

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

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 25178-2:2022 sisaldab Euroopa standardi EN ISO 25178-2:2022 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 25178-2:2022 consists of the English text of the European standard EN ISO 25178-2:2022.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 19.01.2022.	Date of Availability of the European standard is 19.01.2022.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 17.040.20

**Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele**

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autoriõiguse kaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

**The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation**

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about standards copyright protection, please contact the Estonian Centre for Standardisation and Accreditation: Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

English Version

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

Spécification géométrique des produits (GPS) - État de  
surface: Surfacique - Partie 2: Termes, définitions et  
paramètres d'états de surface (ISO 25178-2:2021)

Geometrische Produktspezifikation (GPS) -  
Oberflächenbeschaffenheit: Flächenhaft - Teil 2:  
Begriffe, Definitionen und Oberflächen-Kenngrößen  
(ISO 25178-2:2021)

This European Standard was approved by CEN on 27 November 2021.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## European foreword

This document (EN ISO 25178-2:2022) has been prepared by Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" in collaboration with Technical Committee CEN/TC 290 "Dimensional and geometrical product specification and verification" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2022, and conflicting national standards shall be withdrawn at the latest by July 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 25178-2:2012.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Endorsement notice

The text of ISO 25178-2:2021 has been approved by CEN as EN ISO 25178-2:2022 without any modification.

# Contents

Page

<b>Foreword</b>	<b>v</b>
<b>Introduction</b>	<b>vi</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
3.1 General terms	1
3.2 Geometrical parameter terms	5
3.3 Geometrical feature terms	11
<b>4 Field parameters</b>	<b>15</b>
4.1 General	15
4.2 Height parameters	15
4.2.1 General	15
4.2.2 Root mean square height	15
4.2.3 Skewness	15
4.2.4 Kurtosis	15
4.2.5 Maximum peak height	16
4.2.6 Maximum pit depth	16
4.2.7 Maximum height	16
4.2.8 Arithmetic mean height	16
4.3 Spatial parameters	16
4.3.1 General	16
4.3.2 Autocorrelation length	16
4.3.3 Texture aspect ratio	17
4.3.4 Texture direction	18
4.3.5 Dominant spatial wavelength	18
4.4 Hybrid parameters	18
4.4.1 General	18
4.4.2 Root mean square gradient	18
4.4.3 Developed interfacial area ratio	18
4.5 Material ratio functions and related parameters	19
4.5.1 Areal material ratio	19
4.5.2 Inverse areal material ratio	19
4.5.3 Material ratio height difference	20
4.5.4 Areal parameter for stratified surfaces	21
4.5.5 Areal material probability parameters	23
4.5.6 Void volume	24
4.5.7 Material volume	25
4.6 Gradient distribution	26
4.7 Multiscale geometric (fractal) methods	28
4.7.1 Morphological volume-scale function	28
4.7.2 Relative area	29
4.7.3 Relative length	29
4.7.4 Scale of observation	29
4.7.5 Volume-scale fractal complexity	29
4.7.6 Area-scale fractal complexity	29
4.7.7 Length-scale fractal complexity	30
4.7.8 Crossover scale	30
<b>5 Feature parameters</b>	<b>30</b>
5.1 General	30
5.2 Type of texture feature	31
5.3 Segmentation	32
5.4 Determining significant features	32

5.5	Section of feature attributes .....	33
5.6	Attribute statistics .....	34
5.7	Feature characterization convention .....	34
5.8	Named feature parameters .....	35
5.8.1	General .....	35
5.8.2	Density of peaks .....	35
5.8.3	Density of pits .....	35
5.8.4	Arithmetic mean peak curvature .....	35
5.8.5	Arithmetic mean pit curvature .....	36
5.8.6	Five-point peak height .....	36
5.8.7	Five-point pit depth .....	36
5.8.8	Ten-point height .....	36
5.9	Additional feature parameters .....	37
5.9.1	General .....	37
5.9.2	Shape parameters .....	37
<b>Annex A (informative) Multiscale geometric (fractal) methods .....</b>		<b>40</b>
<b>Annex B (informative) Determination of areal parameters for stratified functional surfaces .....</b>		<b>47</b>
<b>Annex C (informative) Basis for areal surface texture standards — Timetable of events .....</b>		<b>50</b>
<b>Annex D (informative) Implementation details .....</b>		<b>51</b>
<b>Annex E (informative) Changes made to the 2012 edition of this document .....</b>		<b>55</b>
<b>Annex F (informative) Summary of areal surface texture parameters .....</b>		<b>57</b>
<b>Annex G (informative) Specification analysis workflow .....</b>		<b>59</b>
<b>Annex H (informative) Overview of profile and areal standards in the GPS matrix model .....</b>		<b>60</b>
<b>Annex I (informative) Relation with the GPS matrix .....</b>		<b>61</b>
<b>Bibliography .....</b>		<b>62</b>

## 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](http://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 (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 290, *Dimensional and geometrical product specification and verification*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 25178-2:2012), which has been technically revised. The main changes to the previous edition are described in [Annex E](#).

A list of all parts in the ISO 25178 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](http://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 the chain link B of the chains of standards on areal surface texture.

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 the specifications made in accordance with this document, unless otherwise indicated.

For more detailed information of the relation of this document to other standards and the GPS matrix model, see [Annex I](#). An overview of standards on profiles and areal surface texture is given in [Annex H](#).

This document develops the terminology, concepts and parameters for areal surface texture.

Throughout this document, parameters are written as abbreviations with lower-case suffixes (as in  $S_q$  or  $V_{mp}$ ) when used in a sentence and are written as symbols with subscripts (as in  $S_q$  or  $V_{mp}$ ) when used in formulae, to avoid misinterpretations of compound letters as an indication of multiplication between quantities in formulae. The parameters in lower case are used in product documentation, drawings and data sheets.

Parameters are calculated from coordinates defined in the specification coordinate system, or from derived quantities (e.g. gradient, curvature).

Parameters are defined for the continuous case, but in verification they are calculated on discrete surfaces such as the primary extracted surface.

A short history of the work done on areal surface texture can be found in [Annex C](#).



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

## Part 2: Terms, definitions and surface texture parameters

### 1 Scope

This document specifies parameters for the determination of surface texture by areal methods.

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

ISO 17450-1:2011, *Geometrical product specifications (GPS) — General concepts — Part 1: Model for geometrical specification and verification*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16610-1:2015 and ISO 17450-1:2011 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 General terms

##### 3.1.1

##### **skin model**

<of a workpiece> model of the physical interface of the workpiece with its environment

[SOURCE: ISO 17450-1:2011, 3.2.2]

##### 3.1.2

##### **surface texture**

<areal> geometrical irregularities contained in a *scale-limited surface* (3.1.9)

Note 1 to entry: Surface texture does not include those geometrical irregularities contributing to the form or shape of the surface.