

First edition
2021-09

Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring systems (CMS) —

Part 13: Optical 3D CMS

*Spécification géométrique des produits (GPS) — Essais de réception
et de vérification périodique des systèmes à mesurer tridimensionnels
(SMT) —*

Partie 13: SMT optique 3D



Reference number
ISO 10360-13:2021(E)

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Published in Switzerland

This is a preview of ISO 10360-13:2021. [Click here to purchase the full version from the ANSI store.](#)

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	6
5 Rated operating conditions	6
5.1 Environmental conditions.....	6
5.2 Operating conditions.....	7
5.2.1 General.....	7
5.2.2 Material and surface characteristic of material standards.....	7
5.2.3 Pre-processing.....	8
6 Acceptance and reverification test	8
6.1 General.....	8
6.2 Distortion characteristics.....	8
6.2.1 General.....	8
6.2.2 Distortion error.....	8
6.3 Probing characteristics.....	12
6.3.1 Principle.....	12
6.3.2 Material standard.....	12
6.3.3 Procedure.....	13
6.3.4 Derivation of test results.....	13
6.3.5 Flat-form distortion error.....	14
6.4 Volumetric length measurement error in concatenated measurement volume.....	17
6.4.1 Principle.....	17
6.4.2 Material standard.....	17
6.4.3 Low CTE case.....	17
6.4.4 Procedure.....	18
6.4.5 Derivation of test results.....	20
7 Conformity with the specification	20
7.1 Acceptance test.....	20
7.1.1 Acceptance criteria.....	20
7.2 Reverification test.....	22
8 Applications	23
8.1 Acceptance test.....	23
8.2 Reverification test.....	23
8.3 Interim check.....	23
9 Indication in product documentation and data sheets	23
Annex A (informative) Evaluation of bi-directional length measurement characteristics	24
Annex B (normative) Artefacts that represent a calibrated test length and corresponding measurement procedures	26
Annex C (informative) Procedure of concatenated length measurement to assess the influence of the concatenation path on error propagation	29
Annex D (informative) Alignment of artefacts	33
Annex E (informative) Surface characteristic of material standard	35
Annex F (informative) Structural resolution test	39
Annex G (informative) Guidelines for the evaluation of the test value uncertainty	44

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Annex H (informative) Relation to the GPS matrix model	51
Bibliography	52

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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).

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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.

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 290, *Dimensional and geometrical product specification and verification*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 10360 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO 14638). It influences chain link F of the chain of standards on size, distance, form, orientation, location and run-out in the general GPS matrix (see [Annex H](#)).

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.

This document has two technical objectives:

- 1) to test the error of indication when measuring a calibrated test length across the global measuring volume of the CMS;
- 2) to test the errors of indication within a locally intended measuring volume.

These two objectives correspond to:

- a) the test performed for a probing system and a moving carrier of the probing system in combination as described in ISO 10360-2, ISO 10360-7, ISO 10360-8, ISO 10360-10, ISO 10360-11¹⁾ and ISO 10360-12;
- b) the test performed dominantly for the probing system as described in ISO 10360-5, ISO 10360-7, ISO 10360-8, ISO 10360-9, ISO 10360-10, ISO 10360-11 and ISO 10360-12.

The benefits of these tests are that the measured result has a direct traceability to the unit of length, the metre, and that it gives information on how the coordinate measuring machine (CMM) or the coordinate measuring system (CMS) performs in similar length measurements.

An optical 3D CMS as specified by this document is a contactless area measuring sensor delivering 3D data in several individual single views by an optical measuring principle and transforming it into a common coordinate system. Typical optical measuring principles are pattern projection, fringe projection and projecting-and-sweeping a scanned line, or similar, delivering single views without assistance of external information related to position and orientation of the objects to be scanned relative to the CMS. Typical registration principles are based on a best fitting of commonly captured position information across at least two different single views by using either or both reference features attached or surface features of the objects to be scanned.

This document is not intended to apply to other types of CMSs, for example:

- tactile CMMs (Cartesian metrological moving carrier), see ISO 10360-2;
- imaging CMMs (Cartesian metrological moving carrier), see ISO 10360-7;
- CMMs equipped with optical distance sensors (Cartesian metrological moving carrier), see ISO 10360-8;
- laser trackers, see ISO 10360-10;
- X-ray CTs, see ISO 10360-11;
- articulated arm CMMs, see ISO 10360-12;
- measuring instruments intended to measure surface characteristics, see the ISO 25178 series;
- optical microscopes;
- hand-held laser-line type scanners.

1) Under preparation. Stage at the time of publication: ISO/DIS 10360-11:2021.

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Parties can apply this document to the above or other types of CMSs by mutual agreement.

This document specifies:

- performance requirements that can be assigned by the manufacturer or the user of the CMS;
- the manner of execution of the acceptance and reverification tests to demonstrate the stated requirements;
- rules for verifying conformance;
- applications for which the acceptance and reverification tests can be used.

NOTE 1 [Annex E](#) describes possible limitations with regard to less cooperative surface characteristics, such as colour, glossiness and roughness, and provides a suggested test that can give CMS users an idea of how representative the maximum permissible error would be when measuring their specific industrial part.

NOTE 2 The optical 3D CMS can be moved and positioned by a manually or automated moving unit. The position, orientation or both can be used as additional information for the registration.

NOTE 3 The acceptance and reverification tests are designed to mimic real but simple measurements occurring in practice, subject to the rated operating conditions and the testing procedures. The user is advised to consider the influence of additional or omitted conditions, procedural steps or both when applying the test results according to this document to predict the performance of an actual CMS.

For more detailed information of the relation of this document to other standards and the GPS matrix model, see [Annex H](#).