INTERNATIONAL STANDARD

ISO 12179

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Geometrical Product Specifications (GPS) — Surface texture: Profile method — Calibration of contact (stylus) instruments

Spécification géométrique des produits (GPS) — État de surface: Méthode du profil — Étalonnage des instruments à contact (palpeur)

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
E-mail copyright@iso.ch
Web www.iso.ch

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 12179 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

Annexes A and B form a normative part of this International Standard. Annexes C and D are for information only.

Introduction

This International Standard is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences the chain link 6 of the chain of standards on roughness, waviness and primary profile.

For more detailed information on the relationship of this standard to the GPS matrix model, see annex D.

This International Standard introduces calibration of contact (stylus) instruments as defined in ISO 3274. The calibration is to be carried out with the aid of measurement standards.

Geometrical Product Specifications (GPS) — Surface texture: Profile method — Calibration of contact (stylus) instruments

1 Scope

This International Standard applies to the calibration of the metrological characteristics of contact (stylus) instruments for the measurement of surface texture by the profile method as defined in ISO 3274. The calibration is to be carried out with the aid of measurement standards.

Annex B applies to the calibration of metrological characteristics of simplified operator contact (stylus) instruments which do not conform with ISO 3274.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 3274:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments.*

ISO 4287:1997, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*.

ISO 5436-1:2000, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Measurement standards — Part 1: Material measures*.

ISO 10012-1:1992, *Quality assurance requirements for measuring equipment — Part 1: Metrological confirmation system for measuring equipment.*

ISO 12085:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Motif parameters.*

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 specification.*

ISO/TS 14253-2:1999, *Geometrical Product Specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 2: Guide to the estimation of uncertainty of measurement in GPS measurement, in calibration of measuring equipment and in product verification*.

Guide to the expression of uncertainty in measurement (GUM). BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1st edition, 1995.

International vocabulary of basic and general terms used in metrology (VIM). BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 2nd edition, 1993.

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 3274, ISO 4287, ISO 14253-1, VIM [some of which are reproduced below (without their notes) for convenience], GUM, and term and definition 3.2, apply.

3.1
calibration
set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards

[VIM 6.11]

3.2
task related calibration
set of operations which establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument and the corresponding known values of a limited family of precisely defined measurands which constitute a subset of the measuring capabilities of the measuring instrument

3.3
adjustment (of a measuring instrument)
operation of bringing a measuring instrument into a state of performance suitable for its use

[VIM 4.30]

3.4
(measurement) standard
etalon
material measure, measuring instrument, reference material or measuring system intended to define, realize, conserve or reproduce a unit or one or more values of a quantity to serve as a reference

[VIM 6.1]

NOTE In ISO 5436:1985, "measurement standards" were referred to as "calibration specimens".

3.5
uncertainty of measurement
parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

[VIM 3.9]

3.6
traceability
property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties

[VIM 6.10]

4 Conditions of use

4.1 Components and configurations of the contact (stylus) instrument

The contact (stylus) instrument is comprised of the basic equipment, a drive unit, a probe and a profile recorder (see ISO 3274).

If the basic equipment is used with several drive units and probes, each of these instrumental combinations (configurations) shall be calibrated separately.

4.2 Calibration of a configuration

The contact (stylus) instrument shall be calibrated when a change is made to the basic elements of the system which intentionally or unintentionally modifies the measured profile/measuring result. Each configuration of the contact (stylus) instrument shall be calibrated separately.

EXAMPLE With a change of probe the contact (stylus) instrument shall be calibrated.

4.3 Place of calibration

The contact (stylus) instrument should be calibrated at the place of use with environmental conditions similar to those present when in use for measurement to take into account external influence factors.

EXAMPLE Noise, temperature, vibration, air movement, etc.

5 Measurement standards

The following measuring standards are applicable to the calibrations given in clause 6:

— optical flat;

— depth measurement standard (Figure 1): type A according to ISO 5436-1;

— spacing measurement standard (Figure 2): type C according to ISO 5436-1;

— inclined optical flat (Figure 3);

— profile co-ordinate measurement standard (consisting of a sphere or prism): type E according to ISO 5436-1;

— roughness measurement standard (Figure 4): type D according to ISO 5436-1.

NOTE It is recommended that a profile co-ordinate measurement standard be used on contact (stylus) instruments where the stylus rotates plus and minus one half of a degree when moving through its full range.

6 Contact (stylus) instrument metrological characteristics

Only those task-related contact (stylus) instrument metrological characteristics which are relevant for the intended measurements should be selected for calibration. For example, for the measurement of spacing parameters, the vertical profile component need not be calibrated.

6.1 Residual profile calibration

The scratch-free optical flat reproduces the residual profile. For task-related calibrations use the appropriate profile and parameters (for example: the roughness profile with Ra, Rq or Rt; the waviness profile with Wq or Wt).

NOTE By using this approach the effects of external guide straightness, environmental conditions and instrument noise can be established.

Dimension in millimetres

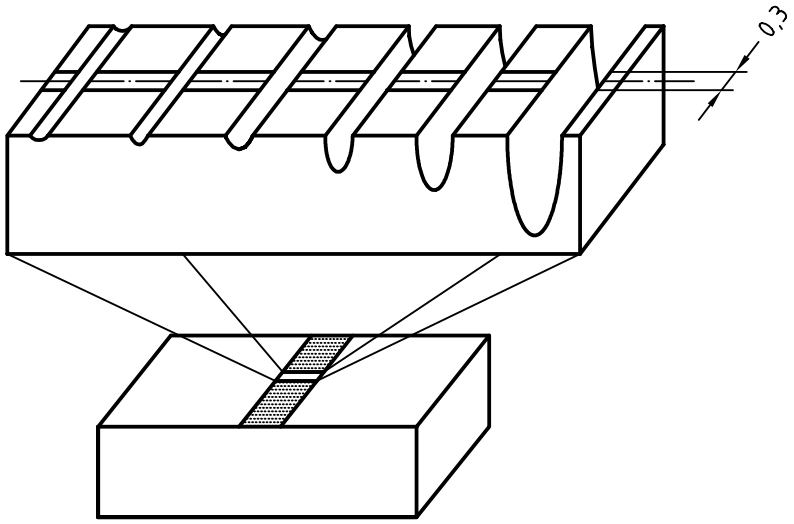

Figure 1 — Example of a depth measurement standard (type A2)

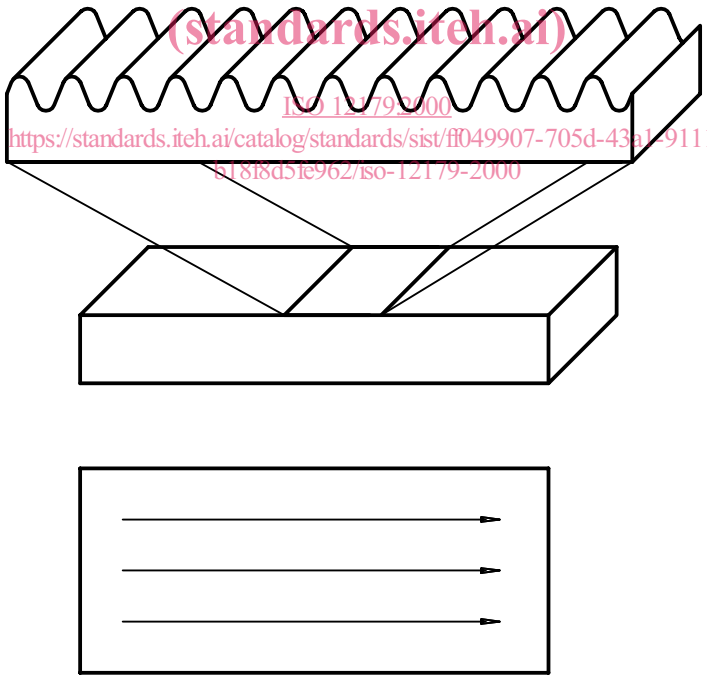

Figure 2 — Example of a spacing measurement standard (type C)

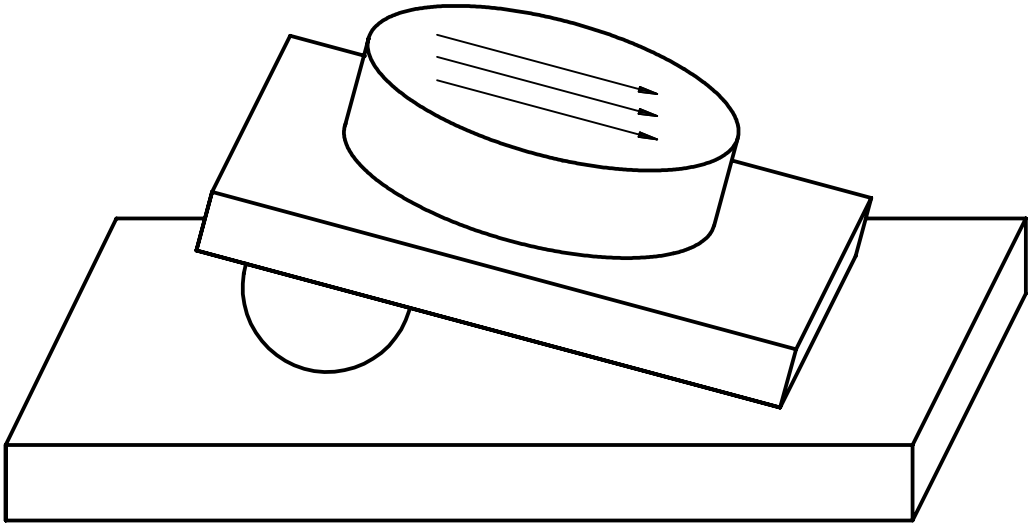

Figure 3 — Example of an inclined optical flat and a measuring plan

Values in millimetres

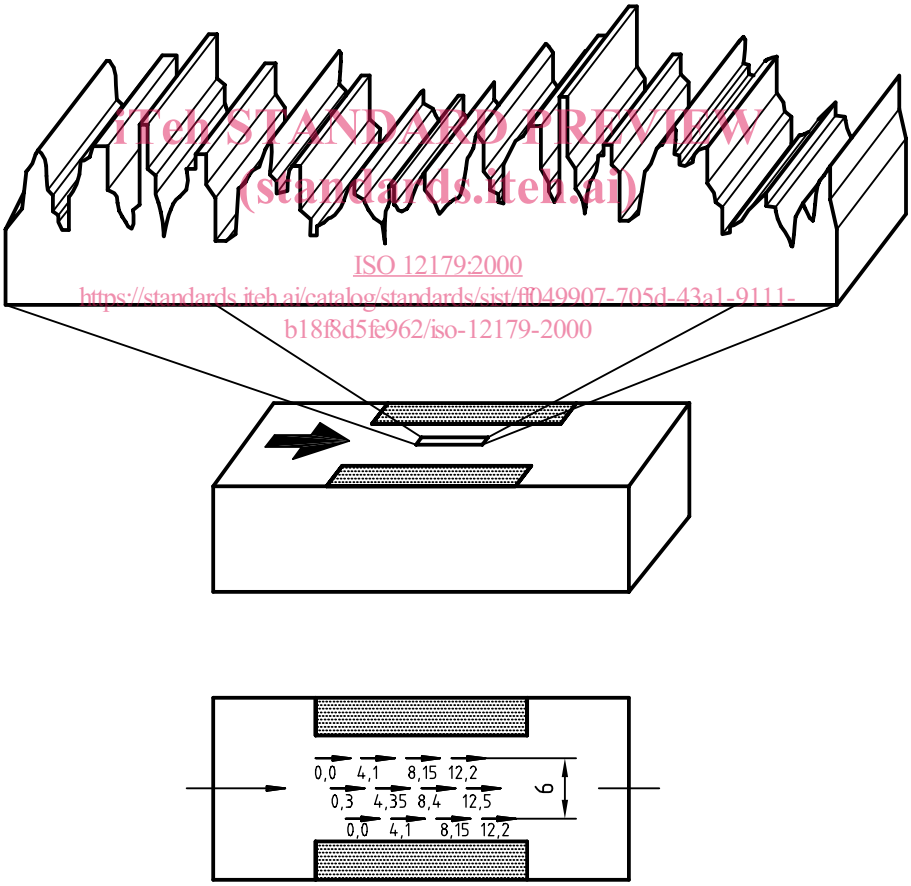

Figure 4 — Example of a roughness measurement standard (type D) and measuring plan

6.2 Vertical profile component calibration

The depth measurement standard reproduces the profile depth in order to measure the error of indication of the vertical profile component.

NOTE If no depth measurement standards are available gauge blocks may be used. Care must be taken concerning the uncertainty of the height difference when using gauge blocks.