
**Geometrical product specifications
(GPS) — Surface texture: Profile
method — Flowchart for *P*Sm, *R*Sm,
*W*Sm and *P*c, *R*c, *W*c**

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Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
3.1 General terms.....	1
3.2 Surface profile parameters.....	3
4 Flowchart for parameters P_{Sm}, R_{Sm}, W_{Sm} and P_c, R_c, W_c.....	6
4.1 General.....	6
4.2 Part one — Calculation of peaks and valleys within the evaluation length.....	7
4.3 Part two — Peak height discrimination and valley depth discrimination.....	8
4.4 Part three — Merging of remaining peaks and valleys.....	9
4.5 Part four — Calculation of roughness parameters X_{Sm} and X_c	10
Bibliography.....	11

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Foreword

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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, *Dimensional and geometrical product specifications and verification*.

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

Feature characterization of rough surfaces is of growing interest in terms of a function-oriented description of technical surfaces. A well-known set of feature parameters is the mean width and mean height of profile elements defined in ISO 4287. Unfortunately, the definition given in ISO 4287 is insufficient for an unambiguous implementation in a high-level programming language. Due to the lack of a flowchart, results given by different software packages are not comparable. The main intention of this document is to provide an unambiguous algorithm for feature parameters PSm , RSm , WSm and Pc , Rc , Wc according to ISO 4287.

The flowchart defined in this document was developed by Seewig and Scott^[5] and represents an extension of crossing the line segmentation proposed by Scott^[4]. The flowchart is based on new knowledge gathered over the past 10 years.

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Geometrical product specifications (GPS) — Surface texture: Profile method — Flowchart for PSm , RSm , WSm and Pc , Rc , Wc

1 Scope

This document provides an unambiguous calculation of parameters PSm , RSm , WSm and Pc , Rc , Wc , as defined in ISO 4287, by means of a flowchart.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 General terms

3.1.1 profile

set of ordered pairs (x, z) which describe the intersection of a surface with a specified plane

Note 1 to entry: For every point x on the X -axis, there is exactly one ordinate z . The relation between x and z is given by a formula $z = f(x)$.

Note 2 to entry: Usually profiles have value pairs (x, z) above and below the X -axis.

Note 3 to entry: In surface metrology three profiles are defined. The primary profile, the roughness profile and the waviness profile. Each profile corresponds to a specific lateral scale.

3.1.2 evaluation length

l_m

length in the direction of the X -axis used for assessing the profile under evaluation

[SOURCE: ISO 4287:1997, 3.1.10, modified — symbol changed from l_n and notes to entry removed.]

3.1.3 profile peak

outwardly directed (from material to surrounding medium) portion of the assessed profile connecting two adjacent intersection points of the profile and the X -axis

3.1.4 profile peak height

normal distance between the X -axis and the highest ordinate of the profile peak

3.1.5

profile valley

inwardly directed (from surrounding medium to material) portion of the assessed profile connecting two adjacent intersection points of the assessed profile and the X-axis

3.1.6

profile valley depth

normal distance between the X-axis and the lowest ordinate of the profile valley

3.1.7

profile element

profile peak/valley and the adjacent profile valley/peak within the evaluation length

Note 1 to entry: Profile elements are calculated from the beginning to the end of the evaluation length and vice versa.

3.1.8

profile element height

sum of the profile peak height and the profile valley depth of a profile element

3.1.9

profile element spacing

distance on the X-axis between the beginning of two adjacent profile elements

Note 1 to entry: The positive or negative portion of the assessed profile at the beginning or end of the evaluation length is considered as an imperfect profile element and is used for the determination of the profile element spacing.

3.1.10

profile peak height discrimination

minimum height of profile peaks of the assessed profile which is taken into account

Note 1 to entry: The minimum height of profile peaks is 10 % of Pp for primary profile parameters, 10 % of Rp for roughness profile parameters and 10 % of Wp for waviness profile parameters.

3.1.11

profile valley depth discrimination

minimum depth of profile valleys of the assessed profile which is taken into account

Note 1 to entry: The minimum depth of profile valleys is 10 % of Pv for primary profile parameters, 10 % of Rv for roughness profile parameters and 10 % of Wv for waviness profile parameters.

3.1.12

sgm

sign of a real number z depending on the positive real numbers u and l

$$\text{sgm}(z, l, u) = \begin{cases} 1 & \text{if } z \geq u \\ -1 & \text{if } z \leq -l \\ 0 & \text{otherwise} \end{cases}$$

3.1.13

root

intersection of the assessed profile with the X-axis by linear interpolation

$$\text{root}(x_a, z_a, x_b, z_b) = \begin{cases} \frac{(x_a + x_b)}{2} & \text{if } z_b = z_a \\ \min \left(\max \left(\frac{(x_a \cdot z_b - x_b \cdot z_a)}{(z_b - z_a)}, x_a \right), x_b \right) & \text{otherwise} \end{cases}$$

with $x_a, z_a \in \mathbb{R}$ and $x_b, z_b \in \mathbb{R}$ as the coordinates of the profile whose linear connection intersects the X-axis

Note 1 to entry: If the intersection point lies outside the interval $[x_a, x_b]$, then the associated interval limit is used instead of the intersection point.

3.2 Surface profile parameters

3.2.1

mean height of the profile elements Pc, Rc, Wc

mean value of the profile element heights Zt_i within the evaluation length

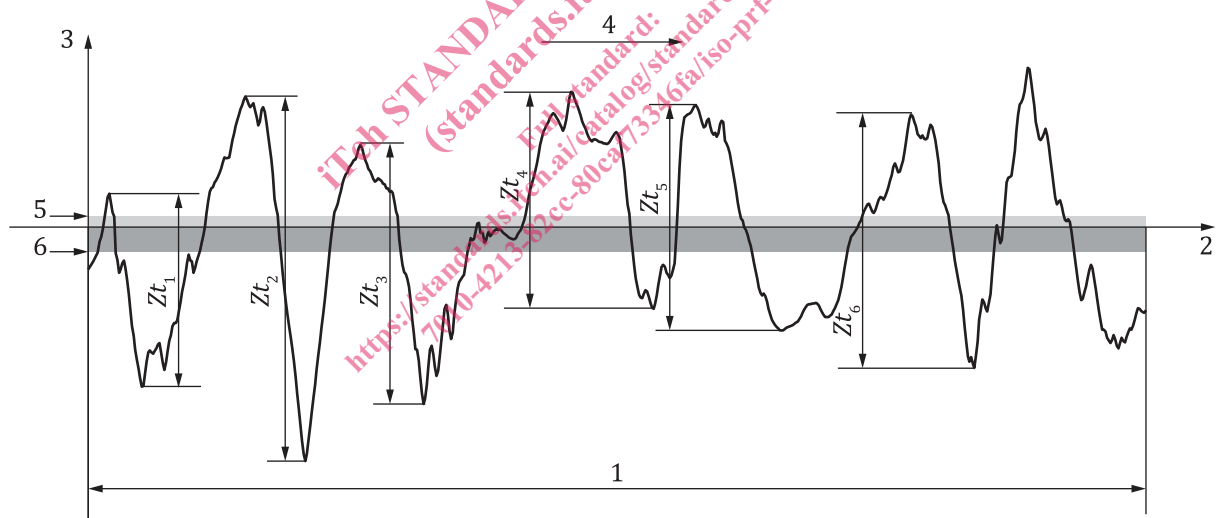
$$Rc = \frac{1}{m} \sum_{i=1}^m Zt_i$$

where m is the total number of profile elements calculated from the beginning to the end of the evaluation length and vice versa.

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

Note 2 to entry: In ISO 4287, the mean height of the profile elements is defined over the sampling length.

Note 3 to entry: Formulae for parameter definitions are exemplarily given for roughness profile parameters. Primary profile parameters and waviness profile parameters are defined in a similar manner, replacing the parameters related to the roughness profile with those related to the primary profile or waviness profile.



Key

- 1 evaluation length
- 2 X-axis
- 3 profile height
- 4 direction of evaluation
- 5 profile peak height discrimination
- 6 profile valley depth discrimination

Figure 1 — Heights Zt_i of profile elements which are calculated from the beginning to the end of the evaluation length