
**Geometrical product specifications
(GPS) — Surface texture: Areal —
Part 71:
Software measurement standards**

*Spécification géométrique des produits (GPS) — État de surface:
Surfacique —*

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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).

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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.
ISO 25178-71:2017

This second edition cancels and replaces the first edition (ISO 25178-71:2012), which has been technically revised.
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The main changes compared to the previous edition are as follows:

- the definition of [3.7](#) has been changed;
- [Table 1](#) has been changed.

A list of all parts in the ISO 25178 series can be found on the ISO website.

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 G of the chains of standards on profile and areal surface texture.

The ISO/GPS Masterplan 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 specifications made in accordance with this document, unless otherwise indicated.

For more detailed information of the relation of this document to the GPS matrix model, see [Annex B](#).

This document is concerned with software gauges (Type S1) and reference software (Type S2). It also defines the SDF file format for Type S1 software gauges.

The surface data file (SDF) format is already used by the industry, in particular, by instrument manufacturers and academia. The SDF file format as defined in this document is a standardized sub-set of the possibilities included in the SDF file format as initially defined in the European Surfstand project and EUR15178. It is envisaged that the SDF file format could evolve (as more experience in its usage and future requirements are identified) later in a version 2.0 with additional fields and possibilities.

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

Part 71: Software measurement standards

1 Scope

This document defines Type S1 and Type S2 software measurement standards (etalons) for verifying the software of measuring instruments. It also defines the file format of Type S1 software measurement standards for the calibration of instruments for the measurement of surface texture by the areal method as defined in the areal surface texture chain of standards, chain link G.

NOTE Throughout this document, the term “softgauge” is used as a substitute for “software measurement standard Type S1”.

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

ISO 16610 (all parts), *Geometrical product specifications (GPS) — Filtration*

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

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

ISO 25178-3, *Geometrical product specifications (GPS) — Surface texture: Areal — Part 3: Specification operators*

ISO/IEC Guide 98-1, *Uncertainty of measurement — Part 1: Introduction to the expression of uncertainty in measurement*

ISO/IEC Guide 99, *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 5436-2, ISO 16610 (all parts), ISO 17450-2, ISO 25178-2, ISO 25178-3, ISO/IEC Guide 98-1 and ISO/IEC Guide 99 and the following apply.

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

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

3.1 software measurement standard

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

3.2 CHAR[n]
array of n ASCII characters

3.3 BYTE
1-byte (8-bit) representation of an ASCII character

3.4 UINT16
2-byte representation of an unsigned integer

Note 1 to entry: Unsigned integers have a minimum value of 0 and a maximum value of 65 535.

Note 2 to entry: The less significant bytes are stored in lower memory addresses; the more significant bytes are stored in higher memory addresses.

3.5 INT16
2-byte representation of a signed integer

Note 1 to entry: Short integers have a minimum value of -32 768 and a maximum value of 32 767.

Note 2 to entry: The less significant bytes are stored in lower memory addresses; the more significant bytes are stored in higher memory addresses.

3.6 INT32
4-byte representation of a signed integer

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Note 1 to entry: Long integers have a minimum value of -2 147 483 648 and a maximum value of 2 147 483 647.

Note 2 to entry: The less significant bytes are stored in lower memory addresses; the more significant bytes are stored in higher memory addresses.

3.7 DOUBLE
8-byte representation of a real number consisting of a sign bit, an 11-bit binary exponent, and a 52-bit mantissa, plus the implied high-order 1 bit

Note 1 to entry: Normalized double precision floating point numbers have a range of $\pm[1 + (1 - 2^{-52})] \cdot 2^{1023} \approx \pm 1,797\,693\,134\,862\,315\,7 \cdot e^{308}$. The smallest value is $2,225\,073\,858\,507\,201\,4 \cdot e^{-308}$.

Note 2 to entry: The less significant bytes are stored in lower memory addresses; the more significant bytes are stored in higher memory addresses.

Note 3 to entry: See IEEE 754-2008 for binary floating-point arithmetic.

4 Type S software measurement standards

4.1 General

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

The content of a measurement standard shall be considered a scale limited surface (i.e. an S-F surface or an S-L surface). No part of the content of a measurement standard shall be considered form and thus,

no form removal shall be undertaken on a measurement standard prior to presenting it to the software being tested.

4.2 Type S1, reference data

This type of measurement standard is a computer data file that contains a digital representation of a scale limited surface in a suitable recording medium.

Type S1 reference data are used to test software by inputting them as data into the software under test/calibration and comparing the results from the software under test with the certified results from the calibration certificate of the softgauge.

NOTE The certified results for mathematically designed synthetic data can often be calculated directly without the need for certification by Type S2 measurement standards.

4.3 Type S2, reference software

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

NOTE 1 Traceable here means a traceable chain of comparisons, with uncertainty, back to a mathematically designed synthetic data set whose results can be calculated directly.

Type S2 reference software are used to test software by inputting a common data set into the software under test/calibration and the reference software and comparing the results from the software under test with the certified results from the reference software. Reference software values shall be traceable.

NOTE 2 Type S2 measurement standards can also be used to certify Type S1 reference data.

5 File format for Type S1 reference data

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5.1 General

The file extension of this file protocol is SDF. The file protocol for the softgauge is divided into three separate sections or records. For implementation of the ASCII and BINARY representations of an SDF data format, see [Annex A](#).

NOTE For the purposes of this document, a right-handed coordinate system is assumed (see ISO 25178-2). Looking from the top, the first point in the data file is in the top left corner.

5.2 Record 1 — Header

5.2.1 General

The header contains general information about each specific measurement. The record is composed of various “fields” in which the information is coded.

The BINARY format consists of fixed length fields defined in [Table 1](#).

Except for the version number, the ASCII format, for the header, consists of a series “keyword = value of field” where the keyword is the ASCII field name given in [Table 1](#).

5.2.2 Version number

The version of a softgauge file format is an array of eight characters formatted the following way: “aISO-1.0” for the ASCII file format or “bISO-1.0” for the BINARY file format. Future evolutions of this format will modify the version number, such as “-2.0”.