
Specifikacija geometrijskih veličin izdelka (GPS) - Filtriranje - 45. del: Morfološki profilni filtri: Segmentacija (ISO/DIS 16610-45:2023)

Geometrical product specifications (GPS) - Filtration - Part 45: Morphological profile filters: Segmentation (ISO/DIS 16610-45:2023)

Geometrische Produktspezifikation (GPS) - Filterung - Teil 45: Morphologische Profilfilter: Segmentierung (ISO/DIS 16610-45:2023)

Spécification géométrique des produits (GPS) - Filtrage - Partie 45: Titre manque (ISO/DIS 16610-45:2023)

Ta slovenski standard je istoveten z: prEN ISO 16610-45

ICS:

17.040.20	Lastnosti površin	Properties of surfaces
17.040.40	Specifikacija geometrijskih veličin izdelka (GPS)	Geometrical Product Specification (GPS)

oSIST prEN ISO 16610-45:2023**en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 16610-45

ISO/TC 213

Secretariat: BSI

Voting begins on:
2023-01-04Voting terminates on:
2023-03-29

Geometrical product specifications (GPS) — Filtration — Part 45: Morphological profile filters: Segmentation

ICS: 17.040.20; 17.040.40

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Published in Switzerland

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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, *Geometrical product specifications and verification*.

A list of all parts in the ISO 16610 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 links C and E in the GPS matrix structure.

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.

For more information on the relationship of this document to filtration matrix model, see [Annex C](#).

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

This document develops the terminology and concepts for profile segmentation.

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Geometrical product specifications (GPS) — Filtration —

Part 45:

Morphological profile filters: Segmentation

1 Scope

This document develops the terminology and concepts for profile morphological segmentation. In particular it describes the watershed segmentation method, the Wolf pruning method and the Crossing-the-Line Method. This document assumes a continuous surface.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 16610-1:2015, *Geometrical product specifications (GPS) — Filtration — Part 1: Overview and basic concepts*

ISO 25178-2:2021, *Geometrical product specifications (GPS) — Surface texture: Areal — Part 2: Terms, definitions and surface texture parameters*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16610-1:2015 and ISO 25178-2:2021 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1 Geometrical feature terms

3.1.1

topographic feature

line or point feature on a profile

3.1.1.1

line feature

hill or dale

3.1.1.2

point feature

peak or pit

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3.1.2

peak

<watershed segmentation> point on the profile which is higher than all other points within a neighbourhood of that point

Note 1 to entry: There is a theoretical possibility of a plateau. In this case, the peak is the middle single point on the plateau. Alternatively techniques given in [Annex B](#) can be used.

3.1.3

peak

<reference line> highest point of a hill (see [3.1.7](#))

Note 1 to entry: There is a theoretical possibility of a plateau. In this case, the peak is the middle single point on the plateau. Alternatively techniques given in [Annex B](#) can be used.

3.1.4

pit

<watershed segmentation> point on the profile which is lower than all other points within a neighbourhood of that point

Note 1 to entry: There is a theoretical possibility of a plateau. In this case, the pit is the middle single point on the plateau. Alternatively techniques given in [Annex B](#) can be used.

3.1.5

pit

<reference line> lowest point of a dale (see [3.1.9](#))

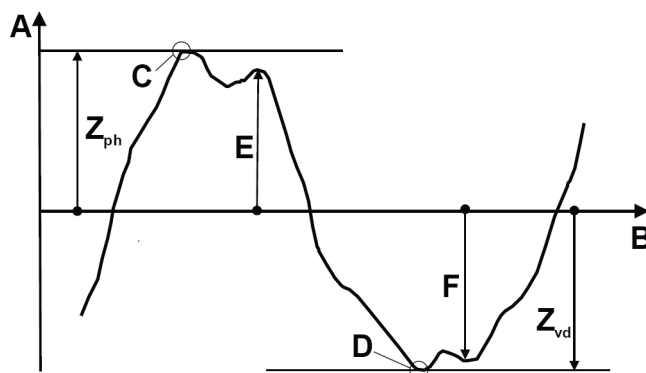
Note 1 to entry: There is a theoretical possibility of a plateau. In this case, the peak is the middle single point on the plateau. Alternatively techniques given in [Annex B](#) can be used.

3.1.6

hill

<watershed segmentation> region around a peak such that all maximal upward paths end at the peak

Note 1 to entry: See [Figure 1](#).

**Key**

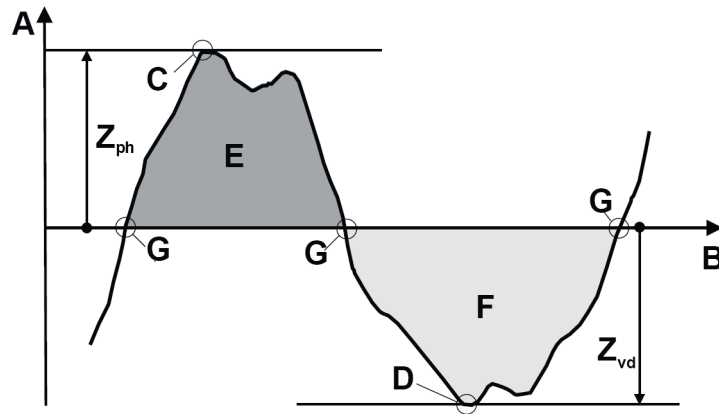
- A height
- B χ -axis (reference line)
- C peak
- D pit
- E hill local height
- F dale local depth

Figure 1 — Hill local height, dale local depth, hill local width, dale local width, hill local volume and dale local volume (watershed segmentation)

3.1.7**hill**

<reference line> outwardly directed (from material to surrounding medium) contiguous portion of the profile above the reference line bounded by the two adjacent points where the ordinate values change their sign

Note 1 to entry: See [Figure 2](#).

**Key**

A height

B χ -axis (reference line)

C peak

D pit

E hill

F dale

G change of sign of the ordinate values

Figure 2 — Peak height and pit depth (reference line)

3.1.8**dale**

<watershed segmentation> region around a pit such that all maximal downward paths end at the pit

Note 1 to entry: See [Figure 1](#).

3.1.9**dale**

<reference line> inwardly directed (from surrounding medium to material) contiguous portion of the scale-limited profile below the reference line bounded by the two adjacent points where the ordinate values change their sign

Note 1 to entry: See [Figure 2](#).

3.2 Segmentation terms**3.2.1****segmentation**

<profile> method which partitions a profile into distinct regions

Note 1 to entry: Within this document here are two types of segmentation:

- 1) Watershed segmentation (see [4.3](#)); and
- 2) Crossing-the line segmentation (see [4.4](#)).

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3.2.1.1

watershed segmentation

filtration operation that spatially decomposes a profile into mutually exclusive portions of that profile

3.2.1.2

crossing-the-line segmentation

operation based on crossings of the reference line by a profile in conjunction with a combination algorithm, to leave a set of significant segments

Note 1 to entry: The crossing-the-line segmentation requires height discrimination (see [3.3.5.2](#)).

3.2.1.3

event

mutually exclusive profile portions whose union cover the profile

EXAMPLE Ordinate values, motifs, etc.

3.2.2

segmentation function

function which splits a set of events into two distinct sets called the significant events and the insignificant events and which satisfies the three segmentation properties

Note 1 to entry: A full mathematical description of the segmentation function and the three segmentation properties can be found in Scott 2004¹⁾.

[SOURCE: ISO 16610-85, 3.2.2]

3.2.3

first segmentation property

property where each event is allocated to the set of significant events or the set of insignificant events but not both

P1 $\forall A \subseteq E, \Psi(A) \cup \Phi(A) = A$ and $\Psi(A) \cap \Phi(A) = \emptyset$

where E is the set of all events

$\Psi(\cdot)$ maps events onto the set of significant events

and $\Phi(\cdot)$ maps events onto the set of insignificant events (see [Figure 3](#)).

[SOURCE: ISO 16610-85, 3.2.3]

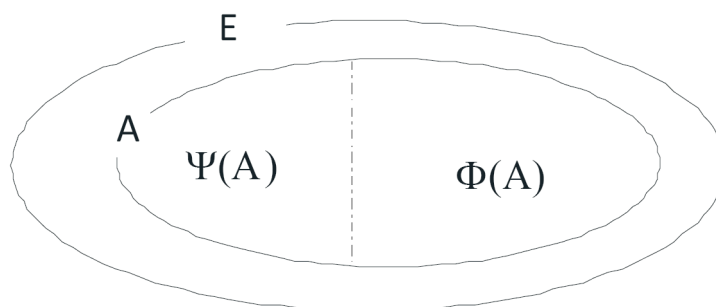


Figure 3 — Venn diagram of first segmentation property

3.2.4

second segmentation property

property where a significant event is removed from the set of events then the remaining significant events are contained in the new set of significant events

1) See Bibliography [9]