of straightness*

ISO 12780-2, *Geometrical product specifications (GPS) — Straightness — Part 2: Specification operators*

ISO 12781-1, *Geometrical product specifications (GPS) — Flatness — Part 1: Vocabulary and parameters of flatness*

ISO 14253-1, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for verifying conformity or nonconformity with specifications*

ISO 14253-5, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 5: Uncertainty in verification testing of indicating measuring instruments*

ISO 14978, *Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment*

ISO 16610-21, *Geometrical product specifications (GPS) — Filtration — Part 21: Linear profile filters: Gaussian filters*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1101, ISO 14978, ISO/IEC Guide 99, and the following apply.

3.1 General terms

3.1.1
measuring coordinate system
cylindrical coordinate system with the longitudinal axis nominally coincident with the rotary axis and with a nominally perpendicular transverse axis

Note 1 to entry: Displacements measured along the longitudinal axis are designated as Z and are measured from a point specified by the manufacturer.

Note 2 to entry: Radius designated as R is measured from the rotary axis and its basic direction is the transverse axis.

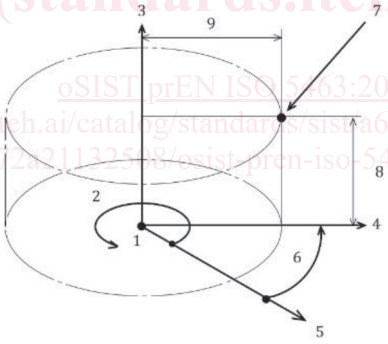
Note 3 to entry: Rotation angle designated as θ is measured from a line with orientation specified by the manufacturer in the transverse plane.

Note 4 to entry: Direction along the rotary axis is called “axial direction” for rotary characteristics.

Note 5 to entry: Outward direction around the rotary axis is called “radial direction” for rotary characteristics.

Note 6 to entry: Rotating Direction around the rotary axis is called “angular direction” for rotary characteristics.

Note 7 to entry: There are other definitions of “coordinate system” for different types of instrument.



Key

1	origin (centre position of rotary bearing)	6	angular distance of transverse axis from datum axis
2	angular motion	7	probing point
3	axis line of rotation	8	probing point height ***H*** from the transverse plane
4	transverse axis/ radial direction	9	probing point distance ***R*** from the rotary axis
5	datum axis on the transverse plane		

Figure 1 — Measurement coordinate system

3.1.2
centring
adjusting, in a plane perpendicular to the axis of rotation, the position of the centre point of the workpiece to be coincident to the axis of rotation of the instrument (see Figure 2)

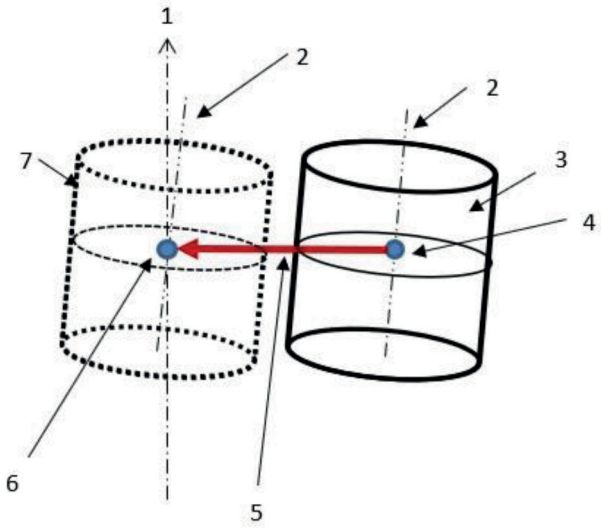


Figure 2 a)

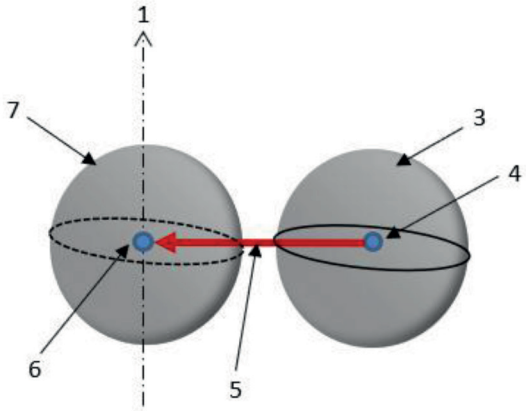


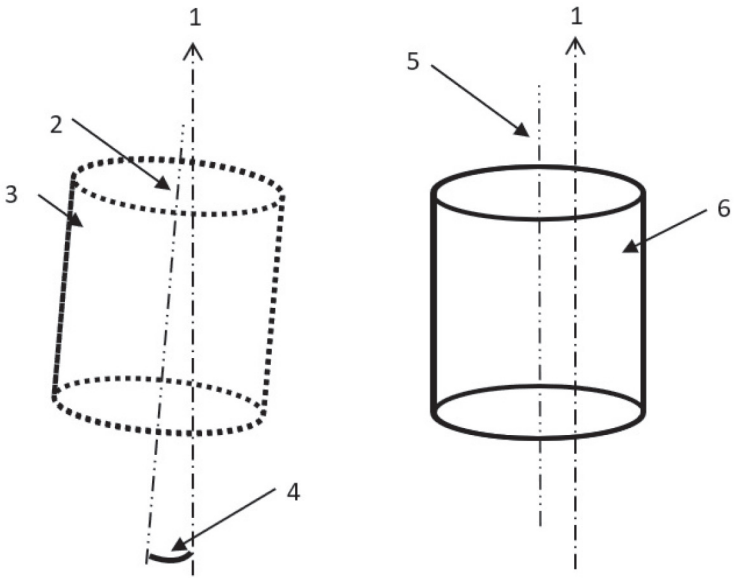
Figure 2 b)

Key

1	axis of rotation	5	centring displacement
2	centre line of revolute workpiece	6	centre point after centring
3	revolute workpiece before centring	7	revolute workpiece after centring
4	centre point before centring		

Figure 2 — Centring

3.1.3
levelling
adjusting the centre line of the workpiece to be parallel to the axis of rotation, or adjusting the normal vector to a plane feature of the workpiece to be parallel to the axis of rotation.



Key

1	axis of rotation	4	angular displacement
2	centre line of revolute workpiece before levelling	5	centre line of revolute workpiece after levelling
3	revolute workpiece before levelling	6	revolute workpiece after levelling

Figure 3 — Levelling

Note 1 to entry: Levelling is often combined with, or followed by, centring in order to bring the axis of the workpiece to be coaxial with the rotary axis of the instrument.

3.2 Terms relating to probe system

3.2.1
stylus
mechanical device consisting of a tip and an arm

[SOURCE: Bibliography [19]: ISO 25178-601:2010, 3.3.4]

3.2.2
stylus tip
physical element that establishes the contact with the workpiece

[SOURCE: Bibliography [9]:ISO 10360-1:2000, 4.2]

4 Design characteristics

4.1 General

This measuring instrument is primarily constructed to acquire form deviations in cylindrical coordinates through the direct measurement of radial (and axial) deviations.

Note A rotary axis form measuring instrument permits evaluation of form deviations, orientation deviations, and location deviations from extracted integral surfaces, which can be obtained by revolution, e.g. a cylindrical surface, a sphere, a plane.

4.2 Types of rotary axis form measuring instrument

4.2.1 General

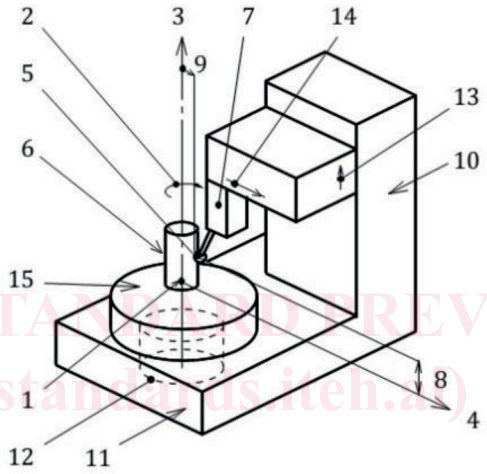
There are different types of rotary axis form measuring instruments, with variants of each of those types.

4.2.2 Rotating workpiece instrument

Design characteristics of this type of instrument are described in Annex A.

Rotating workpiece instruments include the following variants:

(1) Vertical axis rotating workpiece instrument



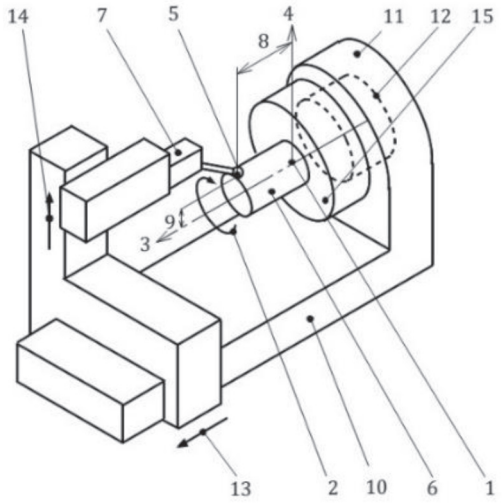
Key

1 origin of measuring coordinate system
2 angular motion
3 axis line of rotation
4 transverse axis
5 probing point
6 workpiece
7 probe
8 probing point height ***H*** from the top plane of the worktable
9 probing point radius ***R*** from rotary axis
10 column
11 base
12 rotary spindle
13 longitudinal axis motion
14 transverse axis motion
15 worktable

Figure 4 — Vertical axis rotating workpiece instrument

(2) Horizontal axis rotating workpiece instrument

which is a variant in which the longitudinal axis lies in a horizontal plane



Key

1	origin of measuring coordinate system	9	probing point radius ***R*** from rotary axis
2	angular motion	10	column
3	axis line of rotation/longitudinal axis	11	base
4	transverse axis direction	12	rotary spindle
5	probing point	13	longitudinal motion
6	workpiece	14	transverse motion
7	probe	15	fixture for workpiece on worktable
8	probing point height ***H*** from worktable top plane		

Figure 5 — Horizontal axis rotating workpiece instrument

(3) Vertical axis rotating workpiece between centres

which is a variant of type (1) where the workpiece is rotated between centres instead of on a worktable

(4) Horizontal axis rotating workpiece between centres

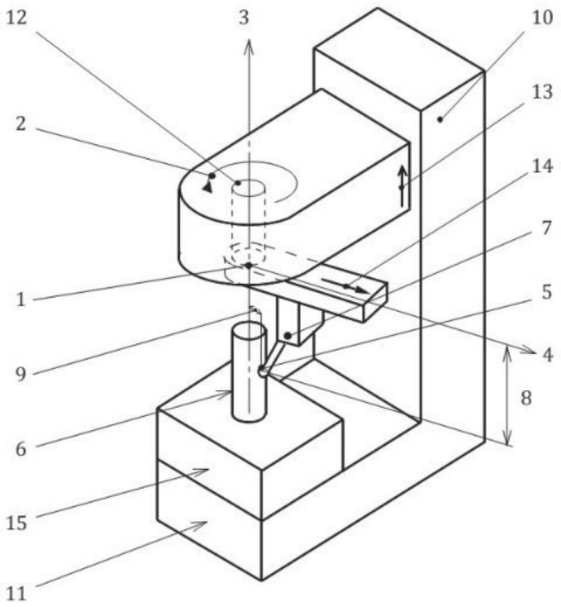
which is a variant of type (2) where the workpiece is rotated between centres instead of on a worktable

NOTE The direction of each axis between “vertical axis rotating workpiece instrument” and “horizontal axis rotating workpiece instrument” should not be confused due to rotated figure layout.

4.2.3 Stationary workpiece instrument

The stationary workpiece type instruments include the following variants:

(1) Vertical axis stationary workpiece instrument



Key

1 origin of measuring coordinate system
2 angular motion
3 axis line of rotation
4 transverse axis
5 probing point
6 workpiece
7 probe
8 probing point height ***H*** from the origin at the transverse axis
9 probing point distance ***R*** from rotary axis
10 column
11 base
12 rotary spindle
13 longitudinal axis motion
14 transverse axis motion
15 worktable

Figure 6 — Vertical axis stationary workpiece instrument

(2) Horizontal axis stationary workpiece instrument

which is a variant in which the longitudinal axis lies in a horizontal plane