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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

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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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This document cancels and replaces ISO 1302:2002, which has been technically revised. In addition to the change of number, the main changes to ISO 1302:2002 are as follows:

— New specification elements for indication are defined.

— The maximum tolerance acceptance rule is the default tolerance acceptance rule.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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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 chain link A of the chains of standards on profile surface texture.

The ISO GPS matrix model 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 the specifications made in accordance with this document, unless otherwise indicated.

For more detailed information of the relation of this document to other standards and the GPS matrix model, see Annex H, Table H.1, and Annex I.

This document 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 document specifies the rules for indication of surface texture by profile methods in technical product documentation by means of graphical symbols.

This document does not cover population requirements.

NOTE See ISO 18391 for population (batch) specifications.

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.

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ISO 21920-2,[1] *Geometrical product specifications (GPS) — Surface texture: Profile — Part 2: Terms, definitions and surface texture parameters*

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ISO 21920-3,[2] *Geometrical product specifications (GPS) — Surface texture: Profile — 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 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 https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Tolerance acceptance rules

4.1 General

Tolerance acceptance rules define how the tolerance limits are applied to the measured parameter values. For profile surface texture, three tolerance acceptance rules can be indicated. See ISO 21920-3: 2021, Table 1 for the position of the measurements.

1) Under preparation. Stage at the time of publication: ISO/FDIS 21920-2:2021.

2) Under preparation. Stage at the time of publication: ISO/FDIS 21920-3:2021.

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4.2 Maximum tolerance acceptance rule

The maximum tolerance acceptance rule does not allow any measured value to exceed the tolerance limit. The symbol of the maximum tolerance acceptance rule is shown in Figure 1.

Tmax

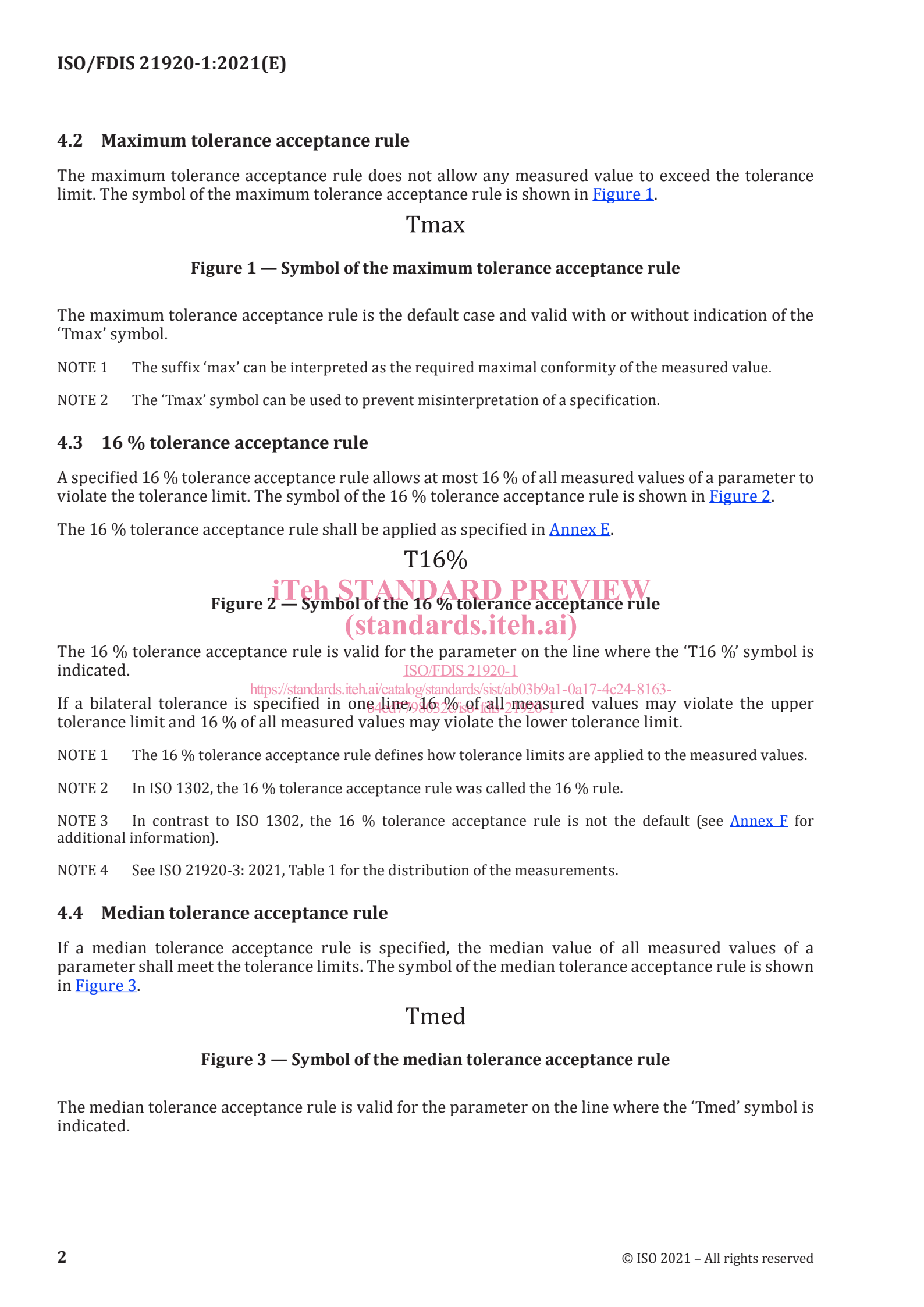

Figure 1 — Symbol of the maximum tolerance acceptance rule

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

NOTE 1 The suffix 'max' can be interpreted as the required maximal conformity of the measured value.

NOTE 2 The 'Tmax' symbol can be used to prevent misinterpretation of a specification.

4.3 16 % tolerance acceptance rule

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

The 16 % tolerance acceptance rule shall be applied as specified in Annex E.

T16%

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Figure 2 — Symbol of the 16 % tolerance acceptance rule

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

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

NOTE 1 The 16 % tolerance acceptance rule defines how tolerance limits are applied to the measured values.

NOTE 2 In ISO 1302, the 16 % tolerance acceptance rule was called the 16 % rule.

NOTE 3 In contrast to ISO 1302, the 16 % tolerance acceptance rule is not the default (see Annex F for additional information).

NOTE 4 See ISO 21920-3: 2021, Table 1 for the distribution of the measurements.

4.4 Median tolerance acceptance rule

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

Tmed

Figure 3 — Symbol of the median tolerance acceptance rule

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

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At least three measured values shall be used to apply the median acceptance rule. A higher number of measurements can be specified in "other requirements" (symbol OR(n), see 7.17).

NOTE 1 The median tolerance acceptance rule defines how tolerance limits are applied to the measured values.

NOTE 2 If the median value of all measured values of a parameter meets the tolerance limit, no more than half the measured values exceed the tolerance limit.

5 Specification elements for indication of profile surface texture specifications

5.1 General

Indications of profile surface texture specify requirements on the surface of a workpiece as well as the specification operator.

NOTE All specification elements permitted for indication of profile surface texture specifications are listed in 5.2 and 5.3 and described in Clause 7.

5.2 Mandatory indication to be explicitly specified

— Graphical symbol for profile surface tolerance.

— Symbol of the profile surface texture parameter.

— Tolerance limit of the profile surface texture parameter.

— For parameters without defined defaults: indication of the profile L-filter nesting index N_{ic} for R-parameters or profile S-filter nesting index N_{ic} for W-parameters or the setting class Scn.

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NOTE 1 Parameters without defined default are not listed in ISO 21920-3: 2021, Tables 3 to 6.

NOTE 2 The indication of the nesting index or the setting class is optional for all parameters listed in ISO 21920-3: 2021, Tables 3 to 6.

NOTE 3 It is the responsibility of the designer to choose and indicate the appropriate L-filter or S-filter. ISO 21920-3: 2021, Tables 3 to 6 define defaults that can be used for surfaces without particular performance requirements.

NOTE 4 A cut-off wavelength for a profile filter is an example of a nesting index, see ISO 21920-2.

5.3 Optional indications to specify non-default or further requirements

— Tolerance type (upper, lower or bilateral tolerance limit).

— Symbol 'T16 %', 'Tmax' or 'Tmed' to specify a tolerance acceptance rule.

— Profile S-filter type.

— Profile S-filter nesting index.

— Profile L-filter type for R-parameters or profile S-filter type for W-parameters.

— Profile L-filter nesting index N_{ic} for R-parameters or profile S-filter nesting index N_{ic} for W-parameters.

— Evaluation length l_e for the evaluation length parameters. Section length l_{sc} and number of sections n_{sc} for the section length parameters.

— Profile F-operator association method and element.

— Profile F-operator nesting index.

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— Method of profile extraction.

— Symbol ‘OR(*n*)’ to specify other requirements.

— Manufacturing process.

— Surface lay and direction of lay.

— Profile direction.

— Symbol ‘Sc*n*’ to specify a setting class.

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 6.2.

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

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

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All indicated specification elements are separated by a single blank character.

NOTE 1 Exceptions are defined in 9.1.

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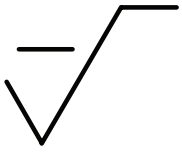
NOTE 2 See Annex G, Table G.1, for new issues in this document and changes to previous documents.

6.2 Graphical symbols

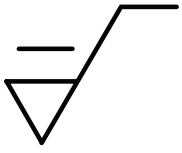
The form of the graphical symbols contains requirements for the production process. Proportions of the graphical symbols shall be indicated as specified in Annex A.

NOTE 1 See Figure 4 for the layout of the three defined graphical symbols and their interpretation.

NOTE 2 The bar above the symbol is to distinguish this symbol from the ones used in ISO 1302 and those used for indication of areal surface texture specifications.



a) Any manufacturing process permitted



b) Material shall be removed

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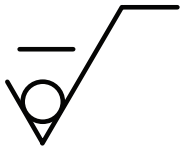

c) Material removal is not permitted

Figure 4 — Graphical symbols 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 cannot be defined for all parameters, the minimal indication is different for parameters with and without defined defaults.

6.3.2 Minimal indication for parameters with defined defaults

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

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Key

a symbol for parameter

b tolerance limit value of the surface texture parameter

< > placeholder has to be specified

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

NOTE 1 Parameters with defined defaults are Rz, Ra, Rp, Rv, Rq, Rmax, Rt and Pt, see ISO 21920-3: 2021, Tables 3 to 6.

NOTE 2 Exceptions are defined in 9.1.

NOTE 3 See Annex D for examples and additional information.

6.3.3 Minimal indication for parameters without defined defaults

Figure 6 shows all symbols and indications mandatory for a minimal indication of profile surface texture requirements and parameters without defined defaults. All defaults are defined by the mandatory specified setting class (Sc*n*) or by one of the default values of the mandatory profile L-filter nesting index N_{ic} for R-parameters or profile S-filter nesting index N_{ic} for W-parameters.

Oblique strokes, "/", are used to separate the specification sections.

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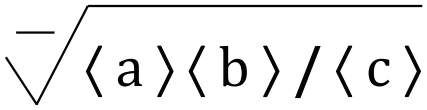

Key

a symbol for parameter

b numerical tolerance limit value

c symbol for the specified setting class S*cn* or a default value of profile L-filter nesting index N_{ic} for R-parameters or profile S-filter nesting index N_{ic} for W-parameters

< > placeholder has to be specified

Figure 6 — Minimal indication for parameter without defined defaults

NOTE 1 Parameters without defined defaults are not listed in ISO 21920-3: 2021, Tables 3 to 6.

NOTE 2 The specified setting class leads directly to the specified column of ISO 21920-3: 2021, Table 2, with the relevant default settings.

NOTE 3 Exceptions are defined in 9.1.

NOTE 4 See Annex D for examples and additional information.

6.4 Complete indication

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6.4.1 General

The specification elements described in Clause 5 shall be arranged as shown in 6.4.2 to 6.4.5, depending on the parameter type. All specification elements for one parameter shall be indicated in one line.

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NOTE 1 If several parameters or different specification elements for the same parameter need to be specified, the indication follows in one or several additional lines.

NOTE 2 See Annex D for examples of indication and additional information.

NOTE 3 The complete indication is shown to define the sequence of the indication of all specification elements and might be rarely used in practice.

6.4.2 Complete indication for evaluation length R-parameters

The specification elements for evaluation length R-parameters shall be arranged as shown in Figure 7.

NOTE Evaluation length R-parameters include Ra, Rq, Rt, Rzx and Rk (see ISO 21920-2).

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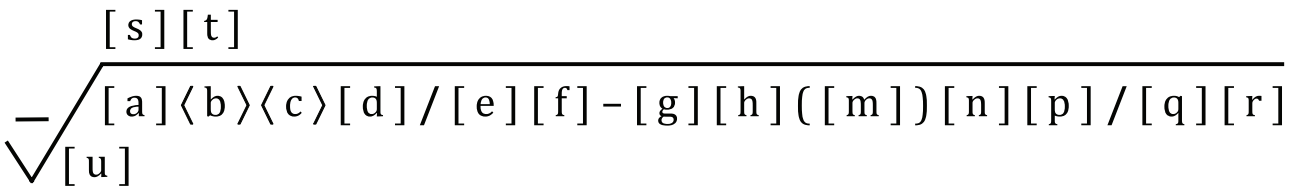

Key

a tolerance type
b symbol for R-parameter
c tolerance limit value of the profile surface texture 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 association method and element
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 relative to the surface lay
< > placeholder has to be specified
[ ] placeholder can be specified if different from the default or an additional requirement

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Figure 7 — Indication for evaluation length R-parameters including all optional specification elements

6.4.3 Complete indication for section length R-parameters

The specification elements for section length R-parameters shall be arranged as shown in Figure 8.

NOTE Section length R-parameters include Rz, Rp and Rv (see ISO 21920-2).

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

Key

a tolerance type
b symbol for R-parameter
c tolerance limit value of the profile surface texture 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 association method and element
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 relative to the surface lay
< > placeholder has to be specified
[ ] placeholder can be specified if different from the default or an additional requirement

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NOTE The parentheses around ([i] × [k]) bring out the relationship between these specification elements as the evaluation length results from this product.

Figure 8 — Indication for section length R-parameters including all optional specification elements

6.4.4 Complete indication for evaluation length P-parameters and W-parameters

The specification elements for evaluation length P-parameters and evaluation length W-parameters shall be arranged as shown in Figure 9.

NOTE Evaluation length P-parameters and W-parameters include Pt, Pa, Wt and Wa (see ISO 21920-2).

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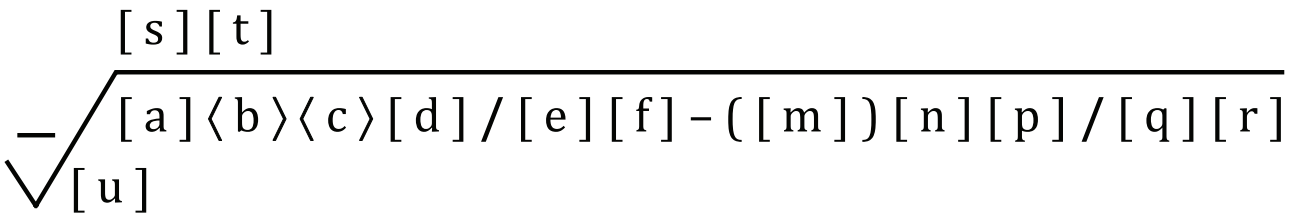

Key

a tolerance type
b symbol for P-parameter or W-parameter
c tolerance limit value of the profile surface texture parameter
d tolerance acceptance rule
e profile S-filter type
f profile S-filter nesting index
m evaluation length
n profile F-operator association method and element
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 relative to the surface lay
< > placeholder has to be specified
[ ] placeholder can be specified if different from the default

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Figure 9 — Indication for evaluation length P-parameters and W-parameters including all optional specification elements

6.4.5 Complete indication for section length P-parameters and W-parameters

The specification elements for section length P-parameters and section length W-parameters shall be arranged as shown in Figure 10.

NOTE Section length P-parameters and W-parameters include Pz, Pmax and Wz (see ISO 21920-2).

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