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(JSA)

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

ICS 17.040.01

Descriptors : dimensional tolerances, dimensional measurement, verification

Reference number : JIS B 0641-1 : 2001 (E)

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 establishing 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.

JIS B 0641 consists of only Part 1.

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

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

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 14253-1 Geometrical Product Specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 1 : Decision rules for proving conformance or nonconformance with specifications** published in 1998 without modifying the technical contents.

This Standard is a geometrical product specifications (GPS) standard and is to be regarded as a global GPS standard (see **TR B 0007**). It influences the chain links 4, 5 and 6 of all chains of general GPS standards.

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

“Informative reference” underlined with dots in this Standard is the matter not stated in the original International Standard.

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

1 Scope This Standard establishes the rules for determining when the characteristics of a specific workpiece or measuring equipment are in conformance or non-conformance with a given tolerance (for a workpiece) or limits of maximum permissible errors (for a measuring equipment), taking into account the uncertainty of measurement.

It also gives rules on how to deal with cases where a clear decision (conformance or non-conformance with specification) cannot be taken, i.e. when the measurement result falls within the uncertainty range (see **3.23**) that exists around the specification limits.

This Standard applies to specifications defined in general GPS standards (see **TR B 0007**), i.e. standards prepared by **ISO/TC 213**, including

- workpiece specifications (usually given as tolerance limits), and
- measuring equipment specifications (usually given as maximum permissible errors).

It may also apply to specifications other than those defined in connection with general GPS standards.

This Standard does not apply to inspection using limit gauges. Inspection with limit gauges is covered by **ISO/R 1938**.

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 14253-1 : 1998 *Geometrical Product Specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 1 : Decision rules for proving conformance or nonconformance with specifications* (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 edition (including amendments).

JIS Z 8101-2 *Statistics—Vocabulary and symbols Part 2: Statistical quality control terms*

Remarks: Items cited from **ISO 3534-2 : 1993** *Statistics—Vocabulary and symbols—Part 2 : Statistical quality control* are equivalent to the corresponding matters of the said standard.

ISO 8402 : 1994 *Quality management and quality assurance—Vocabulary*
Guide to the expression of uncertainty in measurement (GUM), 1st edition, 1995
International vocabulary of basic and general terms in metrology (VIM), BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 2nd edition, 1993

3 Definitions For the purposes of this Standard, the definitions given in **JIS Z 8101-2**, **ISO 8402**, **VIM**, **GUM** and the following apply.

3.1 tolerance T difference between the upper and lower tolerance limits. [**JIS Z 8101-2**, 1.13]

Notes 1 The tolerance is a quantity without sign.

2 A tolerance may be two-sided or one-sided (maximum permissible value on one side; the other limit value is zero) but the tolerance zone does not necessarily include the nominal value.

3.2 tolerance zone/tolerance interval variate values of the characteristic between and including the tolerance limits. [**ISO 3534-2 : 1993**, 1.4.5]

3.3 tolerance limits, limiting values specified values of the characteristic giving upper and/or lower bounds of the permissible value. [**JIS Z 8101-2**, 1.12]

3.4 maximum permissible errors (of a measuring equipment) MPE extreme values of an error permitted by specifications, regulations, etc. for a given measuring equipment. [**VIM : 1993**, 5.21]

3.5 specification tolerance on a workpiece characteristic or the maximum permissible errors, MPE, of measuring equipment characteristic.

Note : A specification should refer to or include drawings, patterns or other relevant documents and indicate the means and the criteria whereby conformity can be checked.

3.6 specification zone/specification interval variate values of the workpiece characteristic and the measuring equipment characteristic between and including the specification limits.

3.7 specification limits tolerance limits of a workpiece characteristic or maximum permissible errors of a measuring equipment characteristic.

3.8 upper specification limit USL specified value giving either:

- the upper boundaries of the permissible value of the tolerance limits of a workpiece characteristic; or
- the upper boundaries of the permissible value of the permissible errors of a measuring equipment characteristic.

3.9 lower specification limit LSL specified value giving either:

- the lower boundaries of the permissible value of the tolerance limits of a workpiece characteristic; or
- the lower boundaries of the permissible value of the permissible errors of a measuring equipment characteristic.

3.10 measurand y particular quantity subject to measurement. [VIM : 1993, 2.6]

3.11 result of measurement y value attributed to a measurand, obtained by measurement.

Notes 1 When a result is given, it should be made clear whether it refers to:

- the indication,
- the uncorrected result,
- the corrected result,

and whether several results are averaged.

- 2 A complete statement of the result of a measurement, y' , includes information about the uncertainty of measurement. [VIM : 1993, 3.1]

3.12 nominal value designated value of a characteristic in a given design specification or drawing.

3.13 uncertainty of measurement parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand.

Notes 1 The parameter may be, for example, a standard deviation (or a given multiple of it), or the half-width of an interval having a stated level of confidence.

- 2 Uncertainty of measurement comprises, in general, many components. Some of these components may be evaluated from the statistical distribution of the results of series of measurements and can be characterized by experimental standard deviations. The other components, which can also be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information.
- 3 It is understood that the result of the measurement is the best estimate of the value of the measurand, and that all components of uncertainty including those arising from systematic effects, such as components associated with corrections and reference standards, contribute to the dispersion. [VIM : 1993, 3.9 and GUM : 1995, B.2.18]

3.14 standard uncertainty (of a measurement) u uncertainty of the result of a measurement expressed as a standard deviation. [GUM : 1995, 2.3.1]

3.15 combined standard uncertainty (of a measurement) u_c standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root sum of terms, the terms being variances or covariances of these other quantities weighted according to how the measurement result varies with changes in these quantities. [GUM : 1995, 2.3.4]

3.16 expanded uncertainty (of a measurement) U quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand.

- Notes
- 1 The fraction may be viewed as the coverage probability or the level of confidence of the interval.
 - 2 To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be justified. [GUM : 1995, 2.3.5]

3.17 coverage factor k numerical factor used as a multiplier of the combined standard uncertainty in order to obtain an expanded uncertainty.

Note : A coverage factor, k , is typically in the range of 2 to 3. [GUM : 1995, 2.3.6]

3.18 result of measurement, complete statement y' result of measurement including the expanded uncertainty, U .

Note : The complete statement is expressed by the equation given in clause 4.

3.19 conformance/conformity fulfilment of specified requirements. [ISO 8402 : 1994, 2.9]