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(JSA)

**Geometrical Product Specifications
(GPS)—Surface texture : Profile
method ; Measurement standards—
Part 1 : Material measures**

ICS 17.040.20; 17.040.30

Reference number : JIS B 0659-1 : 2002 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of revising a Japanese Industrial Standard from the Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Since the original International Standard does not contain the items concerning the roughness comparison specimens, part of the former standard, **JIS B 0659 : 1996** is modified and described in Annex 1 as an informative reference.

JIS B 0659 consists of the following two parts.

JIS B 0659-1 *Geometrical Product Specifications (GPS)—Surface texture : Profile method ; Measurement standards—Part 1 : Material measures*

JIS B 0659-2 *Geometrical Product Specifications (GPS)—Surface texture : Profile method ; Measurement standards—Part 2 : Software measurement standards (to be published)*

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4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Geometrical Product Specifications (GPS)— Surface texture : Profile method ; Measurement standards— Part 1 : Material measures

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 5436-1** *Geometrical Product Specifications (GPS)—Surface texture : Profile method ; Measurement standards—Part 1 : Material measures* published in 2000 with some modifications of the technical contents.

This Standard is part of the Geometrical Product Specifications (GPS), is to be regarded as a general GPS standard (see **TR B 0007**), and influences chain link 6 of the chain of standards on roughness curve, waviness curve and primary profile.

For more detailed information of the relation of this Standard to other GPS standards, see Annex A.

This Standard introduces new measurement standards, namely type E, to calibrate the profile co-ordinate system.

The original International Standard does not contain the items concerning the roughness comparison specimens, and part of the former standard, **JIS B 0659 : 1996** is modified and described in Annex 1 as information.

The portions with sidelines or underlines with dots in this Standard are the matters in which the original International Standard has been modified.

Remarks : “Measurement standards” were formerly referred to as “calibration specimens”.

1 Scope This Standard specifies the characteristics of material measures used as measurement standards (etalons) for the calibration of metrological characteristics of contact (stylus) instruments for the measurement of surface texture by the profile method as defined in **JIS B 0651**.

Remarks : 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 5436-1 : 2000 *Geometrical Product Specifications (GPS)—Surface texture : Profile method ; Measurement standards—Part 1 : Material measures* (MOD)

Information : Etalon is a measuring instrument, material measure, reference material, or measuring system, intended to define, realize, conserve or reproduce a value of a unit or quantity, to serve as a reference (**JIS Z 8103**).

2 Normative references The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

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

Remarks : **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*

Remarks : **ISO 12085** : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Motif parameters* 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*

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

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

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

JIS Z 8103 *Glossary of terms used in measurement*

Information : The terms used in measurement of this Standard is based on the definitions of **JIS Z 8103**, and therefore the said standard is added to the normative reference of this Standard.

ISO 10012-1 : 1992 *Quality assurance requirements for measuring equipment—Part 1 : Metrological confirmation system for measuring equipment*

ISO/TS 14253-2 : 1999 *Geometrical Product Specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 2 : Guide to the estimation of uncertainty of GPS measurement, in calibration of measuring equipment and in product verification*

Guide to the expression of uncertainty in measurement (GUM), BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1993

3 Terms and definitions For the purposes of this Standard the terms and definitions given in **JIS B 0601**, **JIS B 0651** and **JIS Z 8103** apply.

4 Design requirements for measurement standards

4.1 Material The material used for measurement standards type A to type E shall be hard enough to ensure adequate life in relation to cost (manufacturing and calibration). Its surface shall be smooth and flat enough not to affect the evaluation.

4.2 Size of measurement standard The measurement window shall be large enough to provide for the total length of traverse required for all intended determinations. The measurement window consists of that region of the total surface over which calibration measurements are made. One or more kinds of measurement standards may be provided on a single block. To ensure the best possible economic conditions, overall dimensions of measurement standards are not given.

5 Types, purposes and metrological characteristics of measurement standards

5.1 General The calibration of the existing wide range of instruments in all modes of operation calls for more than one type of measurement standard. Each measurement standard may have a limited range of application according to its own characteristics and those of the instrument to be calibrated. The validity of the calibration of an instrument will be dependent on the correct association of these characteristics.

To cover the range of requirements, five types of measurement standards are described, each of which may have a number of variants (see Table 1).

Table 1 Types and names of measurement standards

Type	Name
A	Depth measurement standard
B	Tip condition measurement standard
C	Spacing measurement standard
D	Roughness measurement standard
E	Profile coordinate measurement standard

5.2 Type A—Depth measurement standard These measurement standards are for calibrating the vertical profile component of stylus instruments.

5.2.1 Type A1—Wide grooves with flat bottoms These measurement standards have a wide calibrated groove with a flat bottom, a ridge with a flat top, or a number of such separated features of equal or increasing depth or height. Each feature is wide enough to be insensitive to the shape or condition of the stylus tip (see Figure 1).

5.2.2 Type A2—Wide grooves with rounded bottoms These measurement standards are similar to type A1, except that the grooves have rounded bottoms of sufficient radius to be insensitive to the shape or condition of the stylus tip (see Figure 2).

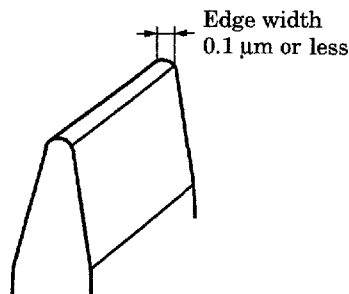
5.3 Type B—Tip condition measurement standard These measurement standards are primarily for calibrating the condition of the stylus tip.

5.3.1 Type B1 These measurement standards have a narrow groove or a number of separated grooves proportioned to be increasingly sensitive to the dimensions of the stylus tip. The narrow grooves have rounded bottoms of sufficient radius to be sensitive to the shape or condition of the stylus tip.

5.3.2 Type B2 These measurement standards have two groove patterns of nominally equal Ra (arithmetical mean roughness) values, one being sensitive and the other insensitive to the dimensions of the stylus tip (see Figures 3 and 4).

5.3.3 Type B3 These measurement standards have a fine protruding edge. Uncoated razor blades, for example, have edge widths of approximately $0.1\text{ }\mu\text{m}$ or less. The stylus condition may be assessed by traversing such a specimen and recording the surface profile.

Information : The edge width shall be measured according to Informative Figure 1.



Informative Figure 1 Edge width of razor blade

5.4 Type C—Spacing measurement standard These measurement standards are used primarily for calibrating horizontal profile components. They may also be used for calibrating vertical profile components if the spacing of the grooves is as accurate as depth measurement standard. The purpose of the series of type C measurement standards is to enable the transmission characteristics to be checked for a number of spacings and amplitudes.

They have a grid of repetitive grooves of simple shape (either sinusoidal, triangular or arcuate).

An essential requirement of type C measurement standards is that standardized measurement standards of differing waveform are nevertheless compatible, in the sense that they will all lead to the same state of instrument calibration or verification, provided they are used correctly.

5.5 Type D—Roughness measurement standard

5.5.1 General These measurement standards are for overall calibration of stylus instruments.

Remarks : The variation over the area of a type D standard is typically higher than that of a type C standard. Therefore it is normally necessary to average a statistically determined number of appropriately positioned tracings to get the full benefit of the D standard.