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

Part 1: Indication of surface texture

*Spécification géométrique des produits (GPS) — État de surface: Méthode du profil —
Partie 1: Indication des états de surface*

ICS: 17.040.40

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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).

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For an explanation on 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.

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

This edition cancels and replaces the edition of ISO 1302:2002, which has been technically revised.

The main changes compared to the edition of ISO 1302:2002 are as follows:

- new criteria for indication are defined
- Tmax rule is the default tolerance acceptance rule

A list of all parts in the ISO 21920 series can be found on the ISO website.

Introduction

This part of ISO 21920 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 C of the chains of standards on profile and areal surface texture.

The ISO/GPS matrix model given in ISO 14638 gives an overview of the ISO/GPS system of which this part of ISO 21920 is a part. The fundamental rules of ISO/GPS given in ISO 8015 apply to this part of ISO 21920 and the default decision rules given in ISO 14253-1 apply to the specifications made in accordance with this part of ISO 21920, unless otherwise indicated.

For more detailed information of the relation of this part of ISO 21920 to other standards and the GPS matrix model, see Annex J.

This part of ISO 21920 covers the indication of profile surface texture.

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Geometrical product specifications (GPS) — Surface texture: Profile — Part 1: Indication of surface texture

1 Scope

This part of ISO 21920 specifies the rules for indication of profile surface texture in technical product documentation by means of graphical symbols. The indications of profile surface texture define requirements to the surface of a workpiece as well as the measurands for verification.

This part of ISO 21920 is only valid for profile surface texture requirements based on a single workpiece.

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 21920-2:2019 *Geometrical product specifications (GPS) — Surface texture: Profile — Part 2: Terms, definitions and surface texture parameters*

ISO 21920-3:2019 *Geometrical product specifications (GPS) — Surface texture: Profile — Part 3: Specification operators*

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3 Terms and definitions

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For the purposes of this document, the terms and definitions given in ISO 21920-2 and ISO 21920-3 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/>

4 Tolerance acceptance rules

4.1 General

Tolerance acceptance rules define the process of approval of a workpiece regarding its tolerance limits due to the measured value(s) of parameter(s). For profile surface texture three tolerance acceptance rules can be indicated.

4.2 Maximum tolerance acceptance rule

The maximum tolerance acceptance rule does not allow the tolerance limit of a parameter to be exceeded. The symbol of the Maximum tolerance acceptance rule is shown in Figure 1.

Tmax

Figure 1 — Symbol of the maximum tolerance acceptance rule

The maximum tolerance acceptance rule is the default case and valid with or without indication of the 'Tmax' symbol.

NOTE: The 'Tmax' symbol can be used for a higher clarity of a specification

4.3 16% tolerance acceptance rule

A specified 16% tolerance acceptance rule allows at most approximately 16 % of all measured values of a parameter to exceed the tolerance limit. The symbol of the 16% tolerance acceptance rule is shown in Figure 2.

The use of the 16% tolerance acceptance rule and the required number of measurements are defined in Annex G.

T16%

Figure 2 — Symbol of the 16% tolerance acceptance rule

The 16% tolerance acceptance rule is valid for the parameter on the line where the 'T16%' symbol is indicated.

If a bilateral tolerance is specified in one line approximately 16 % of all measured values may violate the upper limit and approximately 16 % of all measured values may violate the lower limit.

NOTE 1: The 16% tolerance acceptance rule is an instruction for the approval of a workpiece based on measured values regarding its tolerance limits.

NOTE 2: In former versions the 16% tolerance acceptance rule was named as simplified 16% rule.

NOTE 3: In contrast to former versions the 16% tolerance acceptance rule is not the default case (see Annex H for background)

4.4 Median tolerance acceptance rule

If a median tolerance acceptance rule is specified the median value of all measured values of a parameter has to meet the tolerance limits. The symbol of the Tmed tolerance acceptance rule is shown in Figure 3.

Tmed

Figure 3 — Symbol of the median tolerance acceptance rule

The Tmed tolerance acceptance rule is valid for the parameter on the line where the 'Tmed' symbol is indicated.

NOTE 1: The median tolerance acceptance rule is an instruction for the approval of a workpiece based on measured values regarding its tolerance limits.

NOTE 2: If the median value of all measured values of a parameter meets the tolerance limits the number of measured values violating the limit(s) is not determined.

NOTE 3: The use of the median tolerance acceptance rule requires a minimal number of three measured values of a parameter. A higher number of measurements can be specified by the OR(n) requirements.

5 Criteria for indication of profile surface texture

5.1 General

Indications of profile surface texture define requirements on the surface of a workpiece as well as the measurands for verification.

NOTE: All criteria permitted for indications of profile surface texture are listed in Clauses 5.2 to 5.4 and described in Clause 7.

5.2 Mandatory indication to be explicitly specified

- Graphical symbol for profile surface tolerance
- Symbol of the surface profile parameter
- For functional parameter and for all parameter without defined defaults: indication of the profile L-filter nesting index for R- parameters or profile S-filter nesting index for W- parameters or the setting class number
- Limit of the surface profile parameter

NOTE 1: The indication of the nesting index or the setting class number is optional for all parameter listed in Table 3 or Table 6 of ISO 21920-3.

NOTE 2: It is the task of the design office to choose and indicate the functionally valid L-filter or S-filter according to earlier experience or performed testing results. The Tables 3 to 6 in ISO 21920-3 are based on extensive experience and define defaults on surfaces with low or normal functional requirements.

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5.3 Optional indication to specify default deviating requirements

- Tolerance type (upper, lower or bilateral tolerance limit)
- profile S-filter type
- profile S-filter nesting index
- profile L-filter type for R- parameter or profile S-filter type for W- parameter
- profile L-filter nesting index for R- parameter or profile S-filter nesting index for W- parameter
- evaluation length or for section length based parameter: section length and number of sections
- profile F-operator type and method
- profile F-operator nesting index
- Method of profile extraction
- Profile direction
- Symbol 'OR(n)' to specify other requirements
- Symbol 'Scn' to specify a setting class number

- Symbol 'T16%' or 'Tmax' or 'Tmed' to specify a tolerance acceptance rule

NOTE: Default settings are defined in ISO 21920-3.

6 Indication of profile surface texture

6.1 General

Profile surface texture requirements in technical product specifications shall be specified by one of the graphical symbols described in Clause 6.2.

A minimal indication of profile surface texture shall be built up of the graphical symbol, the parameter designation and the parameter limit value, see Clause 6.3.

In case several parameters are specified the parameter in the first line is relevant for the determination of default settings (see ISO 21920-3).

NOTE: Exceptions are defined in 9.4.

6.2 Graphical symbol

The design of the graphical symbols contains requirements on the production process.

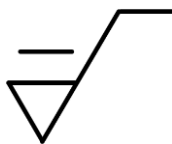
NOTE 1: Proportions of graphical symbols are defined in Annex A.

NOTE 2: See Figure 4 for layout of the three defined graphical symbols and its interpretation.

NOTE 2: The bar in front of the symbol is for a better distinction of a profile to an areal specification and to former versions of the standard.



a) any manufacturing process permitted



b) material shall be removed



c) material shall not be removed

Figure 4 — Graphical symbol indicating profile surface texture

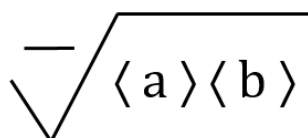
6.3 Minimal indication

6.3.1 General

If a minimal indication is specified all defaults shall be applied. Because defaults can not be defined for all parameter the minimal indication is different for parameter with and without defined defaults.

6.3.2 Minimal indication for parameter with defined defaults

Figure 5 shows all symbols and indications mandatory for a minimal indication of profile surface texture requirements and parameter with defined defaults.



Key:

a symbol for parameter

b numerical limit value

< > placeholder has to be specified

Figure 5 — Minimal indication for parameter with defined defaults (all defaults apply)

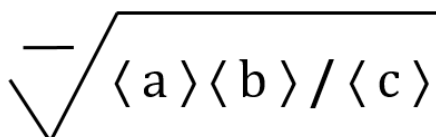
NOTE 1: Parameter with defined defaults are Ra, Rz, Rmax, Rp, Rv and Pt, see ISO 21920-3, Table 3 and 5.

NOTE 2: Exceptions are defined in 9.4. [ISO/DIS 21920-1](https://standards.iteh.ai/catalog/standards/sist/ab03b9a1-0a17-4c24-8163-b4ed7798032e/iso-dis-21920-1)
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NOTE 3: See Annex F for examples. [b4ed7798032e/iso-dis-21920-1](https://standards.iteh.ai/catalog/standards/sist/ab03b9a1-0a17-4c24-8163-b4ed7798032e/iso-dis-21920-1)

6.3.3 Minimal indication for functional parameter and parameter without defined defaults

Figure 6 shows all symbols and indications mandatory for a minimal indication of profile surface texture requirements and parameter without defined defaults. All defaults are defined by the mandatory specified setting class number (Scn) or by the default value of the mandatory profile L-filter nesting index for R- parameters or profile S-filter nesting index for W- parameter.



Key:

a symbol for parameter

b numerical limit value

c symbol for the specified setting class number Scn or a default value of profile L-filter nesting index for R- parameters or profile S-filter nesting index for W- parameter

< > placeholder has to be specified

Figure 6 — Minimal indication for parameter without defined defaults

- NOTE 1: Parameter without defined default are not listed in Table 3 and Table 5 of ISO 21920-3.
- NOTE 2: For functional parameter (e.g. Rk, Rpk, Rvk) are no default nesting index values defined to consider and indicate a functionally valid profile L-filter nesting index value.
- NOTE 3: The specified setting class number leads directly to the column of the Table 2 of ISO 21920-3 with the relevant default settings.
- NOTE 4: Exceptions are defined in 9.4.
- NOTE 5: See Annex F for examples.

6.4 Complete indication

6.4.1 General

The criteria specifying profile surface texture described in Clause 5 shall be arranged depending on the profile parameter type as shown in Clauses 6.4.2 to 6.4.6. All criteria for one parameter shall be indicated in one line.

- NOTE 1: In case several parameters or different criteria for the same parameter need to be specified, the indication follows in one or several additional lines.

- NOTE 2: Examples for indications are given in detail in Annex F.

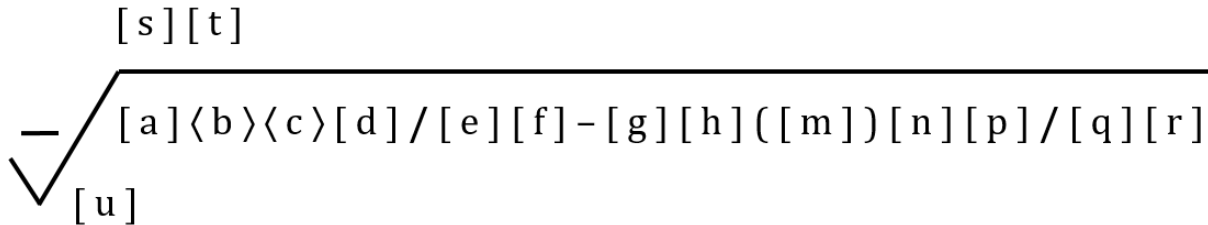
- NOTE 3: The complete indication is shown to define the sequence of the indication of all criteria and may be rarely used in practice.

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6.4.2 Complete indication for non section length based R- parameter

The criteria specifying the non section length based profile roughness parameter shall be arranged as in Figure 7.

NOTE: Non section based R- parameter are e.g. Ra, Rq, Rt, Rk (see ISO 21920-2).



Key:

- a tolerance type
- b symbol for R- parameter
- c numerical limit value of parameter
- d tolerance acceptance rule
- e profile s- filter type
- f profile s- filter nesting index
- g profile L- filter type
- h profile L- filter nesting index
- m evaluation length
- n profile F- operator type and method
- p profile F- operator nesting index
- q method of profile extraction
- r placeholder for the OR(n) – symbol for other requirements
- s manufacturing process
- t surface lay and direction of lay
- u profile direction if indicated relatively to the surface lay

< > placeholder has to be specified

[] placeholder can be specified, if different from the default or an additional requirement

Figure 7 — Indication for non section length based R- parameter including all definable criteria

6.4.3 Complete indication for section length based R- parameter

The criteria specifying the section length based profile roughness parameter shall be arranged as in Figure 8.

NOTE: Section length based R- parameter are e.g. Rz, Rp, Rmax (see ISO 21920-2).

$$\sqrt{\frac{[s][t] \left([a] \langle b \rangle \langle c \rangle [d] / [e][f] - [g][h] ([i] \times [k]) [n][p] / [q][r] \right)}{[u]}}$$

Key:

- a tolerance type
- b symbol for R- parameter
- c numerical limit value of parameter
- d tolerance acceptance rule
- e profile s- filter type
- f profile s- filter nesting index
- g profile L- filter type
- h profile L- filter nesting index
- i section length
- k number of sections
- n profile F- operator type and method
- p profile F- operator nesting index
- q method of profile extraction
- r placeholder for the OR(n) – symbol for other requirements
- s manufacturing process
- t surface lay and direction of lay
- u profile direction if indicated relatively to the surface lay

< > placeholder has to be specified

[] placeholder can be specified, if different from the default or an additional requirement

Figure 8 — Indication for section length based R- parameter including all definable criteria

NOTE: The brackets around ([i] x [k]) bring out the relationship between these criteria as the evaluation length results from this product.

6.4.4 Complete indication for non section length based P- and W- parameter

The criteria specifying non section length based profile primary and waviness parameter shall be arranged as in Figure 9.

NOTE: Non section length based P- and W- parameter are e.g. Pt, Pa, Wt, Wa (see ISO 21920-2).

$$\sqrt{[s][t] \frac{[a]\langle b \rangle\langle c \rangle[d]}{[e][f] - ([m])[n][p]/[q][r]}}_{[u]}$$

Key:

- a tolerance type
- b symbol for P- or W- parameter
- c numerical limit value of parameter
- d tolerance acceptance rule
- e profile s- filter type
- f profile s- filter nesting index
- m evaluation length
- n profile F- operator type and method
- p profile F- operator nesting index
- q method of profile extraction
- r placeholder for the OR(n) – symbol for other requirements
- s manufacturing process
- t surface lay and direction of lay
- u profile direction if indicated relatively to the surface lay

< > placeholder has to be specified

[] placeholder can be specified, if different from the default

Figure 9 — Indication for non section length based P- and W- parameter including all definable criteria