

SLOVENSKI STANDARD
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Specifikacija geometrijskih veličin izdelka (GPS) - Osnove in zahteve za merilno opremo GPS (ISO/DIS 14978:2017)

Geometrical product specifications (GPS) - General concepts and requirements for GPS measuring equipment (ISO/DIS 14978:2017)

Geometrische Produktspezifikation (GPS) - Allgemeine Begriffe und Anforderungen für GPS-Messeinrichtungen (ISO/DIS 14978:2017)

Spécification géométrique des produits (GPS) - Concepts et exigences généraux pour les équipements de mesure GPS (ISO/DIS 14978:2017)

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Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment

Spécification géométrique des produits (GPS) — Concepts et exigences généraux pour les équipements de mesure GPS

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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).

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This second edition cancels and replaces the first edition (ISO 14978:2006), which has been technically revised.

In this edition, terms and definitions have been updated relative to ISO/IEC Guide 99:2007, and a number of design characteristics common in GPS measuring equipment have been added. This edition also includes updated discussion of calibration and verification and applies concepts from ISO 14253-5:2015.

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ISO/DIS 14978:2017(E)**Introduction**

This document is a geometrical product specification (GPS) standard and is to be regarded as a global GPS standard (see ISO 14638). It influences all the chain links for measuring equipment and calibration in the general 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.

For more detailed information of the relation of this document to other standards and the GPS matrix model, see Annex E.

This document contains guidance for writing the standards for specific GPS measuring equipment.

This document is intended to give the user a basic understanding of the use of ISO standards for GPS measuring equipment. This document presents and defines general concepts to be used in connection with GPS measuring equipment to avoid multiple repetitions in the ISO standards for specific GPS measuring equipment. This document is also intended as guidance for the manufacturer/supplier to evaluate and present specifications for characteristics for GPS measuring equipment.

This document should be close at hand when reading and using ISO standards for a specific GPS measuring equipment.

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Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment

1 Scope

This document specifies the general requirements, terms and definitions of characteristics of GPS measuring equipment, e.g. micrometers, callipers, gauge blocks, and rotary axis form measuring instruments. Some measuring equipment, e.g. coordinate measuring systems, are covered in other standards, but the requirements, terms and definitions given in this document may be applicable. This document forms the basis for standards defining and describing the design characteristics and metrological characteristics for measuring equipment and gives guidance for the development and content of standards for GPS measuring equipment.

This document is intended to ease the communication between manufacturer/supplier and customer/user and to make the specification phase of GPS measuring equipment more accurate. This document is also intended as a tool to be used in companies in the process of defining and selecting relevant characteristics for measuring equipment.

This document includes terms which are frequently used in connection with the characterization of specific measuring equipment.

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 14253-1, *Geometrical Product Specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for proving conformance or non-conformance with specifications*

ISO 14253-5:2015, *Geometrical Product Specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 5: Uncertainty in verification testing of indicating measuring instruments*

ISO/TR 14253-6, *Geometrical Product Specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 6: Generalized decision rules for the acceptance and rejection of instruments and workpieces*

ISO/IEC Guide 99:2007, *International Vocabulary of Metrology – Basic and general concepts and associated terms (VIM)*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM)*

ISO/IEC Guide 98-4:2012, *Uncertainty of measurement – Part 4: Role of measurement uncertainty in conformity assessment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 99, ISO/IEC Guide 98-4, ISO 14253-1, ISO 14253-5, ISO/TR 14253-6 and the following apply:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>

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- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE 1: For the terms shown in Table 1, the definitions from ISO/IEC Guide 99 specifically apply in the use of this document. This non-exhaustive list is included to avoid ambiguity with other possible terms and definitions.

NOTE 2: The terms shown in Table 2, as used in this document, are synonyms for the ISO/IEC Guide 99 terms as shown in the table. These synonym terms are used for consistency with previous versions of this document.

NOTE 3: For the terms shown in Table 3, the definitions from ISO/IEC Guide 98-4 specifically apply in the use of this document. This non-exhaustive list is included to avoid ambiguity with other possible terms and definitions.

NOTE 4: For the terms shown in Table 4, the definitions from ISO 14253-5 specifically apply in the use of this document. This non-exhaustive list is included to avoid ambiguity with other possible terms and definitions.

Table 1 — ISO/IEC Guide 99 terms applicable in the use of this document

Term	Definition Number
calibration	2.39
indicating measuring instrument	3.3
indication	4.1
material measure	3.6
maximum permissible measurement error	4.26
measurand	2.3
measured quantity value	2.10
measurement error	2.16
measurement method	2.5
measurement repeatability	2.21
measurement standard	5.1
measurement uncertainty	2.26
measuring instrument	3.1
measuring system	3.2
quantity value	1.19
rated operating condition	4.9
reference measurement standard	5.6
reference value	5.18
resolution	4.14
uncertainty budget	2.33
verification	2.44

Table 2 — Synonym terms to ISO/IEC Guide 99 terms

Synonym term	Notes	ISO/IEC Guide 99	
		Term	Definition number
measuring range	See Figure 5	measuring interval	4.7
nominal range	See Figure 5	nominal indication interval	4.4
nominal span	See Figure 5	range of a nominal indication interval	4.5

Table 3 — ISO/IEC Guide 98-4 terms applicable in the use of this document

Term	Definition number
decision rule	3.3.12
specified requirement	3.3.3
tolerance limit (specification limit)	3.3.4

Table 4 — ISO 14253-5 terms applicable in the use of this document

Term	Definition number
test measurand	3.4
test protocol	3.5
test value	3.8
test value uncertainty (test uncertainty)	3.9

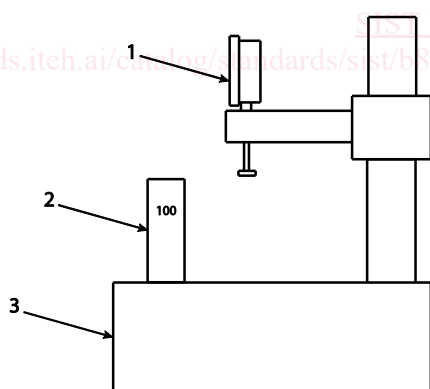
3.1**measuring equipment**

any indicating measuring instrument, material measure, software, measurement standard, reference material or auxiliary equipment used in a measurement

Note 1 to entry: This definition is necessarily wider than that of a measuring instrument since it includes all the devices used in a measurement.

Note 2 to entry: Measuring equipment should not be confused with a measuring system, which is a set of measuring equipment assembled and used for a specific measurement.

See Figure 1.

**Key**

- 1 dial gage (indicating measuring instrument)
- 2 gage block (material measure)
- 3 measuring stand (auxiliary measuring equipment)

Figure 1 — A measuring system composed of various measuring equipment

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3.2**task-related calibration**

〈measuring equipment〉 calibration of only those metrological characteristics which influence the measurement uncertainty for the intended use

3.3**metrological characteristic**

〈measuring equipment〉 characteristic of measuring equipment, which may influence the results of measurement

Note 1 to entry: The influence on the results of measurement is a contributor to measurement uncertainty (see Clause 6).

Note 2 to entry: The value of a metrological characteristic is expressed in numerical values and can be evaluated in a unit other than that of the measurement results of the measuring equipment.

Note 3 to entry: Measuring equipment usually has several metrological characteristics.

Note 4 to entry: Metrological characteristics can be subject to calibration and verification.

3.4**design characteristic**

〈measuring equipment〉 characteristic of measuring equipment which does not influence the measurement directly, but which may be of interest for other reasons when the measuring equipment is used

Note 1 to entry: Design characteristics can influence interchangeability, readability of line scales and digital read-outs, wear resistance, etc. (see Clause 5).

Note 2 to entry: Some design characteristics can influence the equipment's long-term capacity to make measurements (influencing design characteristics), e.g. its wear resistance, its environmental resistance, etc. Other design characteristics have no influence on measurements (non-influencing design characteristics).

Note 3 to entry: A design characteristic may be expressed as dimensions, material properties, interface protocols etc.

3.5**direct indication**

value provided by an indicating device of a measuring equipment

3.6**derived indication**

indication determined from a set of more than one direct indications

3.7**maximum permissible limit**

MPL

extreme values of a metrological characteristic permitted by specifications or regulations for a given piece of measuring equipment

Note 1 to entry: MPE, not MPL, should be used for metrological characteristics associated with errors of indication.

EXAMPLE 1: MPL for the measuring force for micrometers for external measurements.

EXAMPLE 2: MPL for the size of the gauge element of a plain limit gauge of linear size.

3.8**verification test**

test

operation that, under specified conditions and with sufficient objective evidence, establishes that measuring equipment conforms to stated specifications

Note 1 to entry: A verification test can be used as the calibration when both the first and second step in the definition of calibration are appropriately satisfied (see 6.1.4).

Note 2 to entry: This definition is consistent with the definition of a test in ISO 14253-5, but is broader in scope as the concept of a test in ISO 14253-5 is limited to indicating measuring instruments.

3.8.1

acceptance test

verification test agreed upon by the measuring equipment manufacturer/supplier and the customer/user to verify that the performance of the measuring equipment is as stated by the manufacturer/supplier

Note 1 to entry: Acceptance tests are commonly used in the purchase of measuring equipment.

3.8.2

reverification test

verification test to verify that the performance of the measuring equipment is as stated by the user and executed following the same general method as that of the acceptance test

Note 1 to entry: The specifications chosen may or may not be the same as those used in the original acceptance test for the measuring equipment.

3.9

required test condition

operating condition or other condition prescribed by a test protocol, which is required to be met during the testing

Note 1 to entry: As a required test condition shall be met during testing, it is generally expressed as an interval (not a single exact value).

Note 2 to entry: The required test conditions come from the test protocol not from the manufacturer/supplier; however, the required test conditions are frequently derived from the rated operating conditions of the measuring instrument.

Note 3 to entry: The required test conditions should not be confused with the test measurand.

3.10

test point

point within the measuring range used in verification testing

Note 1 to entry: Test points are usually defined relative to a reference point.

3.11

hysteresis

property of measuring equipment, or a characteristic, whereby the indication of the equipment or value of the characteristic depends on the orientation of the preceding stimulus

3.12

digital step

in a digital indicating device, the smallest possible change in the least significant digit

Note 1 to entry: For a digital displaying device, the resolution is usually equal to the digital step.

3.13

scale division

space on a scale between any two successive scale marks

See Figures 2 and 3.

3.14

scale interval

absolute value of the difference between the values corresponding to two successive scale marks, in the units marked on the scale

Note 1 to entry: Scale interval should not be confused with resolution, which is not necessarily equal to the scale interval.