# SLOVENSKI STANDARD
# SIST EN ISO 13565-3:2002

**01-januar-2002**

---

**Specifikacija geometrijskih veliļ in izdelka - Tekstura povrġine: profilna metoda - Povrġine s slojevitimi funkcionalnimi lastnostmi - 3. del: Doloļ evanje viġine na osnovi krivulje verjetnosti (ISO 13565-3:1998)**

Geometrical Product Specifications (GPS) - Surface texture: Profile method; surfaces having stratified functional properties - Part 3: Height characterization using the material probability curve (ISO 13565-3:1998)



Geometrische Produktspezifikation (GPS) - Oberflächenbeschaffenheit: Tastschnittverfahren; Oberflächen mit plateauartigen funktionsrelevanten Eigenschaften - Teil 3: Beschreibung der Höhe von Oberflächen mit der Wahrscheinlichkeitsdichtekurve (ISO 13565-3:1998)



Spécification géométrique des produits (GPS) - Etat de surface: Méthode du profil; surfaces ayant des propriétés fonctionnelles différentes suivant les niveaux - Partie 3: Caractérisation des hauteurs par la courbe de probabilité de matiere (ISO 13565-3:1998)

**Ta slovenski standard je istoveten z:** **EN ISO 13565-3:2000**

---

**ICS:**

17.040.20 Lastnosti površin Properties of surfaces

**SIST EN ISO 13565-3:2002** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

**EN ISO 13565-3**

May 2000

ICS 17.040.20

English version

# Geometrical Product Specifications (GPS) - Surface texture: Profile method; Surfaces having stratified functional properties - Part 3: Height characterization using the material probability curve (ISO 13565-3:1998)

Spécification géométrique des produits (GPS) - Etat de surface: Méthode du profil; surfaces ayant des propriétés fonctionnelles différentes suivant les niveaux - Partie 3: Caractérisation des hauteurs par la courbe de probabilité de matière (ISO 13565-3:1998)

Geometrische Produktspezifikation (GPS) - Oberflächenbeschaffenheit: Tastschnittverfahren; Oberflächen mit plateauartigen funktionsrelevanten Eigenschaften - Teil 3: Beschreibung der Höhe von Oberflächen mit der Wahrscheinlichkeitsdichtekurve (ISO 13565-3:1998)

This European Standard was approved by CEN on 13 April 2000.



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 Central Secretariat 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 Central Secretariat has the same status as the official versions.



CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

**Central Secretariat: rue de Stassart, 36 B-1050 Brussels**

## Foreword

The text of the International Standard from Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 290 "Dimensional and geometrical product specification and verification", the secretariat of which is held by DIN.

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 November 2000, and conflicting national standards shall be withdrawn at the latest by November 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of the International Standard ISO 13565-3:1998 has been approved by CEN as a European Standard without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

INTERNATIONAL STANDARD

**ISO 13565-3**

First edition
1998-11-15

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

## Part 3:
Height characterization using the material probability curve



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



*Partie 3: Caractérisation des hauteurs par la courbe de probabilité de matière*

Reference number
ISO 13565-3:1998(E)

## Contents

Page







International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

## 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 13565-3 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification.*

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*



Annex A forms an integral part of this part of ISO 13565. Annexes B to F are for information only.

## 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 the chain link 2 of the chains of standards on roughness profile and primary profile.

For more detailed information on the relation of this standard to the GPS matrix model see annex E.

This part of ISO 13565 provides a numerical characterization of surfaces consisting of two vertical random components, namely, a relatively coarse "valley" texture and a finer "plateau" texture. This type of surface is used for lubricated, sliding contact, for example in cylinder liners and fuel injectors. The calculations necessary to determine the parameters *Rpq*, *Rvq*, and *Rmq* (*Ppq*, *Pvq*, and *Pmq*) used to characterize these two components separately involves the generation of the material probability curve, the determination of its linear regions, and the linear regressions through these regions.

The parameters are undefined for surfaces not consisting of two such components.

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

# Part 3:
Height characterization using the material probability curve

## 1 Scope

This part of ISO 13565 establishes the evaluation process for determining parameters from the linear regions of the material probability curve, which is the Gaussian representation of the material ratio curve. The parameters are intended to aid in assessing tribological behaviour, for example of lubricated, sliding surfaces, and to control the manufacturing process.

## 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 1302:1992, *Technical drawings — Methods of indicating surface texture.*

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

ISO 4287:1997, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters.*

ISO 13565-1:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Surfaces having stratified functional properties — Part 1: Filtering and general measurement conditions.*

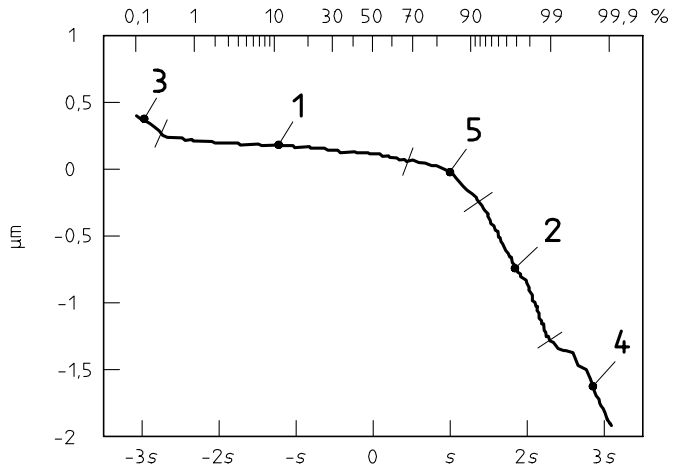
ISO 13565-2:1996, *Geometrical Product Specifications (GPS) — Surface Texture: Profile method; Surfaces having stratified functional properties — Part 2: Height characterization using the linear material ratio curve.*

## 3 Definitions

For the purposes of this part of ISO 13565, the definitions given in ISO 3274, ISO 4287, ISO 13565-2 and the following apply.

**3.1**
**material probability curve**
a representation of the material ratio curve in which the profile material length ratio is expressed as Gaussian probability in standard deviation values, plotted linearly on the horizontal axis

NOTE — This scale is expressed linearly in standard deviations according to the Gaussian distribution. In this scale the material ratio curve of a Gaussian distribution becomes a straight line. For stratified surfaces composed of two Gaussian distributions, the material probability curve will exhibit two linear regions (see 1 and 2 in figure 1).




**Key**

1 Plateau region
2 Valley region
3 Debris or outlying peaks in the data (profile)
4 Deep scratches or outlying valleys in the data (profile)
5 Unstable region (curvature) introduced at the plateau to valley transition point based on the combination of two distributions

**Figure 1 — Material probability curve**



**3.2**
*Rpq* (*Ppq*) **parameter**
slope of a linear regression performed through the plateau region



See figure 2.

NOTE — *Rpq* (*Ppq*) can thus be interpreted as the *Rq* (*Pq*)-value (in micrometres) of the random process that generated the plateau component of the profile.

**3.3**
*Rvq* (*Pvq*) **parameter**
slope of a linear regression performed through the valley region

See figure 2.

NOTE — *Rvq* (*Pvq*) can thus be interpreted as the *Rq* (*Pq*)-value (in micrometres) of the random process that generated the valley component of the profile.

**3.4**
*Rmq* (*Pmq*) **parameter**
relative material ratio at the plateau to valley intersection

See figure 2.

## 4 Procedure

The roughness profile used for determining the parameters *Rpq*, *Rvq* and *Rmq* shall be calculated in accordance with ISO 13565-1. This roughness profile is different from that in ISO 4287. The profile for determining the parameters *Ppq*, *Pvq* and *Pmq* shall be the primary profile.

Three non-linear effects can be present in the material probability curve as shown in figure 1 for measured surface data from a two-process surface. These effects shall be eliminated by limiting the fitted portions of the material probability curve, using only the statistically sound, Gaussian portions of the material probability curve excluding a number of influences.

In figure 1 the non-linear effects originate from:

— debris or outlying peaks in the data (profile) (labelled 3);

— deep scratches or outlying valleys in the data (profile) (labelled 4); and

— unstable region (curvature) introduced at the plateau to valley transition point based on the combination of two distributions (labelled 5).

These exclusions are intended keep the parameters more stable for repeated measurements of a given surface. Figure 2 shows a profile with its corresponding material probability curve and its plateau and valley regions and the parts of the surface that defines the two regions. The profile has a peak that is outlying and the figure shows how it does not influence the parameters. Figure 2 also shows how the bottom parts of the deepest groves, which will vary significantly depending on where the measurements are made on a surface, are disregarded when determining the parameters.

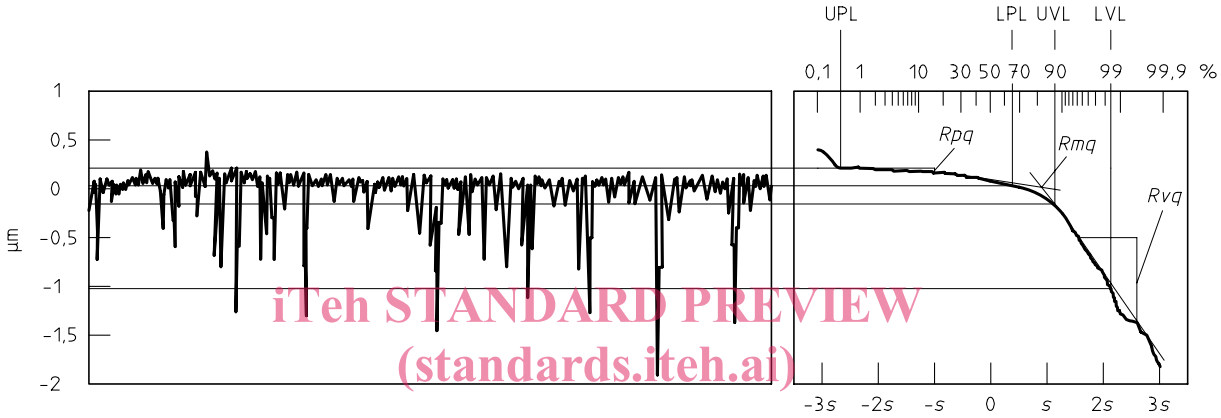





**Figure 2 — Roughness profile with its corresponding material probability curve and the regions used in the definitions of the parameters *Rpq*, *Rvq*, and *Rmq***



## 5 Measurement process requirements

The following criteria are designed to ensure that the profile represents a proper two-process surface and that the measuring process is adequate for calculating a stable material probability curve resulting in reliable parameter values. These criteria shall be met in order for the parameters *Rpq*, *Rvq*, and *Rmq* (*Ppq*, *Pvq*, and *Pmq*) to be defined:

— The instrument shall be capable of measuring a value of *Rq* from an optical flat that is less than 30 % of the nominal value of *Rpq* (*Ppq*).

— The vertical resolution of the material probability curve shall be such that at least 40 classes fall within the linear plateau and linear valley regions respectively.

— The digital data density of the material probability curve shall be such that at least 100 profile ordinates fall within the linear plateau and linear valley regions respectively.

— The ratio *Rvq*: *Rpq* (*Pvq*: *Ppq*) shall be at least 5.

— The conic section regressions result in a hyperbolic solution (see annex A).

If the profile does not satisfy the above criteria, a suitable warning message shall give the reason for the failure.

## 6 Drawing indications

The parameters specified in this part of ISO 13565 shall be indicated on drawings in accordance with ISO 1302.