

SVENSK STANDARD

SS-EN ISO 5436-2:2012

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Geometriska produktspecifikationer (GPS) – Ytstruktur: Profilm Metod; Ytnormaler – Del 2: Kalibrering via mjukvara (ISO 5436-2:2012)

Geometrical product specifications (GPS) – Surface texture: Profile method; Measurement standards – Part 2: Software measurement standards (ISO 5436-2:2012)

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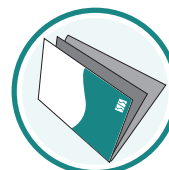
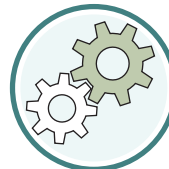
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Denna standard ersätter SS-EN ISO 5436-2, utgåva 1 och SS-EN ISO 5436-2/AC:2008, utgåva 1.

The European Standard EN ISO 5436-2:2012 has the status of a Swedish Standard. This document contains the official version of EN ISO 5436-2:2012.

This standard supersedes the Swedish Standard SS-EN ISO 5436-2, edition 1 and SS-EN ISO 5436-2/AC:2008, edition 1.

**Förhållandet till övriga delar under samma huvudtitel - Utdrag ur Förord i ISO 5436-2:2012/
Relations to other parts under the same general title - Extract from the Foreword of
ISO 5436-2:2012**

ISO 5436 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Surface texture: Profile method; Measurement standards*:

- Part 1: *Material measures*
- Part 2: *Software measurement standards*

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Denna standard är framtagen av kommittén för Mätteknik GPS och Ytstruktur, SIS/TK 507/AG 6.

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EUROPEAN STANDARD

EN ISO 5436-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2012

ICS 17.040.30

Supersedes EN ISO 5436-2:2001

English Version

**Geometrical product specifications (GPS) - Surface texture:
Profile method; Measurement standards - Part 2: Software
measurement standards (ISO 5436-2:2012)**

Spécification géométrique des produits (GPS) - État de
surface: Méthode du profil; Étalons - Partie 2: Étalons
logiciels (ISO 5436-2:2012)

Geometrische Produktspezifikation (GPS) -
Oberflächenbeschaffenheit: Tastschnittverfahren; Normale
- Teil 2: Software-Normale (ISO 5436-2:2012)

This European Standard was approved by CEN on 25 September 2012.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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SS-EN ISO 5436-2:2012 (E)

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Foreword

This document (EN ISO 5436-2:2012) 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 April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

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

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The text of ISO 5436-2:2012 has been approved by CEN as a EN ISO 5436-2:2012 without any modification.

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Introduction

This part of ISO 5436 is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences chain link 6 of the chain of standards on roughness, waviness and primary profiles.

The ISO/GPS Masterplan given in ISO/TR 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 detailed information on the relationship of this part of ISO 5436 to other standards and the GPS matrix model, see Annex B.

This part of ISO 5436, together with ISO 5436-1, introduces two new measurement standards:

- Type E, for calibrating the profile co-ordinate system;
- Type F, for calibrating software.

This part of ISO 5436 is concerned with software measurement standards.

Geometrical product specifications (GPS) — Surface texture: Profile method; Measurement standards —

Part 2: Software measurement standards

1 Scope

This part of ISO 5436 defines Type F1 and Type F2 software measurement standards (etalons) for verifying the software of measuring instruments. It also defines the file format of Type F1 software measurement standards for the calibration of instruments used for measuring the surface texture by the profile method defined in ISO 3274.

NOTE 1 Throughout this part of ISO 5436, the term “softgauge” is used as a substitute for “software measurement standard Type F1”.

NOTE 2 Formerly, “measurement standards” were referred to as “calibration specimens”.

NOTE 3 ISO 3274 only refers to instruments with independent reference datums.

2 Normative references

The following referenced documents are indispensable for the application 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 3274:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

ISO 5436-1:2000, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Measurement standards — Part 1: Material measures*

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

ISO 16610-21:2011, *Geometrical product specifications (GPS) — Filtration — Part 21: Linear profile filters: Gaussian filters*

ISO 17450-2:2012, *Geometrical product specifications (GPS) — General concepts — Part 2: Basic tenets, specifications, operators, uncertainties and ambiguities*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in Measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3274, ISO 5436-1, ISO 12085, ISO 16610-21:2011, ISO/IEC Guide 99 and the following apply.

3.1

software measurement standard

reference data or reference software intended to reproduce the value of a measurand with known uncertainty in order to verify the software used to calculate the measurand in a measuring instrument

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3.2

ASCII string

array of ASCII characters terminating in <ASCII 0>

3.3

integer

2-byte representation of whole number

NOTE 1 Integers have a minimum value of $-32\,768$ and a maximum value of $+32\,767$.

NOTE 2 The less significant bytes are stored in memory addresses lower than those in which are stored the more significant bytes.

3.4

unsigned integer

2-byte representation of a positive whole number

NOTE 1 Unsigned integers have a minimum value of 0 and a maximum value of 65 535.

NOTE 2 The less significant bytes are stored in memory addresses lower than those in which are stored the more significant bytes.

3.5

long integer

4-byte representation of a whole number

NOTE 1 Long integers have a minimum value of $-2\,147\,483\,648$ and a maximum value of $+2\,147\,483\,647$.

NOTE 2 The less significant bytes are stored in memory addresses lower than those in which are stored the more significant bytes.

3.6

single precision float

4-byte representation consisting of a sign bit, an 8-bit excess -127 binary exponent and a 23-bit mantissa representing numbers between 1,0 and 2,0

NOTE 1 Since the high-order bit of the mantissa is always 1, it is not stored in the number.

NOTE 2 Single precision floats have an approximate range of $\pm 1,17e^{-38}$ to $\pm 3,4e^{+38}$.

NOTE 3 The less significant bytes are stored in memory addresses lower than those in which the more significant bytes are stored.

3.7

double precision float

8-byte representation consisting of a sign bit, an 11-bit excess $-1\,023$ binary exponent, and a 52-bit mantissa, plus the implied high-order 1 bit

NOTE 1 Double precision floats have an approximate range of $\pm 2,22e^{-308}$ to $\pm 2,22e^{+308}$.

NOTE 2 The less significant bytes are stored in memory addresses lower than those in which the more significant bytes are stored.

4 Type F software measurement standards

4.1 General

Type F software measurement standards are designed to verify the measuring instrument's software (i.e. filter algorithms, parameter calculations, etc.).

These measurement standards can contain a form component which it shall be possible to remove.

4.2 Type F1 — Reference data

Type F1 measurement standards are computer data files that depict a digital representation of a primary profile in a suitable recording medium.

Most of the operations between the total profile and primary profile are instrument-specific and, as a result, are difficult to standardize. The primary profile is currently the first point where all the subsequent operations for the definition of surface texture measurands are standardized and is thus chosen as the standardized point of entry for type F1 softgauges.

A non-exhaustive, non-ordered, informative list of operations between the total profile and primary profile may include the following.

- **Adjustment for calibration** — There are many different calibration models: gain factor, polynomial corrections for curvilinear co-ordinates, interpolation method corrections for curvilinear co-ordinates, etc.
- **Stylus tip correction** — Corrects for the finite size and shape of the stylus.
- **Decimation** — Reduces the number of the data points for subsequent calculation.
- **Equalization of interval of data points** — Makes the data by using mathematical interpolation.
- **Ls filtering** — Convolutates with previous filtering (i.e. an anti-aliasing filter of an A/D convertor) to make a true Gaussian filter.
- **End effects** — Removes a portion of the profile at the beginning and at the end to reduce possible end effects due to, for example, Ls filtering, stylus tip correction, etc.
- **Fitting of form by association** — Total least squares, linear least squares, Chebychev (minimum zone), fitting using robust norms (i.e. L1), one-sided fitting, Theil-Sen-type estimators.
- **Removal of form from profile** — Projection, orthogonal to line normal.

If the entry point for the F1 standard is before the primary profile (e.g. the total profile), the signal flow to generate the primary profile (by steps like those exemplarily listed above) shall be agreed upon between the producer and the user of the F1 standard.

NOTE The certified results for mathematically designed synthetic data can often be calculated directly without the need for certification by Type F2 measurement standards.

4.3 Type F2 — Reference software

Type F2 measurement standards are reference software. Reference software consists of traceable computer software against which software in a measuring instrument can be compared.

Type F2 measurement standards are used to test software by inputting a common data set into both the software under test/calibration and the reference software, then comparing the results from the software under test with the certified results from the reference software.

NOTE Type F2 measurement standards can also be used to certify Type F1 measurement standards.

Reference software values shall be traceable.

5 File format for Type F1 reference data

5.1 General

The file extension of this file protocol is `.smd`. The file protocol for the softgauge is divided into four separate sections or records. Each record is composed of lines of information and, within each line, there are various "fields" in which the information is coded. The file format is in 7-bit ASCII character code. Each line is terminated by a carriage return (`<cr>`) and line feed (`<lf>`).