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

Part 603:

**Nominal characteristics of non-contact
(phase-shifting interferometric
microscopy) instruments**

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

*Partie 603: Caractéristiques nominales des instruments sans contact
(microscopes interférométriques à glissement de franges)*



Reference number
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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. 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. www.iso.org/patents

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

- *Part 1: Areal surface texture drawing indication*
- *Part 2: Terms, definitions and surface texture parameters*
- *Part 3: Specification operators*
- *Part 6: Classification of methods for measuring surface texture*
- *Part 70: Material measures*
- *Part 71: Software measurement standards*
- *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 interferometric microscopy) instruments*
- *Part 605: Nominal characteristics of non-contact (point autofocus probe) instruments*
- *Part 606: Nominal characteristics of non-contact (focus variation microscopy) 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*

The following part is under preparation: *Part 72: XML file format x3p*

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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 chain of standards on areal surface texture.

This part of ISO 25178 describes the metrological characteristics of phase-shifting interferometric (PSI) profile and areal surface texture measuring microscopes, designed for the measurement of surface topography maps. For more detailed information on the phase-shifting interferometry technique, see [Annex A](#) and [Annex B](#).

The ISO/GPS Masterplan given in ISO /TR 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.

NOTE Portions of this document, particularly the informative clauses, may describe patented systems and methods. This information is provided only to assist users in understanding the operating principles of phase-shifting interferometry. This document is not intended to establish priority for any intellectual property, nor does it imply a license to any proprietary technologies that may be described herein.

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

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

1 Scope

This part of ISO 25178 describes the metrological characteristics of phase-shifting interferometric (PSI) profile and areal surface texture measuring microscopes.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

2.1.1 areal reference

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

2.1.2

coordinate system of the instrument

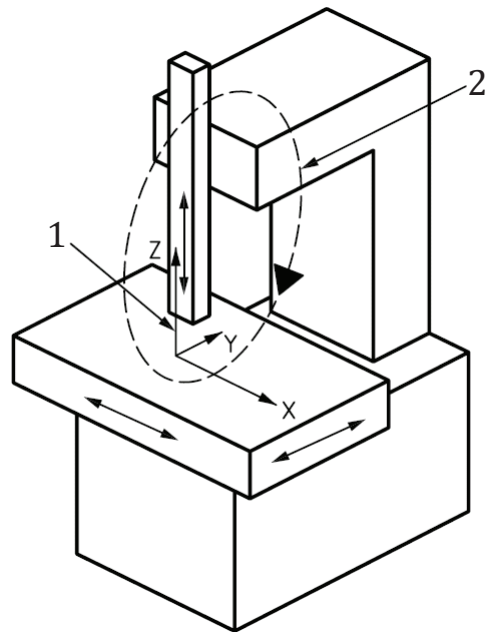
right hand orthonormal system of axes (x, y, z) where

- (x, y) is the plane established by the areal reference of the instrument (note that there are optical instruments that do not possess a physical areal guide);
- z -axis is mounted parallel to the optical axis and is perpendicular to the (x, y) plane for an optical instrument; the z -axis is in the plane of the stylus trajectory and is perpendicular to the (x, y) plane for a stylus instrument

Note 1 to entry: 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 to entry: See also “specification coordinate system” [ISO 25178-2:2012, 3.1.2] and “measurement coordinate system” [ISO 25178-6:2010, 3.1.1].

SEE: [Figure 1](#).



Key

- 1 coordinate system of the instrument
- 2 measurement loop

Figure 1 — Coordinate system and measurement loop of the instrument

2.1.3

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

Note 1 to entry: The measurement loop will be subjected to external and internal disturbances that influence the measurement uncertainty.

SEE: [Figure 1](#).

2.1.4

real surface of a workpiece

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

Note 1 to entry: The real surface is a mathematical representation of the surface that is independent of the measurement process.

Note 2 to entry: See also “mechanical surface” [ISO 25178-2:2012, 3.1.1.1 or ISO 14406:2010, 3.1.1] and “electromagnetic surface” [ISO 25178-2:2012, 3.1.1.2 or ISO 14406:2010, 3.1.2].

Note 3 to entry: The electromagnetic surface considered for one type of optical instrument may be different from the electromagnetic surface for other types of optical instruments.

2.1.5

surface probe

device that converts the surface height into a signal during measurement

Note 1 to entry: In earlier standards, this was termed “transducer”.

2.1.6**measuring volume**

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

Note 1 to entry: For areal surface texture measuring instruments, the measuring volume is defined by the measuring range of the x - and y - drive units, and the measuring range of the z -probing system.

[SOURCE: ISO 25178-601:2010, 3.4.1]

2.1.7**response curve**

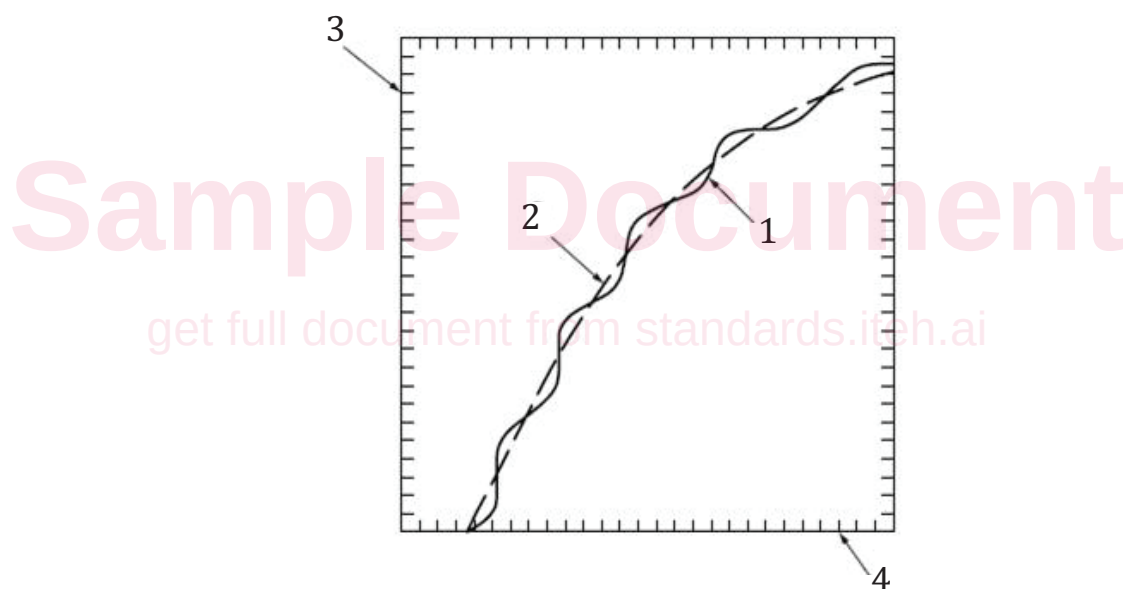
F_x, F_y, F_z

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

Note 1 to entry: An actual quantity in x (respectively y or z) corresponds to a measured quantity x_M (respectively y_M or z_M).

Note 2 to entry: The response curve can be used for adjustments and error corrections.

SEE: [Figure 2](#)

**Key**

- | | | | |
|---|---|---|---------------------|
| 1 | response curve | 3 | measured quantities |
| 2 | assessment of the linearity deviation by polynomial approximation | 4 | input quantities |

Figure 2 — Example of a nonlinear response curve

[ISO 25178-601:2010, 3.4.2]

2.1.8**amplification coefficient**

$\alpha_x, \alpha_y, \alpha_z$

slope of the linear regression curve obtained from the *response curve* ([2.1.7](#))

Note 1 to entry: There will be amplification coefficients applicable to the x, y and z quantities.

Note 2 to entry: 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.