EESTI STANDARD

EVS-EN ISO 10360-6:2002

Geometrical Product Specifications (GPS) - Acceptance and reverification tests for coordinate measuring machines (CMM) - Part 6: Estimation of errors in computing Gaussian associated features

Geometrical Product Specifications (GPS) - Acceptance and reverification tests for coordinate measuring machines (CMM) - Part 6: Estimation of errors in computing Gaussian associated features

EVS EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 10360-6:2002 sisaldab Euroopa standardi EN ISO 10360-6:2001 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 10360-6:2002 consists of the English text of the European standard EN ISO 10360-6:2001.
Käesolev dokument on jõustatud 14.03.2002 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.	This document is endorsed on 14.03.2002 with the notification being published in the official publication of the Estonian national standardisation organisation.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

Käsitlusala: This part of EN ISO 10360 specifies a method for testing software used for computing associated features from coordinate measurements.	**Scope:** This part of EN ISO 10360 specifies a method for testing software used for computing associated features from coordinate measurements.

ICS 17.040.30

Võtmesõnad: coor, dimensional measurement, geometrical product specification, geometry, gps, mathematical calculations, measurement, measuring instruments, measuring techniques, metrology, probable errors, product specifications, size measurement, testing and instruments

EUROPEAN STANDARD
NORME EUROPÉENNE
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EN ISO 10360-6

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English version

Geometrical Product Specifications (GPS)
Acceptance and reverification tests for coordinate measuring machines (CMM)
Part 6: Estimation of errors in computing Gaussian associated features
(ISO 10360-6 : 2001)

Spécification géométrique des produits (GPS) – Essais de réception et de vérification périodique des machines à mesurer tridimensionnelles (MMT) – Partie 6: Estimation des erreurs dans le calcul des éléments associés gaussiens (ISO 10360-6 : 2001)

Geometrische Produktspezifikation (GPS) – Annahmeprüfung und Bestätigungsprüfung für Koordinatenmessgeräte (KMG) – Teil 6: Abweichungsabschätzung beim Berechnen zugeordneter Geometrieelemente nach Gauß (ISO 10360-6 : 2001)

This European Standard was approved by CEN on 2001-11-12.

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 Management Centre or to any CEN member.

The European Standards exist 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Management Centre: rue de Stassart 36, B-1050 Brussels

Ref. No. EN ISO 10360-6 : 2001 E

Foreword

International Standard

ISO 10360-6 : 2001   Geometrical Product Specifications (GPS) – Acceptance and reverification tests for coordinate measuring machines (CMM) – Part 6: Estimation of errors in computing Gaussian associated features,

which was prepared by ISO/TC 213 'Dimensional and geometrical Product Specifications and verification' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 290 'Dimensional and geometrical Product Specifications and verification', the Secretariat of which is held by AFNOR, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by June 2002 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 10360-6 : 2001 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

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Introduction

This part of ISO 10360 is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences link 5 of the chains of standards on size, distance, radius, angle, form, orientation, location, run-out and datums.

For more detailed information of the relation of this part of ISO 10360 to other standards and the GPS matrix model see annex B.

Coordinate measurement technology is widely used in industrial metrology to assess features of a workpiece. A common requirement is to fit an associated feature to a data set consisting of coordinate measurements of a real feature. This fitting is carried out by software.

Software for calculating an associated feature provides values of parameters of the associated feature that are descriptive of the size, shape, location and orientation of the feature. These parameters are useful

— for the purpose of carrying out calculations involving the feature, often in conjunction with other associated features and other information, and

— in determining the extent to which a workpiece satisfies dimensional and positional specifications.

The reliability of information about features that is determined from associated features is influenced by the quality of the software for computing these features.

The tests defined in this part of ISO 10360 are concerned with assessing the correctness of the parameters of computed associated features as measured by a coordinate measuring machine (CMM) or other coordinate measuring system. Although different criteria may be used to compute associated features, for example, by minimizing the Euclidean or Chebyshev norm of residuals, this test is applicable for software designed for unconstrained Gaussian (least-squares) features.

In the case of reverification tests of CMMs, the software test of this part of ISO 10360 usually does not provide new or different information in comparison with that obtained by an acceptance test, since software is supposed to be stable over time. However, a reverification test of the software may be useful following possible corruption or alteration of the software under test.

For software already in existence, the evaluation of the performance may not be obtained only by fulfilling the requirements of this part of ISO 10360. However, such cases do not necessarily exclude the ability of the software to perform correct computation of measurements.

This part of ISO 10360 is applicable to software submitted for test in respect of the values it provides for the parameters of an associated feature. The test procedure is based on applying the software under test to reference data sets, and comparing the results obtained with reference results.

1 Scope

This part of ISO 10360 specifies a method for testing software used for computing associated features from coordinate measurements. The features of concern are the line (in two and three dimensions), the plane, the circle (in two and three dimensions), the sphere, the cylinder, the cone and the torus.

One or more separate tests are required for each feature claimed to be covered by the software.

The test is of the software alone and therefore independent of the coordinate measuring system.

NOTE 1   If the result of the test indicates that the performance values for linear size parameters of the associated feature are significant compared with the error of indication of a CMM for size measurement (see ISO 10360-2), as provided by the CMM manufacturer, the software is inadequate for application on that measuring system. However, small performance values, obtained as a result of this test, do not provide complete assurance that the software is totally suitable for computing associated features.

This part of ISO 10360 is concerned with complete features and non-extremely partial features; however, the test for complete features and that for partial features are separate, and software may be submitted for either or both tests.

Cones with very large apex angles are not covered by the test.

NOTE 2   Associated cones with very large angles are unusual in practice and the software for their stable computation is not widely available.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10360. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10360 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 10360-1:2000, *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM) — Part 1: Vocabulary*

ISO 10360-2:2001, *Geometrical Product Specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM) — Part 2: CMMs used for measuring size*

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 14660-2:1999, *Geometrical product specifications (GPS) — Geometrical features — Part 2: Extracted median line of a cylinder and a cone, extracted median surface, local size of an extracted feature*

International Vocabulary of Basic and General Terms in Metrology (VIM). BIPM, IFCC, IEC, ISO, IUPAC, IUPAP, OIML, 2nd edition, 1993

3 Terms and definitions

For the purposes of this part of ISO 10360, the terms and definitions given in ISO 10360-1, ISO 14660-1, ISO 14660-2 and VIM apply.

4 Basic requirements

The following basic requirements shall be met by the software supplier.

a) The software under test shall have an unambiguous and unique identification (e.g. a release number).

Improper applications of the test result to other versions of the software under test are forbidden. The testing body is allowed to satisfy the request by an owner of (a license of) the software under test and its test certificate to re-run the test based on the reference data sets identified by the release number reported in the test certificate.

b) The software under test shall provide a means of

1) direct input of a reference data set and output of test parameter values to adequate numerical precision (see clause 8), bypassing the measurement and software correction parts of the system, and

2) inputting 2D coordinates to the software under test for computing 2D associated features (line and circle in two dimensions); if this is not available, it is tolerated to add a dummy null z coordinate to each point in the reference data sets, thus projecting the feature onto the xy coordinate plane.

NOTE 1   The input and output procedures associated with some measuring systems may be limited in terms of the numerical precision of the values transmitted. This limitation may disadvantage the software under test in terms of the test results obtained.

c) The method of input to, and output from, the processor is to be agreed with the testing body.

NOTE 2   It may be convenient to use a standard computer-readable medium in a standard format (e.g. ASCII on a 3,5" disk).

d) Corresponding to each feature for which the software under test is to be tested, a statement of the parametrization of the feature used by the software under test shall be provided.

NOTE 3   Reference parametrizations are given in Table 3.

e) Corresponding to each feature for which the software under test is to be tested and to the test type (see Table 2), a statement of the maximum permissible errors, MPEq, of the relevant parameter classes (see 9.3) shall be provided.