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**Micrometers**

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## Contents

|                                                                                                                                                      | Page |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Introduction .....                                                                                                                                   | 1    |
| 1 Scope .....                                                                                                                                        | 1    |
| 2 Normative references .....                                                                                                                         | 1    |
| 3 Terms and definitions .....                                                                                                                        | 2    |
| 4 Design specification (design characteristics) .....                                                                                                | 3    |
| 4.1 General .....                                                                                                                                    | 3    |
| 4.2 Names of main parts .....                                                                                                                        | 3    |
| 4.3 Dimensions .....                                                                                                                                 | 6    |
| 4.4 Measuring range .....                                                                                                                            | 10   |
| 4.5 Types of indicating devices .....                                                                                                                | 11   |
| 4.6 Protection of electronic digital indication for field use .....                                                                                  | 13   |
| 4.7 Insulation plate .....                                                                                                                           | 13   |
| 4.8 Measuring faces .....                                                                                                                            | 14   |
| 4.9 Measuring-force limiting device .....                                                                                                            | 14   |
| 4.10 Adjustment devices .....                                                                                                                        | 14   |
| 4.11 Spindle .....                                                                                                                                   | 14   |
| 5 Metrological characteristics and performance .....                                                                                                 | 14   |
| 5.1 General .....                                                                                                                                    | 14   |
| 5.2 Metrological characteristics .....                                                                                                               | 15   |
| 5.3 Performance .....                                                                                                                                | 20   |
| 6 Marking on product documents .....                                                                                                                 | 28   |
| 7 Proof of conformance with specifications .....                                                                                                     | 28   |
| 7.1 General .....                                                                                                                                    | 28   |
| 7.2 Measurement standard for calibration of metrological characteristics<br>and performance .....                                                    | 29   |
| 7.3 Standard reference temperature .....                                                                                                             | 29   |
| 8 Inspection .....                                                                                                                                   | 29   |
| 9 Marking .....                                                                                                                                      | 29   |
| Annex A (informative) Example of an error-of-indication curve .....                                                                                  | 30   |
| Annex B (informative) Notes on use .....                                                                                                             | 31   |
| Annex C (informative) Typical data sheet for design specification (design<br>characteristics), metrological characteristics and<br>performance ..... | 32   |
| Annex D (informative) Relation to the GPS matrix model .....                                                                                         | 33   |

|                        |                                                                                |    |
|------------------------|--------------------------------------------------------------------------------|----|
| Annex JA (informative) | Marking on product documents .....                                             | 35 |
| Annex JB (informative) | Comparison table between JIS and corresponding<br>International Standard ..... | 36 |

## 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 Japan Precision Measuring Instruments manufacturers Association (JMA)/ 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 7502:1994** is replaced with this Standard.

**JIS B 7502:1994** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until August 21, 2017.

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

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

# Micrometers

## Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 3611** published in 2010 with some modifications of the technical contents in order to correspond to the practical manufacture and use.

The portions given sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JB.

This Standard is one of geometrical product specifications (GPS) under the GPS Basic Standard (see **ISO/TR 14638** : 1995) and related to the chain link 5 for the chain of standards on size. The details on the relation between this Standard and other GPS Standards are given in Annex D.

## 1 Scope

This Standard specifies micrometer for external measurements, bar-shaped micrometer for internal measurements, micrometer for span measurements of teeth, and micrometer head (hereafter referred to as micrometer, unless otherwise specified), equipped with analogue indication, mechanical or electronic digital indication.

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

ISO 3611 : 2010 *Geometrical product specifications (GPS) — Dimensional measuring equipment : Micrometers for external measurements — Design and metrological characteristics* (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 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 :** Corresponding International Standard : ISO 14253-1 *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1 : Decision rules for proving conformity or nonconformity with specifications*

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

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

JIS B 0680 *Geometrical Product Specifications (GPS) — Standard reference temperature for geometrical product specification and verification*

JIS B 7430 *Optical flats*

JIS B 7431 *Optical parallels*

JIS B 7506 *Gauge blocks*

JIS B 7536 *Electrical comparators*

JIS B 7538 *Autocollimators*

JIS C 0920 *Degrees of protection provided by enclosures (IP Code)*

NOTE : Corresponding International Standard : IEC 60529 *Degrees of protection provided by enclosures (IP Code)* (IDT)

JIS Z 8103 *Glossary of terms used in measurement*

### 3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS B 0641-1**, **JIS B 0642**, **JIS Z 8103**, and the following apply.

#### 3.1 micrometer for external measurements

measuring instrument which gives the evaluation of a dimensional quantity of an external feature of a workpiece on the basis of movement of a spindle with a measuring face, moving relatively to a material measure and a fixed anvil, with the movement generated by a screw thread

NOTE 1 The guiding elements of the spindle and of the anvil are connected by a frame.

NOTE 2 Usually, micrometers for external measurements have a thread as a material measure with the anvil, spindle and screw mechanism arranged linearly.

#### 3.2 bar-shaped micrometer for internal measurements

measuring instrument which gives the evaluation of a dimensional quantity of an internal feature of a workpiece on the basis of movement of a spindle with a measuring face, moving relatively to an adjusting anvil fixed on the body, with the movement generated by a screw thread (hereafter referred to as “micrometer for internal measurements”)

This type of micrometers does not include extendable micrometers whose measuring range can be expanded.

NOTE 1 An adjusting anvil and an anvil fixed on the spindle have a spherical

measuring face.

NOTE 2 Micrometers for internal measurements have a screw thread as a material measure with the adjusting anvil, anvil, spindle and screw mechanism arranged linearly.

### 3.3 micrometer for span measurements of teeth

micrometer for external measurements to be mainly used for the measurement of the base tangent length of the involute gear

NOTE : The micrometer has a disc-shaped measuring face.

### 3.4 micrometer head

measuring instrument which gives the evaluation of a displacement of a workpiece on the basis of movement of a spindle with a measuring face, with the movement generated by a screw thread

NOTE 1 The micrometer head has a mounting part to fix the instrument.

NOTE 2 The micrometer head has the spindle and screw mechanism arranged linearly.

### 3.5 measuring face contact

contact between the measuring face and a feature of a workpiece

#### 3.5.1 full measuring face contact

contact between the full area of the measuring face and a feature of a workpiece

#### 3.5.2 partial measuring face contact

contact between a partial area of the measuring face and a feature of a workpiece

### 3.6 error of indication

indication of a micrometer minus a true value of the corresponding input quantity

NOTE : The conventional true value is used because it is impracticable to determine a true value.

## 4 Design specification (design characteristics)

### 4.1 General

The general design specification (design characteristics) of the micrometer shall be such that its metrological characteristics comply with the requirements of this Standard under all operational orientations, unless otherwise specified by the manufacturer (supplier).

NOTE : An example of data sheet for specification marking in the case of providing the information for users is given in Annex C.

### 4.2 Names of main parts

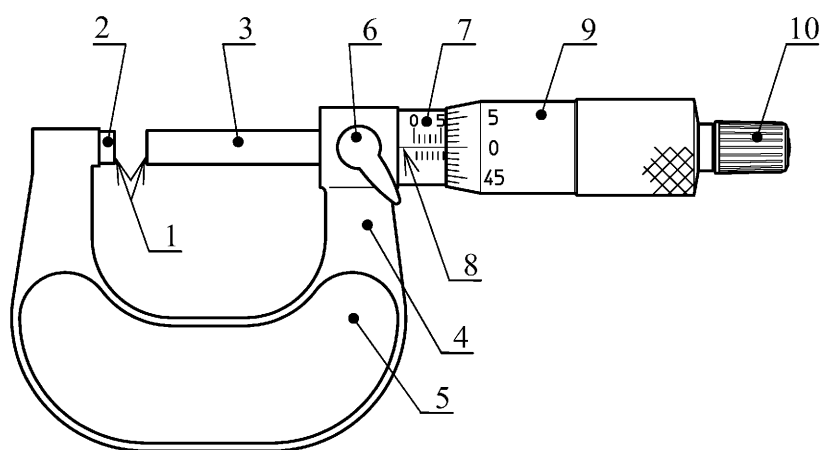
The names of main parts of micrometer shall be as given in Table 1.

The figures are intended to indicate the names but not intended to give the design

details.

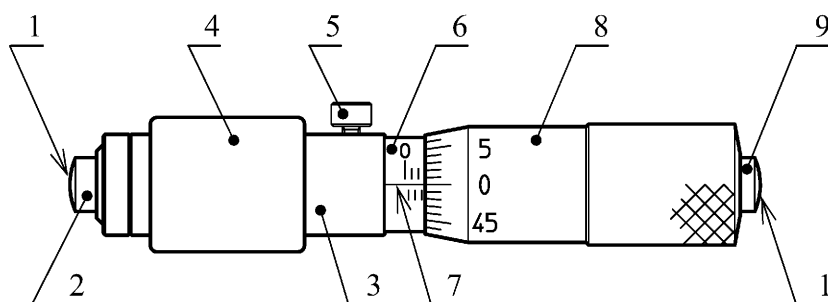
**Table 1 Names of micrometer**

| Classification                            | Main parts shown in : |
|-------------------------------------------|-----------------------|
| Micrometer for external measurements      | Figure 1              |
| Micrometer for internal measurements      | Figure 2              |
| Micrometer for span measurements of teeth | Figure 3              |
| Micrometer head                           | Figure 4              |



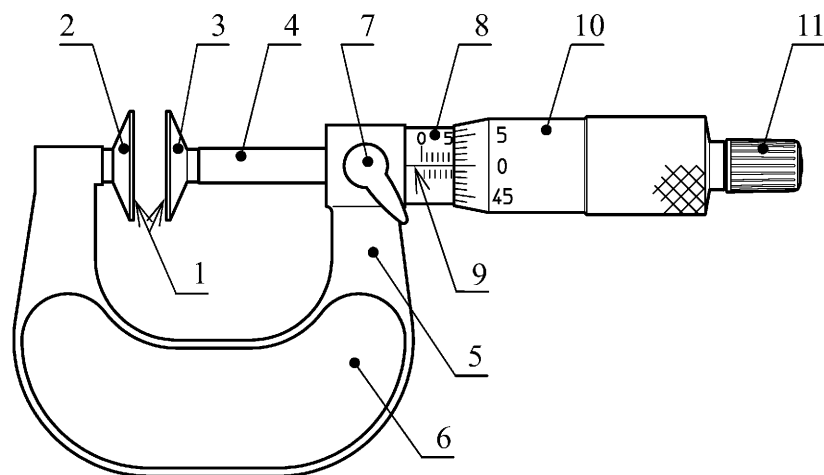
- |                              |                                                 |
|------------------------------|-------------------------------------------------|
| 1 measuring face             | 6 clamp                                         |
| 2 anvil                      | 7 sleeve                                        |
| 3 spindle                    | 8 fiducial line                                 |
| 4 frame                      | 9 thimble                                       |
| 5 thermally insulating plate | 10 fast drive (measuring-force limiting device) |

**Figure 1 Main parts of micrometer for external measurements**



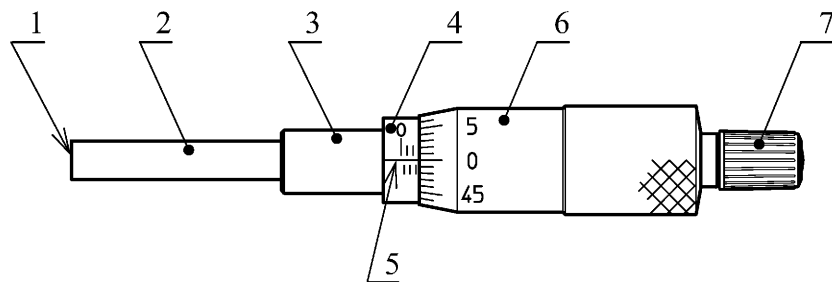
- |                                    |                 |
|------------------------------------|-----------------|
| 1 measuring face                   | 6 sleeve        |
| 2 adjusting anvil                  | 7 fiducial line |
| 3 body                             | 8 thimble       |
| 4 grip (thermally insulating part) | 9 anvil         |
| 5 clamp                            |                 |

**Figure 2 Main parts of micrometer for internal measurements**



- |                              |                                                 |
|------------------------------|-------------------------------------------------|
| 1 measuring face             | 7 clamp                                         |
| 2 anvil disc                 | 8 sleeve                                        |
| 3 spindle disc               | 9 fiducial line                                 |
| 4 spindle                    | 10 thimble                                      |
| 5 frame                      | 11 fast drive (measuring-force limiting device) |
| 6 thermally insulating plate |                                                 |

**Figure 3 Main parts of micrometer for span measurements of teeth**



- |                  |                                                |
|------------------|------------------------------------------------|
| 1 measuring face | 4 sleeve                                       |
| 2 spindle        | 5 fiducial line                                |
| 3 attaching face | 6 thimble                                      |
|                  | 7 fast drive (measuring-force limiting device) |

**Figure 4 Main parts of micrometer head**

### 4.3 Dimensions

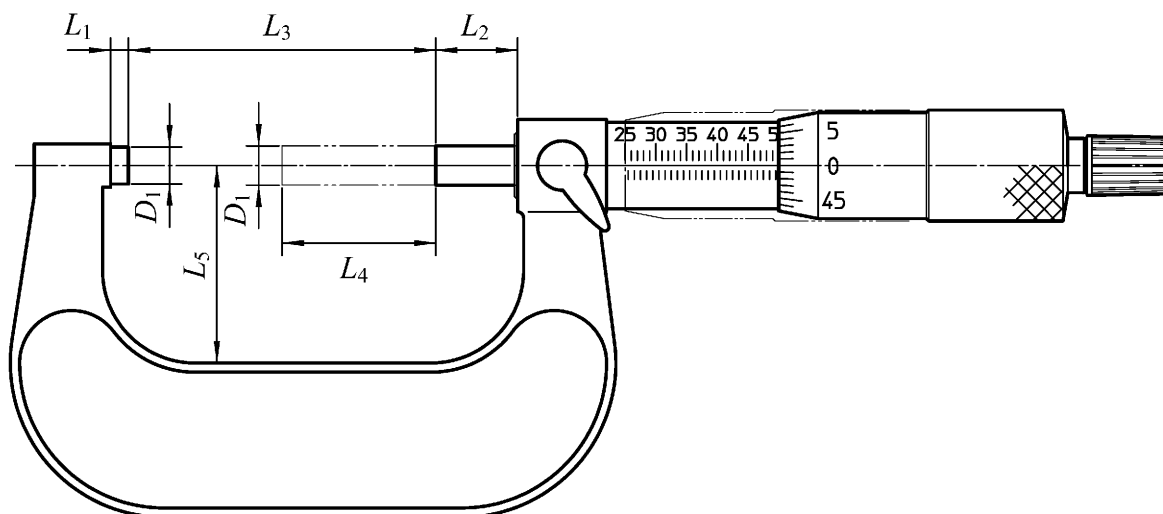
The main shapes and dimensions of the micrometer shall be as follows.

- Micrometer for external measurements shall be as given in Table 2.
- Micrometer for internal measurements shall be as shown in Figure 5.
- Anvil disc and spindle disc of micrometer for span measurements of teeth shall be as given in Table 3.
- The mounting part of micrometer head shall be as shown in Figure 6.

The clearance between the spindle and the guide hole of micrometer for external

measurements, micrometer for span measurements of teeth and micrometer head shall be as given in Table 4.

**Table 2 Shape and dimensions of micrometer for external measurements**



| Dimensions                                                                                                                                      | Nominal value                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Anvil length, $L_1$                                                                                                                             | —                                           |
| Spindle length in end position, $L_2$                                                                                                           | —                                           |
| Maximum measurable dimension, $L_3$                                                                                                             | —                                           |
| Measuring span, $L_4$                                                                                                                           | 25 mm <sup>a)</sup>                         |
| Frame depth, $L_5$ <sup>b)</sup>                                                                                                                | —                                           |
| Spindle and anvil diameter, $D_1$                                                                                                               | 6.35 mm, 6.5 mm, 7.5 mm, 8 mm <sup>a)</sup> |
| NOTE : $D_1$ , $L_1$ and $L_2$ dimensions are important as a compatibility of device to be attached on the measuring face.                      |                                             |
| Notes <sup>a)</sup> At the manufacturer's discretion. Other diameters are possible.                                                             |                                             |
| <sup>b)</sup> Usually, $L_5$ is determined to permit the measurement of the diameter of the cylinder equal to the maximum measurable dimension. |                                             |

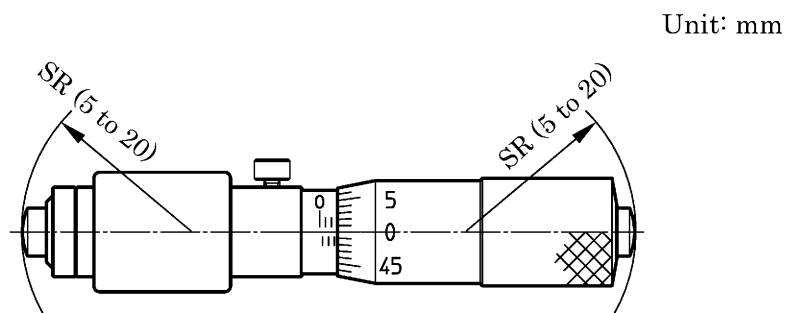
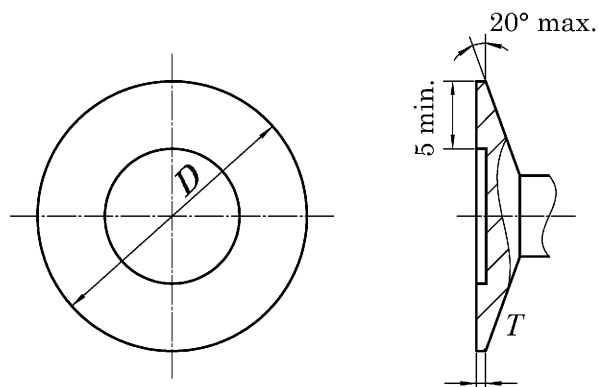


**Figure 5** Radius of curvature of measuring face of micrometer for internal measurements

**Table 3** Shapes and dimensions of anvil disc and spindle disc of micrometer for span measurements of teeth

Unit: mm



| Maximum measurable dimension                                                                                                         | <i>D</i> | <i>T</i>   |
|--------------------------------------------------------------------------------------------------------------------------------------|----------|------------|
| 50 or under                                                                                                                          | 15 to 20 | 0.5 to 1.0 |
| over 50 up to and incl. 100                                                                                                          | 18 to 25 | 0.5 to 1.2 |
| over 100 up to and incl. 200                                                                                                         | 20 to 30 | 0.7 to 1.5 |
| over 200 up to and incl. 300                                                                                                         | 20 to 40 | 0.7 to 2.0 |
| Anvil discs and spindle discs of other maximum measurable dimensions shall be as agreed between the parties concerned with delivery. |          |            |

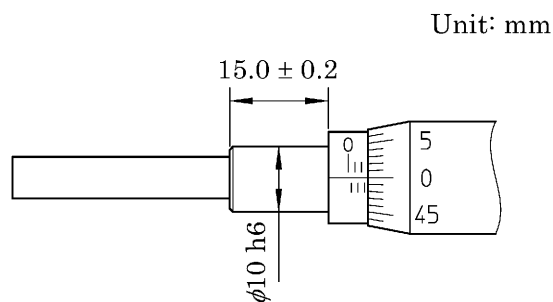
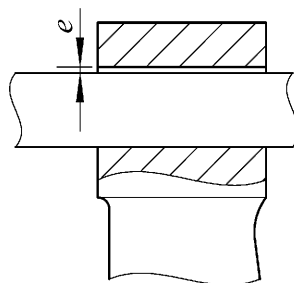


**Figure 6** Shape and dimensions of mounting part of micrometer head

**Table 4** Clearance between a spindle and its guide hole



Unit: mm

| Classification                            | Clearance                |
|-------------------------------------------|--------------------------|
| Micrometer for external measurements      | $e = 0.01 \text{ max.}$  |
| Micrometer for span measurements of teeth |                          |
| Micrometer head                           | $e = 0.015 \text{ max.}$ |

#### 4.4 Measuring range

The types of measuring ranges of the micrometer shall be as given in Table 5.

**Table 5 Types of measuring ranges**

Unit: mm

| Measuring range                                                                                           |                                      |                                           |                 |
|-----------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------|-----------------|
| Micrometer for external measurements                                                                      | Micrometer for internal measurements | Micrometer for span measurements of teeth | Micrometer head |
| 0 to 25                                                                                                   | —                                    | 0 to 25                                   | 0 to 25         |
| 25 to 50                                                                                                  |                                      | 25 to 50                                  | —               |
| 50 to 75                                                                                                  | 50 to 75                             | 50 to 75                                  |                 |
| 75 to 100                                                                                                 | 75 to 100                            | 75 to 100                                 |                 |
| 100 to 125                                                                                                | 100 to 125                           | 100 to 125                                |                 |
| 125 to 150                                                                                                | 125 to 150                           | 125 to 150                                |                 |
| 150 to 175                                                                                                | 150 to 175                           | 150 to 175                                |                 |
| 175 to 200                                                                                                | 175 to 200                           | 175 to 200                                |                 |
| 200 to 225                                                                                                | 200 to 225                           | 200 to 225                                |                 |
| 225 to 250                                                                                                | 225 to 250                           | 225 to 250                                |                 |
| 250 to 275                                                                                                | 250 to 275                           | 250 to 275                                |                 |
| 275 to 300                                                                                                | 275 to 300                           | 275 to 300                                |                 |
| 300 to 325                                                                                                | 300 to 325                           | —                                         |                 |
| 325 to 350                                                                                                | 325 to 350                           |                                           |                 |
| 350 to 375                                                                                                | 350 to 375                           |                                           |                 |
| 375 to 400                                                                                                | 375 to 400                           |                                           |                 |
| 400 to 425                                                                                                | 400 to 425                           |                                           |                 |
| 425 to 450                                                                                                | 425 to 450                           |                                           |                 |
| 450 to 475                                                                                                | 450 to 475                           |                                           |                 |
| 475 to 500                                                                                                | 475 to 500                           |                                           |                 |
| Micrometers having other measuring ranges shall be as agreed between the parties concerned with delivery. |                                      |                                           |                 |