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(ISO 1302 : 2002)

(JSA)

**Geometrical Product Specifications  
(GPS)—Indication of surface texture  
in technical product documentation**

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ICS 01.100.20; 17.040.20

Reference number : JIS B 0031 : 2003 (E)

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## Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS B 0031 : 1994** is replaced with this Standard.

This revision is made along with the revision of **ISO 1302** which is the corresponding International Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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## Geometrical Product Specifications (GPS)—Indication of surface texture in technical product documentation

**Introduction** This Japanese Industrial Standard has been prepared based on the forth edition of **ISO 1302 Geometrical Product Specifications (GPS)—Indication of surface texture in technical product documentation** published in 2002 without modifying the technical contents.

This Standard is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see **TR B 0007**). It influences link 1 of the chain of standards on roughness, waviness and primary profile.

For more detailed information of the relation of this Standard to other standards and the GPS matrix model, see annex J.

This edition of **JIS B 0031** has been developed for use together with the new editions of the surface texture standards issued in 1996 and 1997, which introduce many radical changes compared with the content of the former surface texture standards issued in the 1980s. The changes are so radical that the drawing indications in some instances have a completely new interpretation. Annex H gives detailed information on these changes.

Drawing indications applied on technical drawings according to former editions of this Standard refer to the rules given in the surface texture standards issued at the time of issue and can only be interpreted according to those surface texture standards. Annex I provides information on former practices.

The drawing indications given in this edition are to be used for the unambiguous reference to the new surface texture standards issued in 1996 and 1997.

In addition, portions with continuous sidelines or dotted underlines are the matters not stated in the original International Standard.

**NOTE :** **TR B 0007** is identical with **ISO/TR 14638 : 1995 Geometrical Product Specifications (GPS)—Master plan**.

**1 Scope** This Standard specifies the rules for the indication of surface texture in technical product documentation (e.g. drawings, specifications, contracts, reports) by means of graphical symbols and textual indications.

It is applicable to the indication of requirements for surfaces by means of

- a) profile parameters, according to **JIS B 0601**, related to the
  - *R*-profile (roughness parameters),
  - *W*-profile (waviness parameters), and
  - *P*-profile (structural parameters),
- b) motif parameters, according to **JIS B 0631**, related to the
  - roughness motif, and
  - waviness motif,

- c) parameters related to the material ratio curve according to **JIS B 0671-2** and **JIS B 0671-3**.

NOTES 1 For the indication of requirements for surface imperfections (pores, scratches etc.), which cannot be specified using surface texture parameters, reference is made to **ISO 8785**, which covers surface imperfections.

- 2 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

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

**2 Normative references** The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter are not applied. The normative references without the indication of the year of coming into effect apply limiting only to the most recent editions (including amendments).

JIS B 0021 *Geometrical product specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out*

NOTE : **ISO/DIS 1101** : 1996 *Geometrical Product Specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out* is identical with the said standard.

JIS B 0601 *Geometrical Product Specification (GPS)—Surface texture : Profile method—Terms, definitions and surface texture parameters*

NOTE : **ISO 4287** : 1997 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Terms, definitions and surface texture parameters* is identical with the said standard.

JIS B 0631 *Geometrical Product Specification (GPS)—Surface texture : Profile method—Motif parameters*

NOTE : **ISO 12085** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Motif parameters* is identical with the said standard.

JIS B 0632 *Geometrical Product Specification (GPS)—Surface texture : Profile method—Metrological characteristics of phase correct filters*

NOTE : **ISO 11562** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Metrological characteristics of phase correct filters* is identical with the said standard.

JIS B 0633 *Geometrical Product Specification (GPS)—Surface texture : Profile method—Rules and procedures for the assessment of surface texture*

NOTE : **ISO 4288** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Rules and procedures for the assessment of surface texture* is equivalent to the said standard.

JIS B 0641-1 *Geometrical Product Specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 1 : Decision rules for proving conformance or nonconformance with specifications*

NOTE : **ISO 14253-1** : 1998 *Geometrical Product Specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 1 : Decision rules for proving conformance or non-conformance with specifications* is identical with the said standard.

JIS B 0651 *Geometrical Product Specification (GPS)—Surface texture : Profile method—Nominal characteristics of contact (stylus) instruments*

NOTE : **ISO 3274** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Nominal characteristics of contact (stylus) instruments* is identical with the said standard

JIS B 0671-1 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 1 : Filtering and general measurement conditions*

NOTE : **ISO 13565-1** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 1 : Filtering and general measurement conditions* is identical with the said standard.

JIS B 0671-2 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 2 : Height characterization using the linear material ratio curve*

NOTE : **ISO 13565-2** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 2 : Height characterization using the linear material ratio curve* is identical with the said standard.

JIS B 0671-3 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 3 : Height characterization using the material probability curve*

NOTE : **ISO 13545-3** : 1998 *Geometrical Product Specifications (GPS)—Surface texture : Profile method; Surfaces having stratified functional properties—Part 3 : Height characterization using the material probability curve* is identical with the said standard.

JIS B 0672-1 *Geometrical Product Specifications (GPS)—Geometrical features—Part 1 : General terms and definitions*

NOTE : **ISO 14660-1** : 1999 *Geometrical Product Specifications (GPS)—Geometrical features—Part 1 : General terms and definitions* is identical with the said standard.

JIS Z 8114 *Technical product documentation—Terms relating to technical drawings*

NOTE : **ISO 10209-1** : 1992 *Technical product documentation—Vocabulary—Part 1 : Terms relating to technical drawings : general and types of drawings* is equivalent to the said standard.

JIS Z 8313-1 *Technical drawings—Lettering—Part 1 : Currently used characters*

NOTE : **ISO 3098-2** : 2000 *Technical product documentation—Lettering—Part 2 : Latin alphabet, numerals and marks* is identical with the said standard.

JIS Z 8317 *Technical drawings—Dimensioning—General principles, definitions, methods of execution and special indications*

NOTE : **ISO 129** : 1985 *Technical drawings—Dimensioning—General principles, definitions, methods of execution and special indications* is equivalent to the said standard.

ISO 8785: 1998 *Geometrical Product Specifications (GPS)—Surface imperfections—Terms, definitions and parameters*

ISO 10135 : —<sup>1)</sup> *Technical drawings—Simplified representation of moulded, cast and forged parts*

ISO 81714-1 : 1999 *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 Standard, the terms and definitions given in **JIS B 0601**, **JIS B 0632**, **JIS B 0633**, **JIS B 0651**, **JIS B 0671-2**, **JIS B 0671-3**, **JIS B 0672-1**, **JIS Z 8114** and the following apply.

a) **basic graphical symbol**

⟨surface texture⟩ graphical symbol indicating that a requirement for surface texture exists

See Figure 1.

b) **expanded graphical symbol**

⟨surface texture⟩ expanded basic graphical symbol indicating that material is either to be removed or not removed in order to obtain the specified surface texture

See Figures 2 and 3.

c) **complete graphical symbol**

⟨surface texture⟩ basic or expanded graphical symbol expanded in order to facilitate the addition of complementary surface texture requirements

See Figure 4.

d) **surface (texture) parameter**

parameter expressing a micro-geometrical property of a surface

NOTE : See annex E for examples of surface texture parameter designations.

Information : Profile parameters (6.3.2), motif parameters (6.3.3) and parameters based on material ratio curve (6.3.4) are generically called surface (texture) parameters.

1) To be published. (Revision of **ISO 10135** : 1994)

e) **(surface) parameter symbol**

symbol indicating the type of surface texture parameter

NOTE : The parameter symbols consist of letters and numerical values (e.g. *Ra*, *Ramax*, *Wz*, *Wz1max*, *AR*, *Rpk*, *Rpq*).

#### 4 Graphical symbols for the indication of surface texture

**4.1 General** Requirements for surface texture are indicated on technical product documentation by several variants of graphical symbols, each having its own significant meaning. The graphical symbols specified in 4.2 and 4.3 shall be supplemented with complementary surface texture requirements in the form of numerical values, graphical symbols and text (see also clauses 5, 6, 7 and 8). Attention is drawn to the fact that, in particular instances, the graphical symbols may be used alone to convey a special meaning on the technical drawing (see clause 11).

**4.2 Basic graphical symbol** The basic graphical symbol shall consist of two straight lines of unequal length inclined at approximately 60° to the line representing the considered surface, as shown in Figure 1. The basic graphical symbol in Figure 1 should not be used alone (without complementary information). Its use shall be to provide collective indications as shown in Figures 23 and 26.

If the basic graphical symbol is used with complementary, supplemental information (see clause 5), then no further decision is required as to whether removal of material is necessary for obtaining the specified surface (see 4.3.1) or whether removal of material is not permitted for obtaining the specified surface (see 4.3.2).



Figure 1 Basic graphical symbol for surface texture

#### 4.3 Expanded graphical symbols

**4.3.1 Removal of material required** If removal of material—for example, by machining—is required for obtaining the specified surface, a bar shall be added to the basic graphical symbol, as shown in Figure 2.

The expanded graphical symbol in Figure 2 should not be used alone (without complementary information).



Figure 2 Expanded graphical symbol indicating removal of material required

**4.3.2 Removal of material not permitted** If removal of material is not permitted for obtaining the specified surface, a circle shall be added to the basic graphical symbol, as shown in Figure 3. For special use of this expanded graphical symbol, see clause 10.



**Figure 3 Expanded graphical symbol indicating removal of material not permitted**

**4.4 Complete graphical symbol** When complementary requirements for surface texture characteristics have to be indicated (see clause 6), a line shall be added to the longer arm of any of the graphical symbols illustrated in Figures 1 to 3, as shown in Figure 4.

For use in the written text of—for example, reports or contracts—the textual indication for Figure 4, a) is APA <sup>2)</sup>, for b) it is MRR <sup>3)</sup> and for c) NMR <sup>4)</sup>.

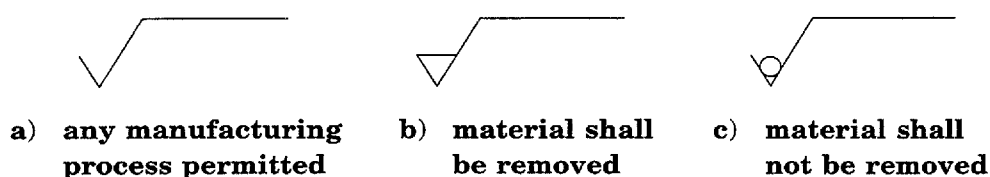
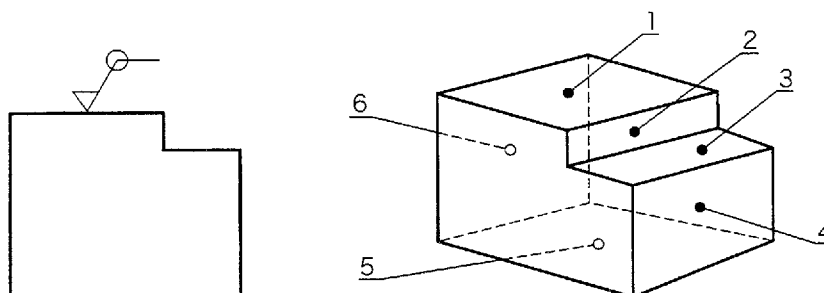


**Figure 4 Complete graphical symbol**

**4.5 Graphical symbol for “all surfaces around a workpiece outline”** 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 illustrated in Figure 4, as shown in Figure 5.

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



**Information :** The outline on the drawing represents the six surfaces shown on the 3D-representation of the workpiece (the front and rear surfaces not included).

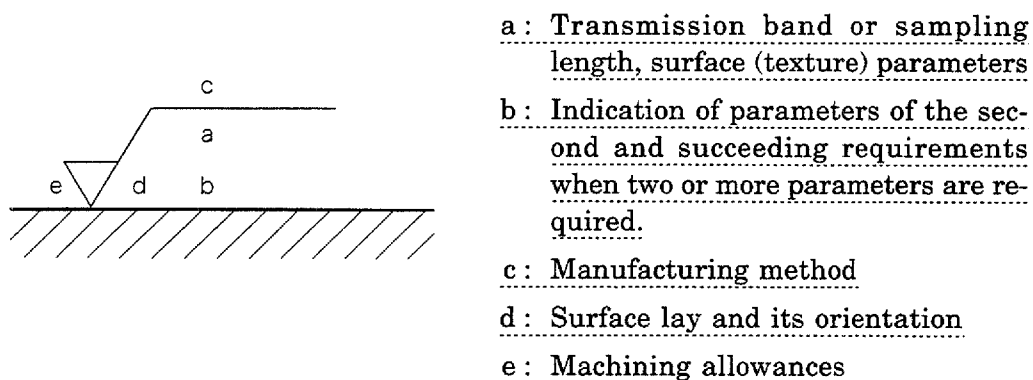
**Figure 5 Surface texture requirement for all six surfaces represented by outline on workpiece**

- 
- 2) Any process allowed.
  - 3) Material removal required.
  - 4) No material removed.

## 5 Composition of complete graphical symbol for surface texture

**5.1 General** In order to ensure that a surface texture requirement is unambiguous, it may be necessary, in addition to the indication of both a surface texture parameter and its numerical value, to specify additional requirements (e.g. transmission band or sampling length, manufacturing process, surface lay and its orientation and possible machining allowances). It may be necessary to set up requirements for several different surface texture parameters in order that the surface requirements ensure unambiguous functional properties of the surface. For more details see annex D.

**5.2 Position of complementary surface texture requirements** The mandatory positions of the various surface texture requirements in the complete graphical symbol are shown in Figure 6.



Information : Matters to indicate the location from “a” to “e” not described in the original International Standard were described.

**Figure 6 Positions (a to e) for location of complementary requirements**

The complementary surface texture requirements in the form of

- surface texture parameters,
- numerical values, and
- transmission band/sampling length,

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 surface texture parameter designation, the numerical limit value and the transmission band/sampling length according to clause 6. To avoid misinterpretation, a double space (double blank) shall be inserted between the parameter designation and the limit value.

Generally, the transmission band or sampling length shall be indicated followed by an oblique stroke (/), followed by the surface texture parameter designation, followed by its numerical value using one text string.

EXAMPLE 1 0.0025-0.8/Rz 6.8 (example with transmission band indicated).

EXAMPLE 2 -0.8/Rz 6.8 (example with only sampling length indicated).

Especially for the motif method, the transmission band shall be indicated, followed by an oblique stroke (/), followed by the value of the evaluation length, followed by another oblique stroke, followed by the surface texture parameter designation, followed by its numerical value.

EXAMPLE 3 0.008-0.5/16/R 10

Information : Generally, the transmission band is the wavelength range between two defined filters (see **JIS B 0651** and **JIS B 0632**) and, for the motif method, the wavelength range between two defined limits (see **JIS B 0631**).

- 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 position “a” and “b” are to be moved upwards when the symbol is enlarged (see clause 6).
- c) **Position c—Manufacturing method** Indicate the manufacturing method, treatment, coatings or other requirements for the manufacturing process etc. to produce the surface, for example, turned, ground, plate (see also clause 7).
- d) **Position d—Surface lay and orientation** Indicate the symbol of the required surface lay and the orientation, if any, of the surface lay, for example, “=”, “X”, “M” (see also clause 8).
- e) **Position e—Machining allowance** Indicate the required machining allowance, if any, as a numerical value given in millimetres (see also clause 9).

## 6 Indication of surface texture parameters

**6.1 General** The parameter designation and the associated numerical value, which shall be indicated, includes four items of information essential for the interpretation of the requirements. These are

- which of the three surface profiles (*R*, *W* or *P*) is indicated,
- which characteristic of the profile is indicated,
- how many sampling lengths make up the evaluation length, and
- how the indicated specification limit shall be interpreted.

Information 1 Three principal groups of surface texture parameters have been standardized for use in connection with the complete symbol. The definitions of the parameters may be found in **JIS B 0601**, **JIS B 0631**, **JIS B 0671-2** and **JIS B 0671-3**, in accordance with Table 1.

2 Roughness profile, Waviness profile and Primary profile are generically called Profile (*R*, *W* and *P*, respectively) (see **JIS B 0601**).

**Table 1 Overview of parameter types (subclause or clause number of the text of this Standard or annex)**

|                   | Parameters |          |          |          |          |                      |             |           |
|-------------------|------------|----------|----------|----------|----------|----------------------|-------------|-----------|
|                   | Profile    |          |          | Motif    |          | Material ratio curve |             |           |
|                   |            |          |          |          |          | linear               | probability |           |
|                   | <i>R</i>   | <i>W</i> | <i>P</i> | <i>R</i> | <i>W</i> | <i>R</i>             | <i>R</i>    | <i>P</i>  |
| Designation       | See E.2    | See E.2  | See E.2  | See E.3  | See E.3  | See E.4.2            | See E.4.3   | See E.4.3 |
| Evaluation length | See F.2    | See F.2  | See F.2  | See F.3  | See F.3  | See F.4              | See F.4     | See F.4   |
| Tolerance limit   | See 6.4    |          |          |          |          |                      |             |           |
| Transmission band | See G.2    | See G.2  | See G.2  | See G.3  | See G.3  | See G.4              | See G.4     | See G.4   |

**6.2 Indication of parameter designations** See annex E. If the parameter designations are indicated as in annex E, without modifiers (see 5.1), this means that the default definition or the default interpretation of the specification limit ("16 %-rule", see 4.2 and 4.3 of JIS B 0633) is invoked. See 6.4 for an indication of the "max-rule" for the interpretation of the specification limit.

### 6.3 Indication of evaluation length, *ln*

**6.3.1 General** If the parameter designation is indicated as shown in annex E, without modifiers (see 5.1), this implies that the requirement is the default evaluation length, if it is defined in the pertinent standards.

In those cases where no default definition exists for the number of sampling lengths within the evaluation length, the number of sampling lengths shall be added to the parameter designation in order to obtain an unambiguous surface texture requirement.

#### 6.3.2 Profile parameters (see JIS B 0601)

- **R-profile** See F.2. If the number of sampling lengths within the evaluation length differs from the default number of five, it shall be indicated adjacent to the relevant parameter designation.

EXAMPLE : *Rp3* or *Rv3* or *Rz3* or *Rc3* or *Rt3* or *Ra3* or ..., *RSm3*, ... (if an evaluation length of three sampling lengths is desired).

- **W-profile** See F.2. The number of sampling lengths shall always be indicated adjacent to the parameter designation of waviness.

EXAMPLE : *Wz5* or *Wa3*.

- **P-profile** See F.2. The sampling length for *P* parameters is equivalent to the evaluation length (see 3.19 of JIS B 0601) and the evaluation length is equal to the length of the feature being measured (see 4.4 of JIS B 0633). Consequently, the indication of the number of sampling lengths in the parameter designation of structure parameters is not relevant.

**6.3.3 Motif parameters** (see **JIS B 0631**) See **F.3**. If the evaluation length differs from the default number of 16 mm, it shall be indicated between two oblique strokes.

EXAMPLE : 0.008-0.5/12/R 10

NOTE : Attention is drawn to the fact that the evaluation length concept in the case of motif parameters has a meaning different from that of other surface texture parameters in that the sampling length concept does not exist. Consequently, indication of the number of sampling lengths in the parameter designation of motif parameters is not relevant.

**6.3.4 Parameters based on material ratio curve** (**JIS B 0671-2**, **JIS B 0671-3** and **JIS B 0631**)

- **R-profile** See **F.4**. If the number of sampling lengths within the evaluation length differs from the default number of five (see clause 7 of **JIS B 0671-1**), it shall be indicated adjacent to the relevant parameter designation.

EXAMPLE : *Rk8*, *Rpk8*, *Rvk8*, *Rpq8*, *Rvq8*, *Rmq8* (if an evaluation length of eight sampling lengths is desired).

For the *R*-profile parameters based on the linear material ratio curve according to **JIS B 0671-2**—i.e. the parameters *Rke*, *Rpke*, *Rvke*, etc.—the indication of the evaluation length shall be according to **6.3.3**.

- **P-profile** See **F.4**. The sampling length for *P* parameters is equivalent to the evaluation length (see **3.19** of **JIS B 0601**) and the evaluation length is equal to the length of the feature being measured (see **4.4** of **JIS B 0633**). Consequently, the indication of the number of sampling lengths in the parameter designation of structure parameters is not relevant.

## 6.4 Indication of tolerance limits

**6.4.1 General** There are two different ways of indicating and interpreting the specification limits of surface texture:

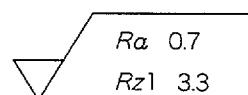
- a) the “16 %-rule”;
- b) the “max-rule”.

See **5.2** and **5.3** of **JIS B 0633**, respectively.

The “16 %-rule” is defined as the default rule for all indications of surface texture requirements. This means that the “16 %-rule” applies to a surface texture requirement when a parameter designation as shown in annex E is applied (see Figure 7). If the “max-rule” is to be applied to a surface texture requirement, “max” shall be added to the parameter designation (see Figure 8).

MRR *Ra* 0.7 ; *Rz*1 3.3

a) in text

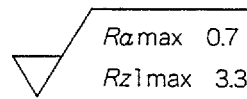


b) on drawing

**Figure 7** Parameter indication where “16 %-rule” applies  
(default transmission band)

MRR  $R_{a\max}$  0.7 ;  $R_{z1\max}$  3.3

a) in text



b) on drawing

**Figure 8 Parameter indication where “max-rule” applies (default transmission band)**

**6.4.2 Profile parameters** (see JIS B 0601) The “16 %-rule” and the “max-rule” are both applicable to profile parameters defined in JIS B 0601.

**6.4.3 Motif parameters** (see JIS B 0631) The motif parameters are defined using only the “16 %-rule” (see 5.4 of JIS B 0631).

**6.4.4 Parameters based on material ratio curve** (JIS B 0671-2, JIS B 0671-3) The “16 %-rule” and the “max-rule” are both applicable to parameters related to the material ratio curve defined in JIS B 0671-2 and JIS B 0671-3.

## 6.5 Indication of transmission band and sampling length

**6.5.1 General** Where no transmission band is indicated in connection with the parameter designation, the default transmission band applies to the surface texture requirement (see annex G for the definition of default transmission bands; see the surface texture requirements in Figures 7 and 8 for no transmission band indicated).

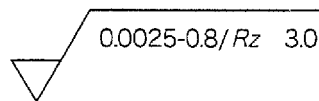
Certain surface texture parameters do not have a defined default transmission band, a default short-wave filter or a default sampling length (long-wave filter). Consequently, the surface texture indication shall specify transmission band, short-wave filter or long-wave filter to ensure that the surface texture requirement is unambiguous.

To provide assurance that the surface is controlled unambiguously by the surface texture requirement, the transmission band shall be indicated in front of the parameter designation separated from it by an oblique stroke (/).

The transmission band shall be indicated by the inclusion of the cut-off values of the filters (in millimetres), separated by a hyphen (“-”), the short-wave filter indicated first, and the long-wave filter second. See Figure 9.

MRR 0.0025-0.8/ $R_z$  3.0

a) in text



b) on drawing

**Figure 9 Indication of transmission band in connection with surface texture requirement**

In some cases, it may be relevant to indicate only one of the two filters in the transmission band. The second filter then has its default value, if it exists. If only one filter is indicated, the hyphen is maintained to indicate whether the indication is of the short-wave or the long-wave filter.

EXAMPLE 1 0.008- (short-wave filter indication).

EXAMPLE 2 -0.25 (long-wave filter indication).

### 6.5.2 Profile parameters (JIS B 0601)

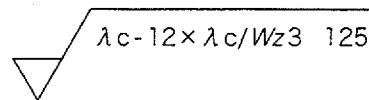
- **R-profile** See G.2. In the event of the transmission band being indicated, it may only be necessary to indicate the long-wave filter  $\lambda_c$  (e.g. -0.8). The short-wave filter  $\lambda_s$  will then be as specified in 4.4 of JIS B 0651.

If control of both the short-wave filter and the long-wave filter in the transmission band for roughness parameters is required, both shall be indicated in connection with the parameter symbol.

EXAMPLE : 0.008-0.8

- **W-profile** See G.2. The transmission band shall always be indicated by both cut-off values to ensure an unambiguous requirement. The transmission band for waviness may be indicated, based on the default cut-off  $\lambda_c$  ( $\lambda_c$  is the cut-off value of short-wave filter) for surface roughness according to JIS B 0633, for the same surface (see Figure 10), by the expression  $\lambda_c - n \times \lambda_c$  ( $n \times \lambda_c$  is the cut-off value of long-wave filter), where the number,  $n$ , is chosen by the designer.

MRR  $\lambda_c - 12 \times \lambda_c / Wz3$  125



a) in text

b) on drawing

Information : The number of sampling lengths which is not specified in the original International Standard was added as 3 to the location after  $Wz$  in accordance with 6.3.2. In this example, the sampling length is  $12 \times \lambda_c$  [in accordance with 3.1.9 (sampling length) of JIS B 0601].

Figure 10 Transmission band for waviness based on default cut-off  $\lambda_c$  for surface roughness

- **P-profile** See G.2. The cut-off value of the short-wave filter  $\lambda_s$  shall always be indicated to ensure an unambiguous requirement.

In the default case,  $P$ -parameters do not have any long-wave filters (sampling lengths). A long-wave filter (sampling length) may be indicated for  $P$ -parameters if required for the function of the workpiece.

EXAMPLE : -25/ $Pz$  225

### 6.5.3 Motif parameters (JIS B 0631)

- **Roughness profile** See G.3. It is not necessary to indicate the evaluation length if its value is taken from JIS B 0631, (Table 1) for the corresponding couple ( $\lambda_s$ ,  $A$ ). Nevertheless, the two oblique strokes shall be indicated.

Information : If no limit for the short-wavelength is indicated, the default value is  $\lambda_s = 0.008$  mm.

- **Waviness profile** See G.3. Both limits  $A$  and  $B$  for the short-wavelength and the long-wavelength shall be indicated together.

It is not necessary to indicate the evaluation length if its value is issued from **JIS B 0631**, Table 1, for the corresponding couple ( $A$ ,  $B$ ). Nevertheless, the two oblique strokes shall be indicated.

If no limit is indicated, the default values are  $A = 0.5$  mm and  $B = 2.5$  mm.

**6.5.4 Parameters based on the material ratio curve (JIS B 0671-2, JIS B 0671-3)**  
When the defined limits ( $A$  and  $B$ ) are not indicated, the standard value shall be  $A = 0.5$  mm and  $B = 2.5$  mm.

- **R-profile** See G.4. Only the default and one non-default are standardized.
- **P-profile** See G.4. If  $P$ -parameters are indicated according to **JIS B 0671-3**, the short-wave filter  $\lambda_s$  shall be indicated in connection with the parameter designation to ensure an unambiguous requirement.

In the default case,  $P$ -parameters do not have any long-wave filters (sampling lengths). A long-wave filter (sampling length) can be indicated for  $P$ -parameters if required for the function of the workpiece.

## 6.6 Tolerance types—Unilateral or bilateral

**6.6.1 General** The surface texture requirement shall be indicated as a unilateral or bilateral tolerance. The tolerance limits shall be expressed by indication of the parameter designation, the parameter value and the transmission band as described in 6.2, 6.3, 6.4 and 6.5.

**6.6.2 Unilateral tolerance of a surface parameter** When the parameter designation, the parameter value and the transmission band are indicated, they shall be understood as a unilateral upper tolerance limit of the parameter in question (“16 %-rule” or “max-rule” limit).

If the parameter designation, the parameter value and the transmission band indicated are to be interpreted as a unilateral lower tolerance limit of the parameter in question (16 % or max. limit), then the parameter designation shall be preceded by the letter L.

EXAMPLE :  $LRa\ 0.32$

**6.6.3 Bilateral tolerance of a surface parameter** A bilateral tolerance shall be indicated in the complete symbol by placing the requirement for the two tolerance limits above each other, the upper specification limit (“16 %-rule” or “max-rule” limit) preceded by U being indicated over the lower specification limit preceded by L (see Figure 11). Where the upper and lower limits are expressed by the same parameter with different limit values, the U and L may be omitted provided the omission does not leave any doubt.

Information : Symbols U and L should be always indicated.

The upper and lower specification limits are not necessarily expressed by means of the same parameter designation and transmission band.