SIST

SLOVENSKI STANDARD
SIST EN ISO 14253-2:2011

01-november-2011

Nadomešča:

SIST ENV ISO 14253-2:2002

SIST ISO/TS 14253-2:2002

Specifikacija geometrijskih veličin izdelka - Preskusi z merjenjem obdelovancev in merilne opreme - 2. del: Navodila za ugotavljanje negotovosti pri meritvi geometrijske veličine izdelka, pri umerjanju merilne opreme in pri preverjanju izdelka (ISO 14253-2:2011)

Geometrical product specifications (GPS) - Inspection by measurement of workpieces and measuring equipment - Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification (ISO 14253-2:2011)

Geometrische Produktspezifikationen (GPS) - Prüfung von Werkstücken und Messgeräten durch Messungen - Teil 2: Leitfaden zur Schätzung der Unsicherheit von GPS-Messungen bei der Kalibrierung von Messgeräten und bei der Produktprüfung (ISO 14253-2:2011)

Spécification géométrique des produits (GPS) - Vérification par la mesure des pièces et des équipements de mesure - Partie 2: Lignes directrices pour l'estimation de l'incertitude dans les mesures GPS, dans l'étalonnage des équipements de mesure et dans la vérification des produits (ISO 14253-2:2011)

Ta slovenski standard je istoveten z: **EN ISO 14253-2:2011**

ICS:

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

SIST EN ISO 14253-2:2011 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 14253-2

April 2011

ICS 17.040.01

Supersedes ENV ISO 14253-2:2001

English Version

Geometrical product specifications (GPS) - Inspection by measurement of workpieces and measuring equipment - Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification (ISO 14253-2:2011)

Spécification géométrique des produits (GPS) - Vérification par la mesure des pièces et des équipements de mesure - Partie 2: Lignes directrices pour l'estimation de l'incertitude dans les mesures GPS, dans l'étalonnage des équipements de mesure et dans la vérification des produits (ISO 14253-2:2011)

Geometrische Produktspezifikationen (GPS) - Prüfung von Werkstücken und Messgeräten durch Messen - Teil 2: Leitfaden zur Schätzung der Unsicherheit von GPS-Messungen bei der Kalibrierung von Messgeräten und bei der Produktprüfung (ISO 14253-2:2011)

This European Standard was approved by CEN on 14 April 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN ISO 14253-2:2011) has been prepared by Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" in collaboration with Technical Committee CEN/TC 290 “Dimensional and geometrical product specification and verification” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2011, and conflicting national standards shall be withdrawn at the latest by October 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes ENV ISO 14253-2:2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 14253-2:2011 has been approved by CEN as a EN ISO 14253-2:2011 without any modification.

INTERNATIONAL STANDARD

ISO 14253-2

First edition
2011-04-15

Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment —

Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification

Spécification géométrique des produits (GPS) — Vérification par la mesure des pièces et des équipements de mesure — Partie 2: Lignes directrices pour l'estimation de l'incertitude dans les mesures GPS, dans l'étalonnage des équipements de mesure et dans la vérification des produits

Reference number
ISO 14253-2:2011(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14253-2 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This first edition of ISO 14253-2 cancels and replaces ISO/TS 14253-2:1999, which has been technically revised. It also incorporates the Technical Corrigendum ISO/TS 14253-2:1999/Cor.1:2007.

ISO 14253 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment*:

— *Part 1: Decision rules for proving conformance or non-conformance with specifications*

— *Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification*

— *Part 3: Guidelines for achieving agreements on measurement uncertainty statements*

— *Part 4: Background on functional limits and specification limits in decision rules* [Technical Specification]

Introduction

This part of ISO 14253 is a global GPS standard (see ISO/TR 14638:1995). This global GPS standard influences chain links 4, 5 and 6 in all chains of standards.

The ISO/GPS Masterplan given in ISO/TR 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.

For more detailed information on the relation of this International Standard to other standards and to the GPS matrix model, see Annex D.

This part of ISO 14253 has been developed to support ISO 14253-1. This part of ISO 14253 establishes a simplified, iterative procedure of the concept and the way to evaluate and determine uncertainty (standard uncertainty and expanded uncertainty) of measurement, and the recommendations of the format to document and report the uncertainty of measurement information as given in the *Guide to the expression of uncertainty in measurement* (GUM). In most cases, only very limited resources are necessary to estimate uncertainty of measurement by this simplified, iterative procedure, but the procedure may lead to a slight overestimation of the uncertainty of measurement. If a more accurate estimation of the uncertainty of measurement is needed, the more elaborated procedures of the GUM need to be applied.

This simplified, iterative procedure of the GUM methods is intended for GPS measurements, but may be used in other areas of industrial (applied) metrology.

The uncertainty of measurement and the concept of handling uncertainty of measurement are important to all the technical functions within a company. This part of ISO 14253 is relevant to several technical functions, including management, design and development, manufacturing, quality assurance and metrology.

This part of ISO 14253 is of special importance in relation to ISO 9000 quality assurance systems, e.g. it is a requirement that methods for monitoring and measurement of the quality management system processes are suitable. The measurement uncertainty is a measure of the process suitability.

In this part of ISO 14253, the uncertainty of the result of a process of calibration and a process of measurement is handled in the same way:

— calibration is treated as a “measurement of the metrological characteristics of a measuring equipment or a measurement standard”;

— measurement is treated as a “measurement of the geometrical characteristics of a workpiece”.

Therefore, in most cases, no distinction is made in the text between measurement and calibration. The term “measurement” is used as a synonym for both.

Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment —

Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification

1 Scope

This part of ISO 14253 gives guidance on the implementation of the concept of the "Guide to the estimation of uncertainty in measurement" (in short GUM) to be applied in industry for the calibration of (measurement) standards and measuring equipment in the field of GPS and the measurement of workpiece GPS characteristics. The aim is to promote full information on how to achieve uncertainty statements and provide the basis for international comparison of measurement results and their uncertainties (relationship between purchaser and supplier).

This part of ISO 14253 is intended to support ISO 14253-1. Both parts are beneficial to all technical functions in a company in the interpretation of GPS specifications [i.e. tolerances of workpiece characteristics and values of maximum permissible errors (MPEs) for metrological characteristics of measuring equipment].

This part of ISO 14253 introduces the Procedure for Uncertainty MAnagement (PUMA), which is a practical, iterative procedure based on the GUM for estimating uncertainty of measurement without changing the basic concepts of the GUM. It is intended to be used generally for estimating uncertainty of measurement and giving statements of uncertainty for:

— single measurement results;

— the comparison of two or more measurement results;

— the comparison of measurement results — from one or more workpieces or pieces of measurement equipment — with given specifications [i.e. maximum permissible errors (MPEs) for a metrological characteristic of a measurement instrument or measurement standard, and tolerance limits for a workpiece characteristic, etc.], for proving conformance or non-conformance with the specification.

The iterative method is based basically on an upper bound strategy, i.e. overestimation of the uncertainty at all levels, but the iterations control the amount of overestimation. Intentional overestimation — and not under-estimation — is necessary to prevent wrong decisions based on measurement results. The amount of overestimation is controlled by economical evaluation of the situation.

The iterative method is a tool to maximize profit and minimize cost in the metrological activities of a company. The iterative method/procedure is economically self-adjusting and is also a tool to change/reduce existing uncertainty in measurement with the aim of reducing cost in metrology (manufacture). The iterative method makes it possible to compromise between risk, effort and cost in uncertainty estimation and budgeting.

2 Normative references

The following referenced documents are indispensable for the application 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 14253-1:1998, *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 14660-1:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *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 14253-1, ISO 14660-1, ISO/IEC Guide 98-3 and ISO/IEC Guide 99 and the following apply.

3.1
black box model for uncertainty estimation
model for uncertainty estimation in which the uncertainties associated with the relevant input quantities are directly represented by their influence on the quantity value being attributed to a measurand (in the units of the measurand)

NOTE 1 The “quantity value being attributed to a measurand” is typically a measured value.

NOTE 2 In many cases, a complex method of measurement may be looked upon as one simple black box with stimulus in and result out from the black box. When a black box is opened, it may turn out to contain several “smaller” black boxes or several transparent boxes, or both.

NOTE 3 The method of uncertainty estimation remains a black box method even if it is necessary to make supplementary measurements to determine the values of influence quantities in order to make corresponding corrections.

3.2
transparent box model for uncertainty estimation
model for uncertainty estimation in which the relationship between the input quantities and the quantity value being attributed to a measurand is explicitly expressed with equations or algorithms

3.3
measuring task
quantification of a measurand according to its definition

3.4
overall measurement task
measurement task that quantifies the final measurand

3.5
intermediate measurement task
measurement task obtained by subdividing the overall measurement task into simpler parts

NOTE 1 The subdivision of the overall measuring task serves the goal of simplification of the evaluation of uncertainty.

NOTE 2 The specific subdivisions are arbitrary, as is whether to subdivide at all.

3.6
target uncertainty
U_T
⟨for a measurement or calibration⟩ uncertainty determined as the optimum for the measuring task

NOTE 1 Target uncertainty is the result of a management decision involving e.g. design, manufacturing, quality assurance, service, marketing, sales and distribution.

NOTE 2 Target uncertainty is determined (optimized) taking into account the specification [tolerance or maximum permissible error (MPE)], the process capability, cost, criticality and the requirements of ISO 9001, ISO 9004 and ISO 14253-1.

NOTE 3 See also 8.8.

3.7
required uncertainty of measurement
U_R
uncertainty required for a given measurement process and task

NOTE See also 6.2. The required uncertainty may be specified by, for example, a customer.

3.8
uncertainty management
process of deriving an adequate measurement procedure from the measuring task and the target uncertainty by using uncertainty budgeting techniques

3.9
uncertainty budget
⟨for a measurement or calibration⟩ statement summarizing the estimation of the uncertainty components that contributes to the uncertainty of a result of a measurement

NOTE 1 The uncertainty of the result of the measurement is unambiguous only when the measurement procedure (including the measurement object, measurand, measurement method and conditions) is defined.

NOTE 2 The term “budget” is used for the assignment of numerical values to the uncertainty components and their combination and expansion, based on the measurement procedure, measurement conditions and assumptions.

3.10
uncertainty component
xx
source of uncertainty of measurement for a measuring process

3.11
limit value (variation limit) for an uncertainty component
a_{xx}
absolute value of the extreme value(s) of the uncertainty component, xx

3.12
uncertainty component
u_{xx}
standard uncertainty of the uncertainty component, xx

NOTE The iteration method uses the designation u_{xx} for all uncertainty components.

3.13
influence quantity of a measurement instrument
characteristic of a measuring instrument that affects the result of a measurement performed by the instrument

3.14
influence quantity of a workpiece
characteristic of a workpiece that affects the result of a measurement performed on that workpiece