

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 0641-1 : 2020 (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

Reference number : JIS B 0641-1 : 2020 (E)

Date of Establishment: 2001-03-20

Date of Revision: 2020-04-20

Date of Public Notice in Official Gazette: 2020-04-20

Investigated by: Japanese Industrial Standards Committee
Standards Board for ISO area

JIS B 0641-1:2020, First English edition published in 2020-10

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

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

© JSA 2020

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

Contents

	Page
Introduction	1
1 Scope	2
2 Normative references	2
3 Terms and definitions	3
4 Default decision rules	13
4.1 General	13
4.2 Default conformance probability limit	17
4.3 Default nonconformance probability limit	17
5 Verifying conformity and nonconformity with specifications	17
5.1 General	17
5.2 Rule for verifying conformity with specifications	18
5.3 Rule for verifying nonconformity with specifications	19
5.4 Uncertainty zone	20
6 Application in a supplier/customer relationship	21
6.1 General	21
6.2 Supplier verifying conformity	21
6.3 Customer verifying nonconformity	22
Annex A (informative) Relation between current edition and previous edition	23
Annex B (informative) Relation to the GPS matrix model	26
Annex JA (informative) Example of economically optimal measuring equipment, and decision rules for acceptance and rejection of workpieces	28
Annex JB (informative) Comparison table between JIS and corresponding International Standard	38

Foreword

This Japanese Industrial Standard has been 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 a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS B 0641-1:2001**), which has been technically revised.

This **JIS** document is protected by the Copyright Act.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, published patent application or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, published patent application or utility model rights.

JIS B 0641 series consists of the following part under the general title *Geometrical product specifications (GPS)—Inspection by measurement of workpieces and measuring equipment*:

Part 1: Decision rules for proving conformance or nonconformance with specifications

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 **ISO 14253-1:2017**, Edition 3, by incorporating the parts corresponding to this Standard without any modifications of the technical contents, and also adding terms and definitions specified in **ISO/TR 14253-6**.

As a reference, Annex A shows the relation between the current edition and the previous edition (**JIS B 0641-1:2001**), and Annex JA shows the decision rules specified in **ISO/TR 14253-6**.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JB.

This Standard is a geometrical product specifications (GPS) standard and is to be regarded as a general GPS standard (see **ISO 14638**).

This Standard influences the chain link D of all chains of general GPS standards.

The ISO/GPS matrix model given in **ISO 14638** gives an overview of the ISO/GPS system of which this Standard is a part.

The fundamental rules of ISO/GPS given in **JIS B 0024** apply to this Standard and the default decision rules given in this Standard apply in ISO/GPS, unless otherwise indicated.

For more detailed information on the relation of this Standard to other standards and the GPS matrix model, see Annex B.

The estimated measurement uncertainty is to be taken into account when verifying conformity or nonconformity with specifications. The problem arises when a measured value falls close to the upper or lower specification limit. In this case, verification of conformity or nonconformity with specifications is not possible: the measurement uncertainty induces a probability that a true value of the characteristic is out of specification even if the measured value falls inside the specification zone, or is in specification even if the measured value falls outside. Therefore, suppliers and customers should agree in advance in a method to resolve any issues that may arise.

This Standard explains how to define default acceptance and rejection zones (i.e. decision rules) for verifying conformity or nonconformity with specifications.

It is not the intention of this Standard to consider any prior knowledge of the possible values of the measurand(s), e.g. the variability of the measured objects, which may

influence the probability of making the correct decision on verification (in mathematical terms, an a prior unconstrained maximum entropy distribution found in Bibliography [10] is assumed).

1 Scope

This Standard establishes the rules for verifying the conformity or nonconformity with a given tolerance for a characteristic of a workpiece (or a population of workpieces) or with a given maximum permissible errors for a metrological characteristic of a measuring equipment, including when the measured value falls close to the specification limits, taking measurement uncertainty into account.

This Standard applies to specifications defined in general GPS standards (see **ISO 14638**), i.e. standards prepared by **ISO/TC 213**, including:

- workpiece specifications and population specifications (usually given as an upper specification limit or a lower specification limit or both);
- measuring equipment specifications (usually given as maximum permissible errors).

This Standard only applies for characteristics and maximum permissible errors expressed as quantity values.

See Annex JA for economically optimal measuring equipment, and decision rules for acceptance and rejection of workpieces.

NOTE 1 Annex JA is prepared based on the following International Standard.

ISO/TR 14253-6:2012 *Geometrical product specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 6: Generalized decision rules for the acceptance and rejection of instruments and workpieces*

NOTE 2 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 14253-1:2017 *Geometrical product specifications (GPS)—Inspection by measurement of workpieces and measuring equipment—Part 1: Decision rules for verifying conformity or nonconformity with specifications (MOD)*

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 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0642 *Geometrical product specifications (GPS)—General concepts and requirements for GPS measuring equipment*

NOTE Corresponding International Standard: ISO 14978:2006 *Geometrical product specifications (GPS)—General concepts and requirements for GPS measuring equipment*

JIS Q 9000 *Quality management systems—Fundamentals and vocabulary*

NOTE Corresponding International Standard: ISO 9000:2015 *Quality management systems—Fundamentals and vocabulary*

JIS Z 8101-2 *Statistics—Vocabulary and symbols—Part 2: Applied statistics*

NOTE Corresponding International Standard: ISO 3534-2 *Statistics—Vocabulary and symbols—Part 2: Applied statistics*

ISO/IEC Guide 98-3 *Uncertainty of measurement—Part 3: Guide to the expression of uncertainty in measurement* (GUM:1995)

ISO/IEC Guide 98-4 *Uncertainty of measurement—Part 4: Role of measurement uncertainty in conformity assessment*

ISO/IEC Guide 99 *International vocabulary of metrology—Basic and general concepts and associated terms* (VIM)

ISO 17450-2 *Geometrical product specifications (GPS)—General concepts—Part 2: Basic tenets, specifications, operators, uncertainties and ambiguities*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 8101-2**, **JIS Q 9000**, **JIS B 0642**, **ISO 17450-2**, **ISO/IEC Guide 98-3**, **ISO/IEC Guide 98-4** and **ISO/IEC Guide 99**, and the following apply.

NOTE 1 “Probability density function (PDF)” is defined in **JIS Z 8101-1**.

NOTE 2 “Specification limit”, “upper specification limit (USL)”, “lower specification limit (LSL)”, “specified tolerance” and “population” are defined in **JIS Z 8101-2**.

NOTE 3 “Maximum permissible measurement error”, “measurement uncertainty”, “standard measurement uncertainty”, “combined standard measurement uncertainty”, “coverage interval” and “coverage probability” are defined in **ISO/IEC Guide 99**.

NOTE 4 “Acceptance limit”, “acceptance interval”, “rejection interval”, “conformance probability” and “guard band” are defined in **ISO/IEC Guide 98-4**.

NOTE 5 “Conformity” and “nonconformity” are defined in **JIS Q 9000**.

NOTE 6 For the purposes of this Standard, “characteristic” is used to express either a workpiece characteristic, a workpiece population characteristic, or a metrological characteristic of measuring equipment. Because conformity assessment involves measurement, these characteristics are also referred to as measurands.

NOTE 7 The terms shown in **3.13** to **3.24** are used in Annex JA.

3.1

specification zone

interval of values, of the workpiece characteristic, population characteristic or the maximum permissible error (MPE) of a metrological characteristic of a measuring equipment, fulfilling the specification

NOTE A specification refers to or includes drawings, patterns or other relevant documents.

3.2

conformance probability limit

agreed minimum value of conformance probability when verifying conformity

NOTE 1 The conformance probability limit effectively sets the criterion for acceptance when verifying conformity.

NOTE 2 A conformance probability limit of p corresponds to a risk of false acceptance not exceeding $(1 - p)$.

3.3

default conformance probability limit

conformance probability limit (3.2) set by this Standard as default

NOTE In this Standard, the default conformance probability limit is 95 % (see 4.2).

3.4

lower nonconformance probability

probability that a value of a characteristic is below the lower specification limit

NOTE 1 A lower nonconformance probability exists only if a lower specification limit exists.

NOTE 2 Conformance probability, lower nonconformance probability and upper nonconformance probability sum up to unity.

3.5

upper nonconformance probability

probability that a value of a characteristic is above the upper specification limit

NOTE 1 An upper nonconformance probability exists only if an upper specification limit exists.

NOTE 2 Conformance probability, lower nonconformance probability and upper nonconformance probability sum up to unity.

3.6

nonconformance probability limit

agreed minimum value of either the upper nonconformance probability (3.5) or the lower nonconformance probability (3.4) when verifying nonconformity

NOTE 1 The nonconformance probability limit effectively sets the criterion for rejection when verifying nonconformity.

NOTE 2 A nonconformance probability limit of p implies a risk of false rejection not exceeding $(1 - p)$.

3.7

default nonconformance probability limit

nonconformance probability limit (3.6) set by this Standard as default

3.8

acceptance zone

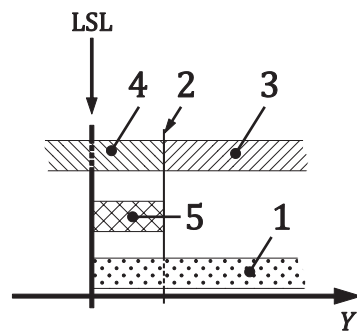
set of one or more acceptance intervals

3.9

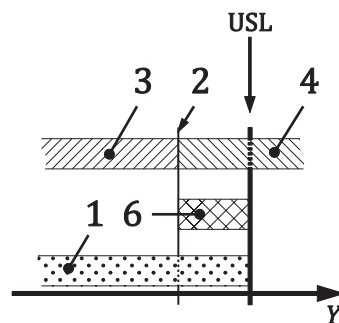
default acceptance zone

acceptance zone (3.8) based on the default conformance probability limit (3.3)

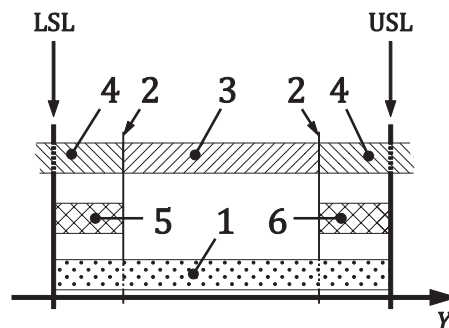
NOTE See Figure 1.



a) Specification defined only by a lower specification limit



b) Specification defined only by an upper specification limit



c) Specification defined by a lower specification limit and an upper specification limit

Key

- 1 specification zone
- 2 acceptance limit
- 3 acceptance zone
- 4 rejection zone
- 5 guard band g_{LA} at lower specification limit
- 6 guard band g_{UA} at upper specification limit
- Y value of characteristic

LSL lower specification limit
USL upper specification limit

NOTE In most cases, the probability density function (PDF) associated with the measured value of the characteristic is considered to be symmetrical, so that g_{UA} , g_{LA} have the same width.

Figure 1 Acceptance zone and rejection zone when verifying conformity

3.10

rejection zone

set of one or more rejection intervals

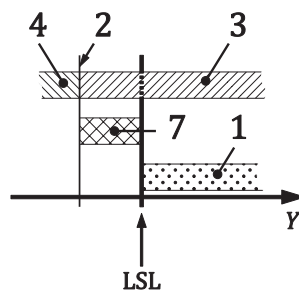
NOTE The rejection zone is the complement to the acceptance zone (**3.8**).

3.11

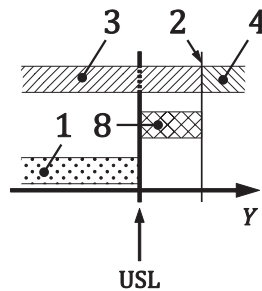
default rejection zone

rejection zone (**3.10**) based on the default nonconformance probability limit (**3.7**)

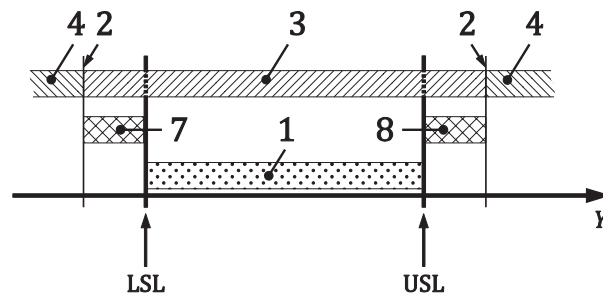
NOTE See Figure 2.



a) Specification defined only by a lower specification limit



b) Specification defined only by an upper specification limit



c) Specification defined by a lower specification limit and an upper specification limit

Key

- 1 specification zone
- 2 acceptance limit
- 3 acceptance zone
- 4 rejection zone
- 7 guard band g_{LR} at lower specification limit
- 8 guard band g_{UR} at upper specification limit
- Y value of characteristic
- LSL lower specification limit
- USL upper specification limit

NOTE In most cases, the probability density function (PDF) associated with the measured value of the characteristic is considered to be symmetrical, so that g_{UR} , g_{LR} have the same width.

Figure 2 Rejection zone and acceptance zone when verifying nonconformity

3.12

uncertainty zone

set of interval(s) close to the specification limit(s) where neither conformity can be verified according to the conformance probability limit (**3.2**) nor nonconformity can be verified according to the nonconformance probability limit (**3.6**)

- NOTE 1 The uncertainty zone is located about the specification limit (unilateral specification) or specification limits (bilateral specification).
- NOTE 2 The uncertainty zone on the upper and lower side of a specification limit may be of different magnitudes.
- NOTE 3 When verifying conformity, the uncertainty zone is part of the rejection zone (**3.10**) and not part of the acceptance zone (**3.8**).
- NOTE 4 When verifying nonconformity, the uncertainty zone is part of the acceptance zone (**3.8**) and not part of the rejection zone (**3.10**).
- NOTE 5 See Figure 3 to Figure 6.

Copyright Japanese Standards Association
Provided by IHS Markit under license with JSA
No reproduction or networking permitted without license from IHS