

STN	Geometrické špecifikácie výrobkov (GPS). Akceptačné a verifikačné skúšky súradnicových meracích systémov (CMS). Časť 10: Laserový zameriavač na dvojbodové meranie vzdialenosti (ISO 10360-10: 2016).	STN EN ISO 10360-10
		25 2011

Geometrical product specifications (GPS) - Acceptance and reverification tests for coordinate measuring systems (CMS) - Part 10: Laser trackers for measuring point-to-point distances (ISO 10360-10:2016)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/16

Obsahuje: EN ISO 10360-10:2016, ISO 10360-10:2016

123563



Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD

EN ISO 10360-10

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2016

ICS 17.040.30

English Version

**Geometrical product specifications (GPS) - Acceptance and
reverification tests for coordinate measuring systems
(CMS) - Part 10: Laser trackers for measuring point-to-
point distances (ISO 10360-10:2016)**

Spécification géométrique des produits (GPS) - Essais
de réception et de vérification périodique des systèmes
à mesurer tridimensionnels (SMT) - Partie 10: Laser de
poursuite pour mesurer les distances de point à point
(ISO 10360-10:2016)

Geometrische Produktspezifikation (GPS) -
Annahmeprüfung und Bestätigungsprüfung für
Koordinatenmessgeräte (KMG) - Teil 10: Lasertracker
(ISO 10360-10:2016)

This European Standard was approved by CEN on 15 January 2016.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents	Page
European foreword.....	3

European foreword

This document (EN ISO 10360-10:2016) 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 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 10360-10:2016 has been approved by CEN as EN ISO 10360-10:2016 without any modification.

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

Part 10:

**Laser trackers for measuring point-to-
point distances**

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

*Partie 10: Laser de poursuite pour mesurer les distances de point à
point*



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols	5
5 Rated operating conditions	6
5.1 Environmental conditions.....	6
5.2 Operating conditions.....	6
6 Acceptance tests and reverification tests	7
6.1 General.....	7
6.2 Probing size and form errors.....	7
6.2.1 Principle.....	7
6.2.2 Measuring equipment.....	8
6.2.3 Procedure.....	8
6.2.4 Derivation of test results.....	10
6.3 Location errors (two-face tests).....	10
6.3.1 Principle.....	10
6.3.2 Measuring equipment.....	10
6.3.3 Procedure.....	10
6.3.4 Derivation of test results.....	11
6.4 Length errors.....	11
6.4.1 General.....	11
6.4.2 Principle.....	12
6.4.3 Measuring equipment.....	12
6.4.4 Procedure.....	13
6.4.5 Derivation of test results.....	20
7 Compliance with specification	20
7.1 Acceptance tests.....	20
7.2 Reverification tests.....	21
8 Applications	21
8.1 Acceptance test.....	21
8.2 Reverification test.....	22
8.3 Interim check.....	22
9 Indication in product documentation and data sheets	22
Annex A (informative) Forms	24
Annex B (normative) Calibrated test lengths	27
Annex C (normative) Thermal compensation of workpieces	29
Annex D (informative) Achieving the alternative measuring volume	30
Annex E (informative) Specification of MPEs	32
Annex F (informative) Interim testing	35
Annex G (normative) Testing of a stylus and retroreflector combination (SRC)	36
Annex H (normative) Testing of an optical distance sensor and retroreflector combination (ODR)	39
Annex I (informative) Relation to the GPS matrix model	41
Bibliography	42

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 WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is 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*

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

- *Part 8: CMMs with optical distance sensors*
- *Part 9: CMMs with multiple probing systems*
- *Part 10: Laser trackers for measuring point-to-point distances*

The following part is under preparation:

- *Part 12: Articulated-arm CMMs*

Computed tomography is to form the subject of a future part 11

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 14638). It influences link F of the chains of standards on size, distance, radius, angle, form, orientation, location, and run-out.

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 part of ISO 10360 and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this part of ISO 10360, unless otherwise indicated.

More detailed information on the relation of this part of ISO 10360 to other standards and the GPS matrix model can be found in Annex I.

The objective of this part of ISO 10360 is to provide a well-defined testing procedure for a) laser tracker manufacturers to specify performance by maximum permissible errors (MPEs), and b) to allow testing of these specifications using calibrated, traceable test lengths, test spheres, and flats. 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 laser tracker will perform on similar length measurements.

This part of ISO 10360 is *distinct* from that of ISO 10360-2, which is for coordinate measuring machines (CMMs) equipped with contact probing systems, in that the orientation of the test lengths reflect the different instrument geometry and error sources within the instrument.

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

Part 10: Laser trackers for measuring point-to-point distances

1 Scope

This part of ISO 10360 specifies the acceptance tests for verifying the performance of a laser tracker by measuring calibrated test lengths, test spheres and flats according to the specifications of the manufacturer. It also specifies the reverification tests that enable the user to periodically reverify the performance of the laser tracker. The acceptance and reverification tests given in this part of ISO 10360 are applicable only to laser trackers utilizing a retro-reflector as a probing system. Laser trackers that use interferometry (IFM), absolute distance meter (ADM) measurement, or both can be verified using this part of ISO 10360. This part of ISO 10360 can also be used to specify and verify the relevant performance tests of other spherical coordinate measurement systems that use cooperative targets, such as “laser radar” systems.

NOTE Systems, such as laser radar systems, which do not track the target, will not be tested for probing performance.

This part of ISO 10360 does not explicitly apply to measuring systems that do not use a spherical coordinate system (i.e. two orthogonal rotary axes having a common intersection point with a third linear axis in the radial direction). However, the parties can apply this part of ISO 10360 to such systems by mutual agreement.

This part of ISO 10360 specifies

- performance requirements that can be assigned by the manufacturer or the user of the laser tracker,
- 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10360-8:2013, *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring systems (CMS) — Part 8: CMMs with optical distance sensors*

ISO 10360-9:2013, *Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring systems (CMS) — Part 9: CMMs with multiple probing systems*

ISO 14253-1, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for proving conformity or nonconformity with specifications*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN