INTERNATIONAL STANDARD

ISO 25178-1

First edition
2016-04-15

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

Part 1: Indication of surface texture

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

Partie 1: Indication des états de surface

Reference number
ISO 25178-1:2016(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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. 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. 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. The committee responsible for this document is ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

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

ISO 25178 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Surface texture: Areal*:

— *Part 1: Indication of surface texture*

— *Part 2: Terms, definitions and surface texture parameters*

— *Part 3: Specification operators*

— *Part 6: Classification of methods for measuring surface texture*

— *Part 70: Physical measurement standards*

— *Part 71: Software measurement standards*

— *Part 72: XML file format x3p*

— *Part 601: Nominal characteristics of contact (stylus) instruments*

— *Part 602: Nominal characteristics of non-contact (confocal chromatic probe) instruments*

— *Part 603: Nominal characteristics of non-contact (phase shifting interferometric microscopy) instruments*

— *Part 604: Nominal characteristics of non-contact (coherence scanning interferometry) instruments*

— *Part 605: Nominal characteristics of non-contact (point autofocus probe) instruments*

— *Part 606: Nominal characteristics of non-contact (focus variation) instruments*

— *Part 701: Calibration and measurement standards for contact (stylus) instruments*

The following parts are planned:

— *Part 4: Comparison rules*

— *Part 5: Verification operators*

— *Part 600: Metrological characteristics for areal-topography measuring methods* [1)]

— *Part 607: Nominal characteristics of non-contact (confocal microscopy) instruments*

— *Part 700: Calibration and verification of metrological characteristics of areal-topography measuring instruments*

1) Part 600 is intended to contain provisions that are in common with the other 600-level parts of ISO 25178. Once Part 600 has been submitted as a Final Draft International Standard, provisions of the other 600-level parts that are then redundant with provisions of Part 600 will be removed from them.

Introduction

This part of the ISO 25178- series standards is a geometrical product specification standard and is to be regarded as a general GPS standard (see ISO 14638). It influences the chain link A of the chains of standards on 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. The default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document, unless otherwise stated.

For more detailed information of the relation of this standard to the GPS matrix model, see Annex F.

This part of ISO 25178 covers the indication of areal surface texture

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

Part 1: Indication of surface texture

1 Scope

This part of ISO 25178 specifies the rules for indication of areal surface texture in technical product documentation (e.g. drawings, specifications, contracts, reports) by means of graphical symbols.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1101:2012, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 1302:2002, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

ISO 3098-2, *Technical product documentation — Lettering — Part 2: Latin alphabet, numerals and marks*

ISO 14406, *Geometrical product specifications (GPS) — Extraction*

ISO 16792, *Technical product documentation — Digital product definition data practices*

ISO 25178-2:2012, *Geometrical product specifications (GPS) — Surface texture: Areal — Part 2: Terms, definitions and surface texture parameters*

ISO 25178-3:2012, *Geometrical product specifications (GPS) — Surface texture: Areal — Part 3: Specification operators*

ISO 81714-1, *Design of graphical symbols for use in the technical documentation of products — Part 1: Basic rules*

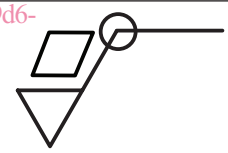
3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 1101, ISO 1302, ISO 14406, ISO 16792, ISO 25178-2 and ISO 25178-3 apply.

4 Graphical symbols for the indication of areal surface texture

Requirements for areal surface texture are indicated on technical product documentation by graphical symbols, each having its own significant meaning. The symbols used are similar to the ones defined in ISO 1302:2002, Clause 4. To identify that the requirement is an areal surface texture, a rhomb is added to the symbol, see Table 1.

Table 1 — Graphical symbols for the indication of areal surface texture

No.	Description	Symbol
1	Basic graphical symbol for areal surface texture	
2	Expanded graphical symbol indicating removal of material required	
3	Expanded graphical symbol indicating removal of material not permitted	
4	Complete graphical symbol. Any manufacturing process permitted	
5	Complete graphical symbol Material shall be removed	
6	Complete graphical symbol Material shall not be removed	
7	Complete graphical symbol With “all around” modifier	

When the same surface texture is required on all surfaces around a workpiece outline (integral features), represented on the drawing by a closed outline of the workpiece, a circle shall be added to the complete graphical symbol as illustrated in Table 1 and shown in Figure 1.

Surfaces shall be indicated independently if any ambiguity may arise from the all-around indication.

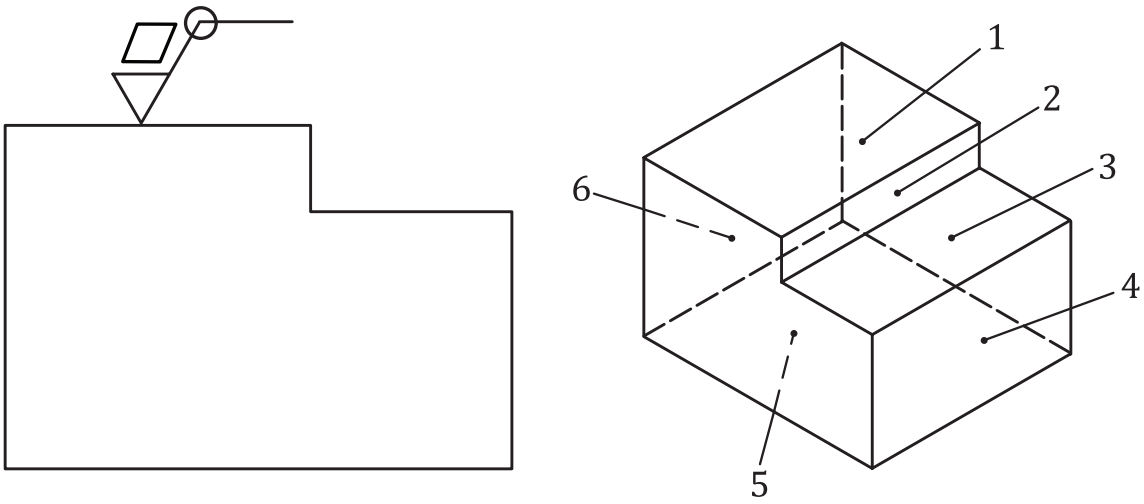


Figure 1 — Areal surface requirement for all six surfaces represented by outline on workpiece

The outline on the drawing in Figure 1 represents the six surfaces shown on the 3 D-representation of the workpiece (the front and rear surfaces not included).

NOTE In 3-D annotation, it might be helpful to add an intersection plane indicator to make the annotation drawing plane independent. For further instructions, see Annex D.

5 Composition of complete graphical symbol for areal surface texture

5.1 General

In order to ensure that an areal surface texture requirement is unambiguous, it is necessary, in addition to the indication of both a surface texture parameter and its numerical value, to specify additional requirements (e.g. type of scale limitation, transmission band, type of filters, manufacturing process, surface lay and possible machining allowances). It may also be necessary to set up requirements for several different surface texture parameters in order that the surface texture requirements ensure the functional properties of the surface. (Examples of indications of areal surface texture requirements are given in Annex C.)

5.2 Positions of surface texture requirements

The mandatory positions of the various surface texture requirements in the complete graphical symbol are shown in Figure 2.

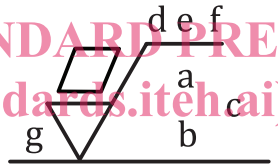


Figure 2 — Positions of surface texture requirements in the complete graphical symbol

The complementary surface texture requirements in the form of

— surface texture parameters

— numerical values, and

— a transmission band

shall be located at the specific positions in the complete graphical symbol in accordance with the following.

a) Position a – Single surface texture requirement

Indicate the type of specification limit, the type of scale limited surface and its nesting indices, the areal surface texture parameter designation with its limit value and other non-defaults in this order.

Generally, the different parts of the indication are separated by a single space but to avoid misinterpretation, a double space (double blank) shall be inserted between the parameter designation and the limit value. Oblique strokes (/) are used to separate the specification sections, see Annex B.

For more information on the contents of position “a”, consult Annex B. Also see ISO 1302:2002, Clause 6.

EXAMPLE S-L 0,025-0,8/Sz 6,8 (minimum content example with mandatory indication of type of scale-limited surface and its nesting indices)

b) Position a and b – Two or more surface texture requirements

Indicate the first surface texture requirement at position “a” as in a).

Indicate the second surface texture requirement at position “b”.

If a third requirement or more is to be indicated, the graphical symbol is to be enlarged accordingly in the vertical direction, to make room for more lines. The positions “a” and “b” are to be moved upwards when the symbol is enlarged. See also ISO 1302:2002, Clause 6.

The orientation of the evaluation area and the orientation of the lay are determined by the position of the graphical symbol on the drawing.

NOTE 1 To make the annotation drawing plane independent, it might be helpful to add an intersection plane indicator, for further instruction see Annex D

c) Position c – Intersection plane for indication of orientation of the evaluation area

If helpful, indicate intersection plane for orientation of the evaluation area, see Annex D.

NOTE 2 If the orientation of the lay is the same as the orientation of the evaluation area, this intersection plane indicator covers both.

d) Position d– Manufacturing requirements

Indicate the manufacturing method, treatment, coatings or other requirements for the manufacturing process to produce the surface, for example, turned, ground, plated. See also ISO 1302:2002, Clause 7.

e) Position e– Surface lay

Indicate the required surface lay symbol in position e, for example, “=”, “X”, “M”. See Table 2. Like the orientation of the evaluation area, the orientation of the lay is determined by the position of the graphical symbol on the drawing.

NOTE 3 If another orientation of the lay is required, it can be indicated in position f by an intersection plane indicator, see Annex D.

f) Position f - Intersection plane indicator for indication of orientation of the surface lay

If the orientation of the surface lay differs from the orientation of the surface texture symbol, it can be indicated here by an intersection plane indicator. See Annex D.

g) Position g – Machining allowance

Indicate the required machining allowance, if any, as a numerical value given in millimetres. See also ISO 1302:2002, Clause 9.

6 Indication of areal surface parameters

6.1 Definition of the tolerance

In the normal case, two conditions are given:

— the type of tolerance, upper or lower limit, designations U or L;

— the type of scale-limited surface, S-F or S-L, as defined in ISO 25178-2:2012, 3.1.5 and 3.1.6.

In the normal case, the upper limit is specified. The designation “U” is then an implicit default and can be left out. For some parameters where there is no normal case, i.e. material ratio parameters and feature parameters, it is recommended always to use the designations U or L. See also ISO 1302:2002, 6.6.

If not otherwise specified, the parameter value indicated is the largest or smallest value allowed.

For bilateral tolerances, see 5.2 b).

6.2 Definition of the parameter

The chosen surface texture areal parameter value shall be supplemented with the information necessary for a correct and unambiguous specification.

In the normal case, three types of information are given:

— filters and nesting indexes;

— parameter and parameter value;

— non-defaults.

For examples, see Annex B.

Defaults according to ISO 25178-2 and -3 are normally not explicitly specified.

Every areal surface texture parameter has its own default control elements and information requirements for specification of non-default elements as given in ISO 25178-3.

The order of the information items follows in principle the order found in ISO 1302 for profile parameters.

For filter designations, see Annex E.

6.3 Indication of manufacturing method or related information

The surface texture parameter value of an actual surface is strongly influenced by the detailed form of the surface texture. A parameter designation, parameter value and transmission band — indicated solely as a surface texture requirement — do not therefore necessarily result in an unambiguous function of the surface.

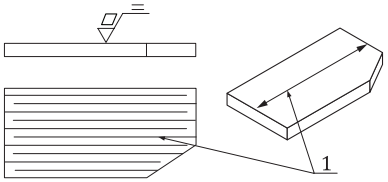
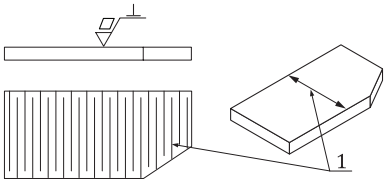
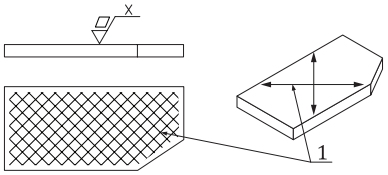
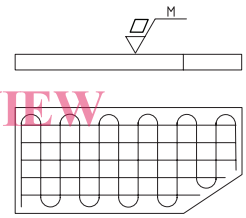
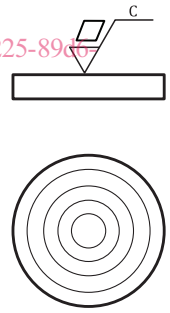
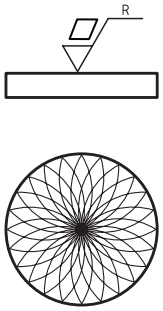
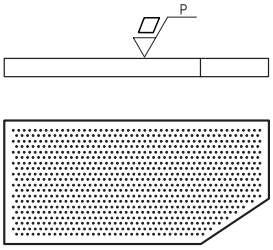
It is consequently sometimes necessary to complement the specification with a statement of the manufacturing process.

For examples, see ISO 1302:2002, Clause 7.

6.4 Indication of surface lay

Standard lay symbols and their indication are shown in Table 2.

Table 2 — Indication of surface lay

Graphical symbol	Interpretation	Examples
=	Parallel to plane of projection of view in which symbol is used	
⊥	Perpendicular to plane of projection of view in which symbol is used	
X	Crossed in two oblique directions relative to plane of projection of view in which symbol is used	
M	Multi-directional	
C	Approximately circular relative to centre of surface to which symbol applies	
R	Approximately radial relative to centre of surface to which symbol applies	
P	Lay is particulate, non-directional or protuberant	
1 Direction of lay		