

# INTERNATIONAL STANDARD

**ISO**  
**13565-1**

First edition  
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## **Geometrical Product Specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties —**

### **Part 1:**

Filtering and general measurement conditions

*Spécification géométrique des produits (GPS) — État de surface: Méthode  
du profil; surfaces ayant des propriétés fonctionnelles différentes suivant  
les niveaux —*

*Partie 1: Filtrage et conditions générales de mesurage*



Reference number  
ISO 13565:1996(E)

## 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.

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.

International Standard ISO 13565-1 was prepared jointly by Technical Committees ISO/TC 57, *Metrology and properties of surfaces*, Subcommittee SC 1, *Geometrical parameters — Instruments and procedures for measurement of surface roughness and waviness*, ISO/TC 3, *Limits and fits*, and ISO/TC 10, *Technical drawings, product definition and related documentation*, Subcommittee SC 5, *Dimensioning and tolerancing*.

ISO 13565 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties*:

- Part 1: *Filtering and general measurement conditions*
- Part 2: *Height characterization using the linear material ratio curve*
- Part 3: *Height characterization using the material probability curve*

Annexes A and B of this part of ISO 13565 are for information only.

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## Introduction

This part of ISO 13565 is a Geometrical Product Specification (GPS) standard and is to be regarded as a *General GPS standard* (see ISO/TR 14638). It influences chain links 2 and 3 of the chain of standards for roughness profile.

For more detailed information of the relation of this standard to other standards and the GPS matrix model, see annex A.

The roughness profile generated using the filter defined in ISO 11562 suffers some undesirable distortions, when the measured surface consists of relatively deep valleys beneath a more finely finished plateau with minimal waviness. This type of surface is very common, for example in cylinder liners for internal combustion engines.

This part of ISO 13565 provides a method of greatly reducing these distortions, thus enabling the parameters defined in ISO 13565-2 and ISO 13565-3 to be used for evaluating the above mentioned type of surface, with minimal influence from these distortions.

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# **Geometrical Product Specification (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties —**

## **Part 1:**

### **Filtering and general measurement conditions**

## **1 Scope**

This part of ISO 13565 describes a filtering method for use with surfaces that have deep valleys below a more finely finished plateau with a relatively small amount of waviness. The reference line resulting from filtering according to ISO 11562 for such surfaces is undesirably influenced by the presence of the valleys. The filtering approach described in this standard suppresses the valley influence on the reference line such that a more satisfactory reference line is generated.

## **2 Normative references**

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 13565. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 13565 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 4287:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*.

ISO 11562:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Metrological characteristics of phase correct filters*.

## **3 Definitions**

For the purposes of this part of ISO 13565, the definitions given in ISO 3274 and ISO 4287 apply.

## 4 Reference guide

To measure profiles in accordance with this part of ISO 13565, a measuring system which incorporates an external reference is recommended. In case of arbitration the use of such a system is obligatory.

## 5 Traversing direction

The traversing direction shall be perpendicular to the direction of lay unless otherwise indicated.

## 6 Filtering process to determine the roughness profile

The filtering process is carried out in several stages giving the modified profiles, sections of which are illustrated in figure 1a) to d).

The first mean line is determined by a preliminary filtering of the primary profile with the phase correct filter in accordance with ISO 11562 using a cut-off wavelength  $\lambda_c$  in accordance with clause 7 and corresponding measuring conditions in accordance with table 1 of ISO 3274:1996. All valley portions which lie below this mean line (shown hatched in figure 1a) are removed. In these places the primary profile is replaced by the curve of the mean line.

The same filter is used again on this profile with the valleys suppressed. The second mean line thus obtained (see figure 1b) is the reference line relative to which the assessment of profile parameters is performed. This reference line is transferred to the original primary profile (see figure 1c) and the roughness profile according to this part of ISO 13565 is obtained from the difference between the primary profile and the reference line (see figure 1d).

## 7 Selection of the cut-off wavelength $\lambda_c$ and the evaluation length $l_n$

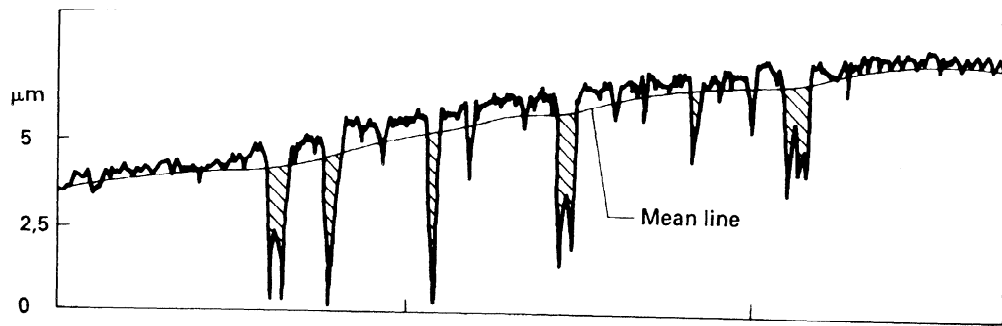
The measurements shall preferably be carried out using a cut-off wavelength of  $\lambda_c = 0,8$  mm. In justified exceptional cases,  $\lambda_c = 2,5$  mm may be selected and this shall be stated in the specification and test results.

Table 1 provides the relationship between cut-off wavelength  $\lambda_c$  and the evaluation length  $l_n$

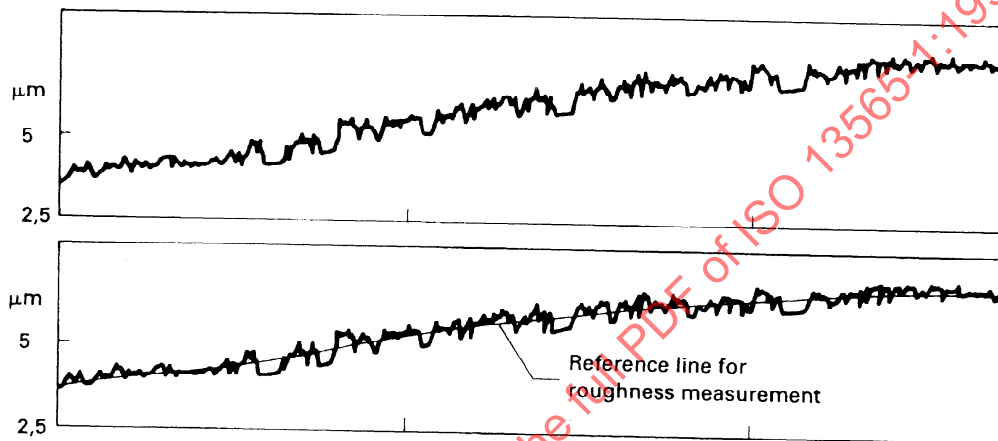
**Table 1 — Relationship between the cut-off wavelength  $\lambda_c$  and the evaluation length  $l_n$**

Dimensions in millimetres

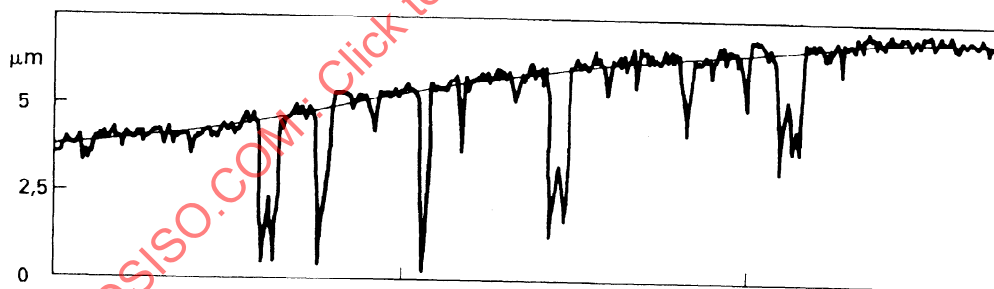
| $\lambda_c$ | $l_n$ |
|-------------|-------|
| 0,8         | 4     |
| 2,5         | 12,5  |



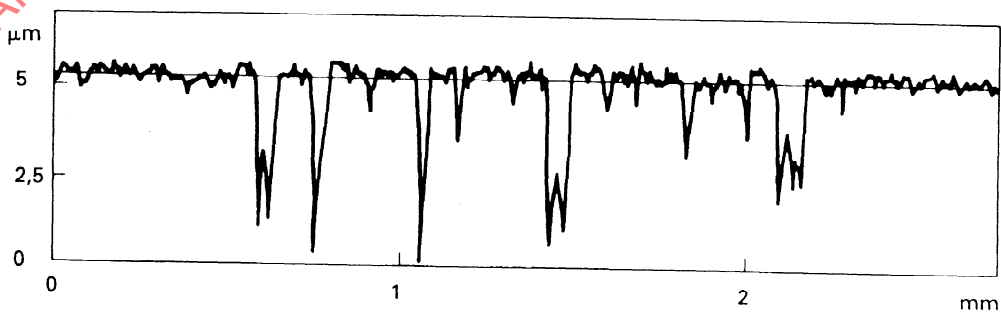
a) Unfiltered primary profile (valleys shown hatched)



b) Unfiltered primary profile after suppression of valleys



c) Position of the reference line in the primary profile



d) Roughness profile in accordance with this standard

Figure 1 — Filtering process

## Annex A (informative)

### Relation to GPS matrix model

For full details about the GPS matrix model see ISO/TR 14638.

#### A.1 Information about this part of ISO 13565 and its use

This part of ISO 13565 describes a filtering method for use with surfaces that have deep valleys below a more finely finished plateau with a relatively small amount of waviness. The roughness profile generated using the filter defined in ISO 11562 suffers some undesirable distortions, when measuring this type of surface, which is very common.

This method serves to reduce these distortions, thus enabling the parameters defined in ISO 13565-2 and ISO 13565-3 to be used for evaluating the above-mentioned type of surface, with minimal influence from these distortions.

#### A.2 Position in the GPS matrix model

This part of ISO 13565 is a *General GPS standard*, which influences the chain links 2 and 3 of the chain of standards for roughness profile in the *General GPS matrix*, as graphically illustrated in figure A.1.

| Fundamental<br>GPS<br>standards | Global GPS standards                 |   |   |   |   |   |   |
|---------------------------------|--------------------------------------|---|---|---|---|---|---|
|                                 | General GPS matrix                   |   |   |   |   |   |   |
|                                 | Chain link number                    | 1 | 2 | 3 | 4 | 5 | 6 |
|                                 | Size                                 |   |   |   |   |   |   |
|                                 | Distance                             |   |   |   |   |   |   |
|                                 | Radius                               |   |   |   |   |   |   |
|                                 | Angle                                |   |   |   |   |   |   |
|                                 | Form of line independent of datum    |   |   |   |   |   |   |
|                                 | Form of line dependent on datum      |   |   |   |   |   |   |
|                                 | Form of surface independent of datum |   |   |   |   |   |   |
|                                 | Form of surface dependent on datum   |   |   |   |   |   |   |
|                                 | Orientation                          |   |   |   |   |   |   |
|                                 | Location                             |   |   |   |   |   |   |
|                                 | Circular run-out                     |   |   |   |   |   |   |
|                                 | Total run-out                        |   |   |   |   |   |   |
|                                 | Datum planes                         |   |   |   |   |   |   |
|                                 | Roughness profile                    |   |   |   |   |   |   |
|                                 | Waviness profile                     |   |   |   |   |   |   |
|                                 | Primary profile                      |   |   |   |   |   |   |
|                                 | Surface defects                      |   |   |   |   |   |   |
|                                 | Edges                                |   |   |   |   |   |   |

Figure A.1

#### A.3 Related standards

The related International Standards are those of the chains of standards indicated in figure A.1.

## **Annex B**

(informative)

### **Bibliography**

- [1] ISO 13565-2:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties — Part 2: Height characterization using the linear material ratio curve.*
- [2] ISO 13565-3:—<sup>1)</sup>, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties — Part 3: Height characterization using the material probability curve.*
- [3] ISO/TR 14638:1995, *Geometrical Product Specifications (GPS) — Masterplan.*
- [4] *VIM — International vocabulary of basic and general terms in metrology.* BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 2nd edition, 1993.

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1) To be published.