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**Geometrical Product Specifications
(GPS)—Acceptance and reverification
tests for coordinate measuring
machines (CMM)—Part 4 : CMMs
used in scanning measuring mode**

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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 establishing a Japanese Industrial Standard from Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

This Standard has been made based on **ISO 10360-4 : 2000 Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)—Part 4 : CMMs used in scanning measuring mode** for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial 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.

JIS B 7440 consists of the following 6 parts under the general title *Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)*.

Part 1 : Vocabulary

Part 2 : CMMs used for measuring size

Part 3 : CMMs with the axis of a rotary table as the fourth axis

Part 4 : CMMs used in scanning measuring mode

Part 5 : CMMs using multiple-stylus probing systems

Part 6 : Estimation of errors in computing Gaussian associated features

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the original JIS is to be the final authority.

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**Geometrical Product Specifications (GPS)—
Acceptance and reverification tests for
coordinate measuring machines (CMM)—
Part 4 : CMMs used in scanning
measuring mode**

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 10360-4 Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)—Part 4 : CMMs used in scanning measuring mode** published in 2000 without modifying the technical contents.

The portions of this Standard shown by dotted underlines are the matters not stated in the corresponding International Standard.

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 5 of the chains of standards on size, distance, radius, angle, form, orientation, location, run-out and datums.

The more detailed information on the relationship of this Standard to other standards and the GPS matrix model, see annex C.

The acceptance test and reverification test of this Standard are applicable only to a CMM that is capable of being used in a scanning measuring mode and may be used to determine the form of a surface or the parameters of an associated feature.

The tests specifies in this Standard are performed in addition to the size measuring test according to **JIS B 7440-2**, which are conducted without the use of scanning, and are designed to assess the performance of a CMM used in a scanning measuring mode. It is normally not useful to isolate the scanning probing errors from other sources of machine error.

1 Scope This Standard specifies the acceptance test which verifies that the performance of a CMM used in scanning measuring mode is as stated by the manufacturer. It also specifies the reverification test which enables the user to periodically reverify the performance of a CMM used in scanning measuring mode.

The acceptance test and reverification test described in this Standard are applicable only to CMMs capable of performing scanings using any type of contacting probing system(s).

This Standard specifies items as follows.

- Requirements for metrological characteristics,
- Acceptance test and reverification test,
- Compliance with specifications,
- Applications.

NOTE : 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 10360-4 : 2000 *Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)—Part 4 : CMMs used in scanning measuring mode* (IDT)

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

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 7440-1 *Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)—Part 1 : Vocabulary*

NOTE : **ISO 10360-1 : 2000** *Geometrical Product Specifications (GPS)—Acceptance and reverification tests for coordinate measuring machines (CMM)—Part 1 : Vocabulary* is identical with the said standard.

(VIM) International Vocabulary of Basic and General Terms in Metrology, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 2nd edition, 1993

3 Terms and definitions For the purposes of this Standard, the terms and definitions given in **JIS B 7440-1**, **JIS B 0641-1** and VIM apply.

4 Requirements for metrological characteristics

4.1 Error of indication The scanning probing error(s), T_{ij} , shall not exceed the maximum permissible scanning probing error(s), $MPE_{T_{ij}}$, as stated by the manufacturer, in case of acceptance tests and the user, in case of reverification tests.

The scanning probing error(s), T_{ij} , and the maximum permissible scanning probing error(s), $MPE_{T_{ij}}$, are expressed in micrometres.

4.2 Time for scanning test The time for scanning test, τ_{ij} , shall not exceed the maximum permissible time for scanning test, $MPT_{\tau_{ij}}$, as stated by the manufacturer, in case of acceptance tests and the user, in case of reverification tests.

The time for scanning test, τ_{ij} , and the maximum permissible time for scanning test, $MPT_{\tau_{ij}}$, are expressed in seconds.

4.3 Environmental conditions Limits to be respected for permissible environmental conditions such as temperature conditions, air humidity and vibration at site of installation that influence the measurements shall be specified by the manufacturer, in case of acceptance tests and the user, in case of reverification tests.

In both cases, the user is free to choose the conditions within the specified limits.

4.4 Stylus system A ball-ended stylus with a nominal tip diameter of 3 mm shall be used for performing the test for CMMs used in scanning measuring mode.

Other limits to be respected for the stylus system configuration, to which the stated values of MPE_{Tij} apply, shall be specified by the manufacturer, in case of acceptance tests and the user, in case of reverification tests.

In both cases, the user is free to choose the way in which the components of the stylus system are configured within the specified limits.

The form deviation of the stylus tip will influence the measurement results and shall be considered when proving conformance or non-conformance with specification.

NOTE: It is recommended that a stylus orientation is chosen which will ensure all axes of the probe and the CMM are exercised simultaneously when performing the scanning.

4.5 Operating conditions The CMM shall be operated using the procedures given in the manufacturer's operating manual when conducting the tests given in clause 5. Specific areas in this manual to be adhered to are for example:

- a) machine start up/warm up cycles;
- b) stylus system configuration;
- c) cleaning procedures for stylus tip and reference sphere;
- d) probing system qualification.

NOTE: The stylus tip and the reference sphere should be cleaned before the probing system qualification so as to leave no residual film which could affect the measuring or test result.

5 Acceptance test and reverification test

5.1 General The tests described are applicable for:

- a) scanning on a predefined path to collect a high density of points (HP);
- b) scanning on a predefined path to collect a low density of points (LP);
- c) scanning on a non-predefined path to collect a high density of points (HN);
- d) scanning on a non-predefined path to collect a low density of points (LN).

NOTE 1 Scanning to collect a high density of points is particularly relevant when information on deviations from perfect form is required. Scanning to collect a low density of points may be relevant to allow the optimization of speed when information on associated feature characteristics is required. In any case the test is not able to define completely CMM