DRAFT INTERNATIONAL STANDARD ISO/DIS 25178-605

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Geometrical product specifications (GPS) — Surface texture: Areal —

Part 605: Nominal characteristics of non-contact (point autofocus probe) instruments

Spécification géométrique des produits (GPS) — État de surface: Surfacique —

Partie 605: Caractéristiques nominales des instruments sans contact (à capteur autofocus à point)

ICS 17.040.20

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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 25178-605 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

ISO 25178 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Surface texture : Areal*:

— *Part 1: Indication of surface texture*

— *Part 2: Terms, definitions and surface texture parameters*

— *Part 3: Specification operators*

— *Part 4: Comparison rules*

— *Part 5: Verification operators*

— *Part 6: Classification of methods for measuring surface texture*

— *Part 7: Software measurement standards*

— *Part 70: Material measures*

— *Part 71: Part 71: STF softgage file format*

— *Part 601: Nominal characteristics of contact (stylus) instruments*

— *Part 602: Nominal characteristics of non-contact (confocal chromatic probe) instruments*

— *Part 603: Nominal characteristics of non-contact (phase shifting interferometric microscopy) instruments*

— *Part 604: Nominal characteristics of non-contact (coherence scanning interferometry) instruments*

— *Part 605: Nominal characteristics of non-contact (point autofocus probe) instruments*

— *Part 606: Nominal characteristics of non-contact (focus variation) instruments*

— *Part 701: Calibration and measurement standards for contact (stylus) instruments*

— *Part 702 Calibration of non-contact (confocal chromatic probe) instruments*

— *Part 703: Calibration and measurement standards for non-contact (interferometric) instruments*

Introduction

This part of ISO 25178 is a Geometrical Product Specification standard and is to be regarded as a General GPS standard (see ISO/TR 14638). It influences the chain link 5 of the chains of standards on roughness profile, waviness profile, primary profile, and areal surface texture.

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

The point autofocus optical principle can be implemented in various set-ups. The configuration described in this document comprises three basic elements: an autofocus optical system, an autofocus mechanism, and an electronic controller.

This type of instrument is mainly designed for areal measurements, but it is also able to perform profile measurements.

This part of ISO 25178 describes the metrological characteristics of an optical profiler using a point auto focusing method for the measurement of areal surface texture.

For more detailed information on the point autofocus method, see Annex B. Reading this Annex before the main body may lead to a better understanding of this standard.

Geometrical product specifications (GPS) — Surface texture: Areal —

Part 605:
Nominal characteristics of non-contact (point autofocus probe) instruments

1 Scope

This part of ISO 25178 describes the metrological characteristics of a non-contact instrument for measuring surface texture using point autofocus probing.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of ISO 25178. Subsequent amendments to or revisions of these dated references do not apply. However, parties to agreements based on this part of ISO 25178 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

ISO 3274:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

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

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

ISO 14406:2010, *Geometrical Product Specifications (GPS) — Extraction*

ISO 14460-1:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions*

ISO 25178-6:2010, *Geometrical Product Specifications (GPS) — Surface texture: Areal — Part 6: Classification of methods for measuring surface texture*

ISO 25178-601:2010, *Geometrical product specification (GPS) — Surface texture: Areal — Nominal characteristics of contact (stylus) instruments*

ISO 25178-602:2010, *Geometrical product specification (GPS) — Surface texture: Areal — Nominal characteristics of non-contact (confocal chromatic probe) instruments*

ISO 25178-701:2010, *Geometrical product specification (GPS) — Surface texture: Areal — Calibration and measurement standards of contact (stylus) instruments*

ISO/IEC Guide 99:2007 *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

3.1 Terms and definitions related to all areal surface texture measurement methods

For the purposes of this document, the terms and definitions given in ISO 3274, ISO 4287, ISO 10360-1, ISO 25178-2, ISO 14406, ISO 14978, ISO/IEC Guide 99 and the following apply.

3.1.1

coordinate system of the instrument

right hand orthonormal system of axes (X,Y,Z) where:

— (X,Y) is the plane established by the areal reference (note that there are optical instruments that do not posses a physical areal guide) of the instrument,

— Z axis is mounted parallel to the optical axis and is perpendicular to the (X,Y) plane for an optical instrument. Z-axis is in the plane of the stylus trajectory and is perpendicular to the (X,Y) plane for a stylus instrument

See Figure 1.

NOTE 1 Normally, the X-axis is the tracing axis and the Y-axis is the stepping axis (this note is valid for instruments that scan in the horizontal plane).

NOTE 2 See also specification coordinate system in ISO 25178-2 and measurement coordinate system ISO 25178 -6.

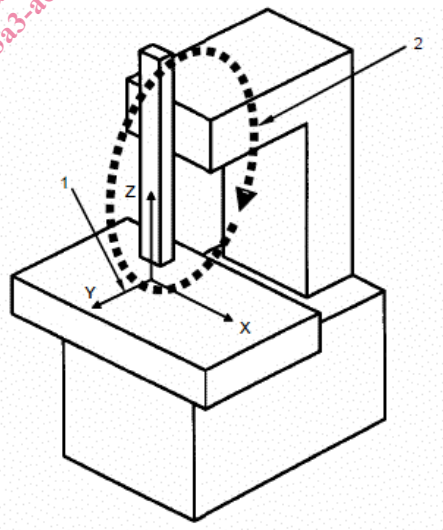
3.1.2

measurement loop

closed chain which comprises all components connecting the workpiece and the probe, e.g. the means of positioning, the work holding fixture, the measuring stand, the drive unit, the probing system

See Figure 1.

NOTE The measurement loop will be subjected to external and internal disturbances that influence the measurement uncertainty.



Key

1 coordinate system of the instrument

2 measurement loop

Figure 1 — Coordinate system and measurement loop of the instrument

3.1.3

real surface of a workpiece

set of features which physically exist and separate the entire workpiece from the surrounding medium

[ISO 14660-1, 2.4]

NOTE 1 The real surface is a mathematical representation of the surface that is independent of the measurement process.

NOTE 2 See also **mechanical surface** (ISO 25178-2, 3.1.1.1 or ISO 14406, 3.1.1) and **electromagnetic surface** (ISO 25178-2, 3.1.1.2 or ISO 14406, 3.1.2).

NOTE 3 The electromagnetic real surface considered for one type of optical instrument may be different from the electromagnetic real surface for other types of optical instruments.

3.1.4

surface probe

device that converts the surface height into a signal during measurement

NOTE In earlier standards this was termed transducer.

3.1.5

areal reference

component of the instrument that generates a reference surface with respect to which the surface topography is measured

3.1.6

measuring volume

range of the instrument stated in terms of the limits on all three coordinates measured by the instrument

NOTE For areal surface texture measuring instruments, the measuring volume is defined by:

- the measuring ranges of the drive unit X and the drive unit Y,

- the measuring range of the probing system

3.1.7

response curve

F_X, F_Y, F_Z

graphical representation of the function that describes the relation between the actual quantity and the measured quantity

See Figure 2.

NOTE 1 An actual quantity in X (respectively Y or Z) corresponds to a measured quantity Xm (respectively Ym or Zm).

NOTE 2 The response curve can be used for adjustments and error corrections.

3.1.8

amplification coefficient

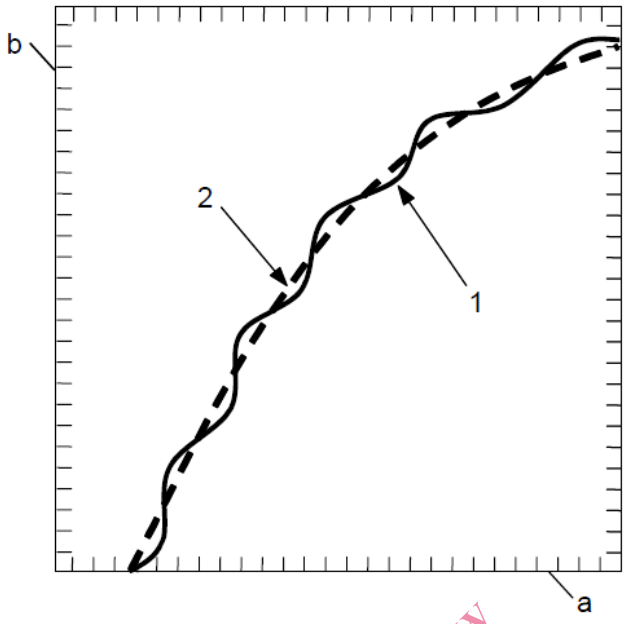
α_x, α_y, α_z

slope of the linear regression curve obtained from the response curve

See Figure 3.

NOTE 1 There will be amplification coefficients applicable to the X, Y and Z quantities.

NOTE 2 The ideal response is a straight line with a slope equal to 1, which means that the values of the measurand are equal to the values of the input quantities.



Key

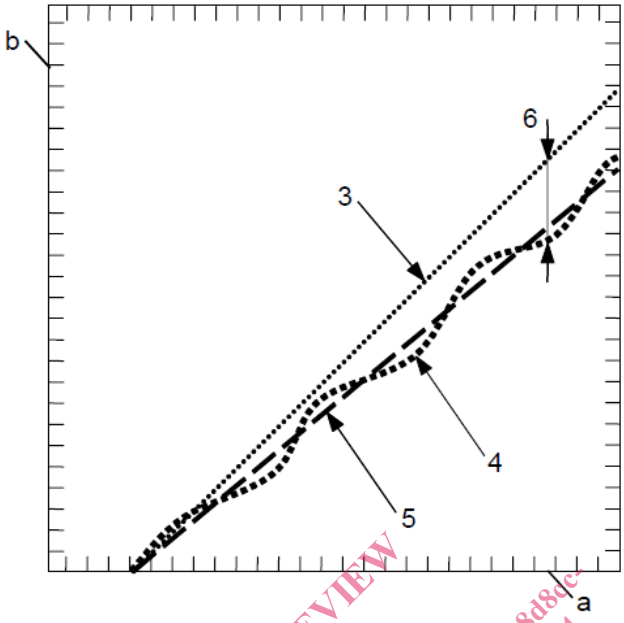
a input quantities

b measured quantities

1 Response curve

2 Assessment of the linearity deviation by polynomial approximation

Figure 2 — Example of a non-linear response curve



Key

a input quantities

b measured quantities

3 ideal response curve

4 linearisation of the response curve 1

5 line from which the amplification coefficient α (slope) is derived

6 local residual correction error

Figure 2 — Example of the linearisation of a response curve

3.1.9

instrument noise

internal noise added to the output signal caused by the instrument if ideally placed in a noise-free environment

NOTE 1 Internal noise can be due to electronic noise, as e.g. amplifiers, or optical noise, as e.g. stray light.

NOTE 2 This noise typically has high frequencies which limit the ability of the instrument to detect small scale surface texture.

NOTE 3 The S-filter in ISO 25178-3 or λ_s-filter in ISO 3274 may reduce this noise.

NOTE 4 For some instruments, instrument noise cannot be solely estimated.

3.1.10

measurement noise

N_M

noise added to the output signal occurring during the normal use of the instrument

NOTE 1 Notes 2 and 3 of 3.1.9 apply as well to this definition.

NOTE 2 Measurement noise includes the instrument noise.