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**Geometrical product specifications  
(GPS) — Acceptance and reverification  
tests for coordinate measuring machines  
(CMM) —**

**Part 7:  
CMMs equipped with imaging probing  
systems**

*Spécification géométrique des produits (GPS) — Essais de réception et  
de vérification périodique des machines à mesurer tridimensionnelles  
(MMT) —*

*Partie 7: MMT équipées de systèmes de palpage imageurs*



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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.

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 10360-7 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

ISO 10360 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM)*:

- *Part 1: Vocabulary*
- *Part 2: CMMs used for measuring linear dimensions*
- *Part 3: CMMs with the axis of a rotary table as the fourth axis*
- *Part 4: CMMs used in scanning measuring mode*
- *Part 5: CMMs using single and multiple stylus contacting probing systems*
- *Part 6: Estimation of errors in computing of Gaussian associated features*
- *Part 7: CMMs equipped with imaging probing systems*
- *Part 9: CMMs with multiple probing systems*

The following part is under preparation:

- *Part 8: CMMs with optical distance sensors*

## 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 chain link 5 of the chains of standards on size, distance, radius, angle, form, orientation, location, run-out and datums. For more detailed information on the relation of this part of ISO 10360 to other standards and the GPS matrix model, see Annex E.

The tests of this part of ISO 10360 have two technical objectives:

- a) to test the error of indication of a calibrated test length using an imaging probing system;
- b) to test the errors in the imaging probing system.

The benefits of these tests are that the measured result has a direct traceability to the unit length, the meter, and that it gives information on how the CMM will perform on similar length measurements.

The structure of this part of ISO 10360 parallels that of ISO 10360-2, which is for CMMs equipped with contact probing systems. The testing methodology between these two parts of ISO 10360 is intentionally similar. The differences that exist may be eliminated in future revisions of either this part of ISO 10360 or ISO 10360-2.

All the definitions in Clause 3 will appear in the revision of ISO 10360-1:2000.

# Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM) —

## Part 7: CMMs equipped with imaging probing systems

### 1 Scope

This part of ISO 10360 specifies the acceptance tests for verifying the performance of a coordinate measuring machine (CMM) used for measuring linear dimensions as stated by the manufacturer. It also specifies the reverification tests that enable the user to periodically reverify the performance of the CMM.

The acceptance and reverification tests given in this part of ISO 10360 are applicable only to Cartesian CMMs using imaging probing systems of any type operating in the discrete-point probing mode.

This part of ISO 10360 does not explicitly apply to:

- non-Cartesian CMMs; however, parties may apply this part of ISO 10360 to non-Cartesian CMMs by mutual agreement;
- CMMs using other types of optical probing; however, parties may apply this approach to other optical CMMs by mutual agreement;
- CMMs using contact probing systems (see ISO 10360-2 for contact probing systems).

This part of ISO 10360 specifies performance requirements that can be assigned by the manufacturer or the user of a CMM, the manner of execution of the acceptance and reverification tests to demonstrate the stated requirements, rules for proving conformance, and applications for which the acceptance and reverification tests can be used.

### 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 10360-1:2000, *Geometrical Product Specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM) — Part 1: Vocabulary*

ISO 10360-2:2009, *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines (CMM) — Part 2: CMMs used for measuring linear dimensions*

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/TS 23165:2006, *Geometrical product specifications (GPS) — Guidelines for the evaluation of coordinate measuring machine (CMM) test uncertainty*

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 10360-1, ISO 10360-2, ISO 14253-1, ISO 14660-1, ISO/TS 23165, ISO/IEC Guide 99 and the following apply.

#### 3.1

##### **imaging probing system**

probing system which creates measurement points through the use of an imaging system

NOTE 1 This part of ISO 10360 is primarily concerned with imaging probing systems that enable measurements in the lateral direction to the probing system axis.

NOTE 2 A video or vision probing system is an imaging probing system.

#### 3.2

##### **imaging probe CMM**

CMM equipped with an imaging probing system

#### 3.3

##### **field of view**

FOV

area viewed by the imaging probing system

See Figure 1.

NOTE The measuring limits, or size, of the FOV are stated as the limits of the object space that is reproduced in the final image.

#### 3.4

##### **measuring window**

region of interest in the FOV that is used in the determination of the measured point(s)

See Figure 1.

NOTE Configurations of measuring windows may vary widely between various imaging probe CMMs and for different measuring applications on the same imaging probe CMM.

#### 3.5

##### **measuring plane (of the imaging probing system)**

two-dimensional plane defined by the FOV of an imaging probing system

#### 3.6

##### **coefficient of thermal expansion**

CTE

$\alpha$

linear thermal expansion coefficient of a material at 20 °C