



Tubular Inside Micrometers (Single Rod Type)
Tubular Inside Micrometers (Extension Rod Type)
Tubular Inside Micrometers (Extension Pipe Type)

Safety Precautions

To ensure operator safety, use this product according to the directions, functions and specifications given in this User's Manual.

Use under other conditions may compromise safety.

CAUTION Shows risks that could result in minor or moderate injury.

Always handle the sharp measuring faces of this product with care to avoid injury.

NOTICE Shows risks that could result in property damage.

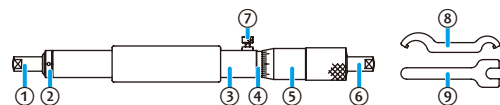
- Do not use this product for purposes other than measurement.
- Do not disassemble or modify. Doing so will void the warranty.
- Do not use or store the product in a place with sudden temperature changes. Adapt the product to ambient temperature before use.
- Do not store the product in a place with high humidity or a lot of dust.
- Do not use the product in a place where it may contact water, etc.
- Do not apply excessive force or subject to sudden impacts such as dropping.
- Remove dust, cutting chips, etc. and apply anti-rust oil after use.
- Remove any dirt on the product by wiping gently with a soft non-linty cloth. Do not use organic solvents such as cleaning agents or thinner.
- Do not write numbers, etc. with an electric pen.
- Do not move or dangle the product with its measuring head still set on the workpiece.

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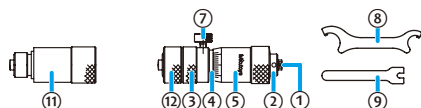
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1. Names of Components

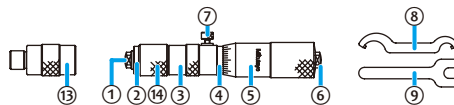
133 Series Tubular Inside Micrometers (IM)



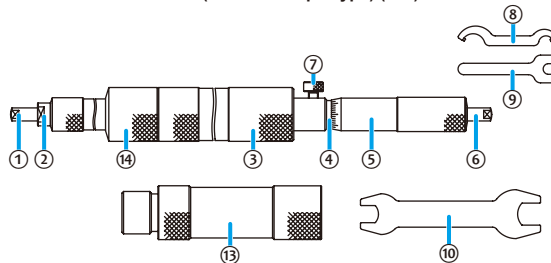
137 Series Tubular Inside Micrometers (Extension Rod Type) (IMZ)



139 Series Tubular Inside Micrometers (Extension Pipe Type) (IMJ)



140 Series Tubular Inside Micrometers (Extension Pipe Type) (IMJ)

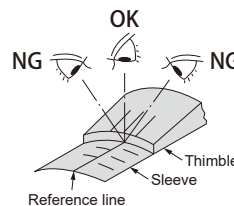


- | | | |
|--------------------|-----------------|------------------|
| ① Adjustment anvil | ⑦ Clamp*1 | ⑬ Extension pipe |
| ② Adjustment nut | ⑧ Wrench | ⑭ Adjustment rod |
| ③ Body | ⑨ Wrench | |
| ④ Sleeve | ⑩ Wrench | |
| ⑤ Thimble | ⑪ Extension rod | |
| ⑥ Anvil | ⑫ Cap | |
- *1: Not included with IM-75

2. Precautions for Use

Parallax

- Because of the structure of the product, the reference line surface on the sleeve and the graduation line surface on the thimble are not on the same plane, so the point where the two lines meet will deviate depending on the position of your eyes. When reading measured values, do so with reference to the figure at right, perpendicular from the point where the reference line on the sleeve is aligned with the graduation line on the thimble.
- If looking from a different direction (as in the figure at right), there will be a parallax of roughly 2 μm.



Precautions for Measurement

- This product, which is not equipped with a constant pressure device, is configured with heavier operation than normal outside micrometers. The interior hydraulic oil will increase in viscosity if used in low temperatures or left unused for a long time, and operation may feel heavier. In this case, operate the thimble at full stroke several times to recover normal operation.

Precautions and Cleaning after Use

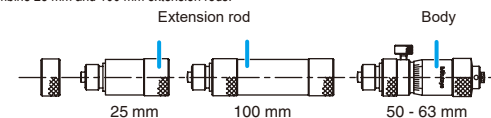
- After use, clean the entire product with a soft, non-linty cloth and check that none of the parts are damaged.
- When oil, cutting fluid, or liquid itself is adhered, or when very dirty, clean with a soft, non-linty cloth impregnated with a volatile solvent (cleaning alcohol, etc.).
- After use, apply anti-rust treatment to the anvil, using Micrometer oil (Part No. 207000).
- If using in places exposed to water-based cutting fluid, always apply anti-rust treatment after cleaning.
- If Micrometer oil is unavailable and the only option is a commercial product, we recommend low-viscosity anti-rust oil of ISO VG10 or so.

3. Extension Rod (Pipe) Selection Examples

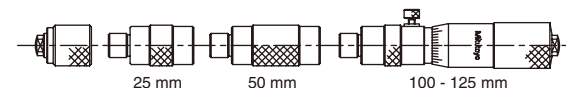
With reference to the selection examples below, attach extension rods (pipes) to measure the workpiece, according to the length of the workpiece.

Attach extension rods to the Tubular Inside Micrometers (Extension Rod Type) (IMZ), or extension pipes to the Tubular Inside Micrometers (Extension Pipe Type) (IMJ).

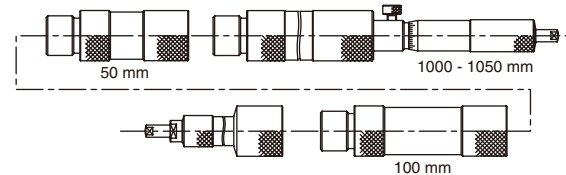
When setting the Tubular Inside Micrometers (Extension Rod Type) (IMZ) measurement range from 175 mm through 188 mm, combine 25 mm and 100 mm extension rods.



When setting the 139 Series Tubular Inside Micrometers (Extension Pipe Type) (IMJ) measurement range from 175 mm through 200 mm, combine 25 mm and 50 mm extension pipes.



When setting the 140 Series Tubular Inside Micrometers (Extension Pipe Type) (IMJ) measurement range from 1150 mm through 1200 mm, combine 50 mm and 100 mm extension pipes.



4. Mounting/Removing Extension Rods (Pipes)

The mounting and removal methods for extension rods (pipes) are indicated below.

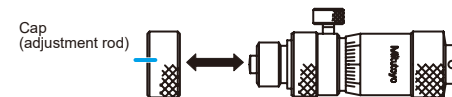
Important

- Before mounting, wipe clean the extension rods (pipes) to be mounted as well as the connection area on the body.
- Be sure to perform reference point setting after mounting or removing rods (pipes).

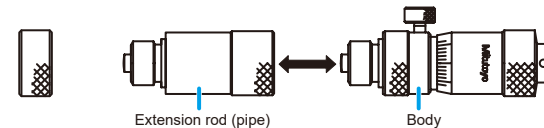
- 1 Wipe clean the extension rods (pipes) to be mounted as well as the connection area on the body, to remove any debris or dust.



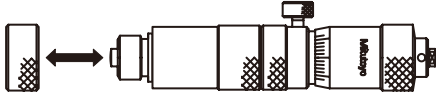
- 2 Loosen and remove the cap (adjustment rod) by hand.



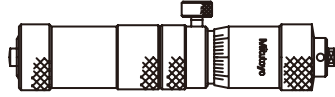
- 3 Mount the extension rod (pipe) by manually screwing it into the body.



- 4 Mount the cap (adjustment rod) by screwing it onto the end of the extension rod (pipe).



- 5 Set the reference point and begin measurement (see "5. Reference Point Setting").

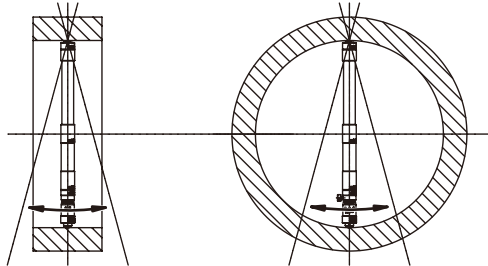


5. Reference Point Setting

Important

- Be sure to follow the procedure shown in 1 to 7 below to confirm and set the reference point prior to measuring.
- When setting the reference point for this product, make sure to use a calibrated gage (setting ring, etc.).
- The reference point can be set by combining with a rectangular gauge block and its accessories. Make use of this option for reference point setting at measurement lengths where a setting ring cannot be used.
- Remove any dirt or oil from the measuring surfaces of the gage and product prior to setting the reference point.
- Use the same orientation and conditions when measuring and setting the reference point.

- 1 Remove any dirt or dust from the measuring surfaces of the gage and the product.
- 2 Rotate the product thimble to set the measurement length slightly smaller than that of the gage, and then slowly insert it into the gage.
- 3 Rotate the product thimble and bring the measurement surface gently into contact with the inside of the gage.
- 4 In order to measure the diameter accurately, move the product in the direction of the arrow with regard to the axis to determine the lowest point.
Next, move it in the direction of the arrow within a cross-section perpendicular to the axis to determine the highest point.



- 5 Read the measured value. If it matches the gage dimension value, reference point setting is complete. If the values do not match, adjust for greater accuracy with the following method (repeat until reference point setting is complete).

- If the reference point difference is ± 0.01 mm or less
Using the included wrench (⊗), rotate the sleeve until its reference line is aligned with the gage dimension value.

- If the reference point difference is ± 0.01 mm or higher
Using the included wrench (⊗), rotate the anvil (for IMZ, the adjustment nut) to loosen it, and rotate the thimble until the sleeve reference line is aligned with the gage dimension value.
If the reference line is slightly off from the zero graduation line on the thimble, adjust according to * If the reference point difference is ± 0.01 mm or less*.

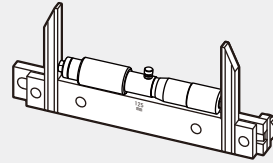
- 6 After adjustment, tighten the anvil (for IMZ, the adjustment nut) to fix the sleeve.
- 7 Repeat steps 1 to 5, and confirm that the measured value matches the gage dimension value.

NOTICE Shows risks that could result in property damage.

Note that rotating the adjustment anvil changes the total length dimension.

Tips

When setting the reference point with a rectangular gauge block and its accessories, set the product as in the figure. For details of the gage assembly method, etc., see the separate "Rectangular Gauge Block Accessories for Gauge Blocks over 100 mm".



6. Measurement Method

Important

For accurate measurement, be sure to perform reference point setting before measurement.

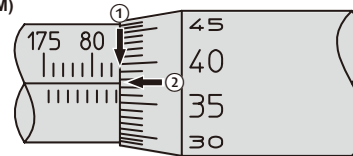
- 1 Insert the product into the workpiece, and then revolve the thimble until the anvil makes contact with the measurement location.
- 2 In the same position and conditions as for reference point setting, move the product forward and backward along the axis to make contact with the minimum measurement length position.
Next, move it horizontally within the cross-section orthogonal to the axis to make contact with the maximum measurement length position, and read the measured value (see "5. Reference Point Setting").

7. How to Read Graduations

■ For Tubular Inside Micrometers (IM)

Read the graduations as below.

① Sleeve reading	182.5 mm
② Thimble reading	0.37 mm
	182.87 mm

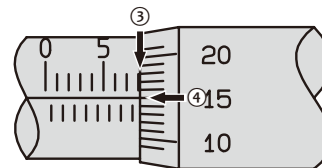


■ For Tubular Inside Micrometers (Extension Rod Type) (IMZ)

Total the readings for each dimension, including the body (50 mm) and the extension rod(s) (e.g. 100 mm), along with the sleeve and thimble.

Read the graduations as below.

① Body dimension	50.0 mm
② Extension rod(s) additional part dimension	100.0 mm
③ Sleeve reading	8.0 mm
④ Thimble reading	0.15 mm
	158.15 mm

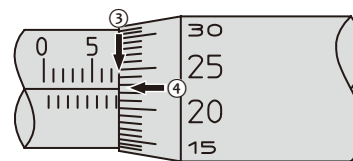


■ For Tubular Inside Micrometers (Extension Pipe Type) (IMJ)

Total the readings for each dimension, including the body (139 Series: 100 mm) and the extension pipe(s) (e.g. 100 mm), along with the sleeve and thimble.

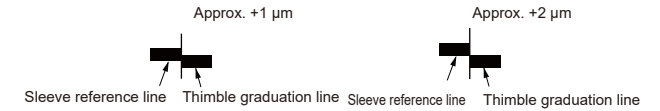
Read the graduations as below.

① Body dimension	100.0 mm
② Extension rod(s) additional part dimension	100.0 mm
③ Sleeve reading	7.5 mm
④ Thimble reading	0.22 mm
	207.72 mm



Read the thimble at the location where the sleeve reference line matches the graduation line on the thimble.

This is normally read up to a graduation of 0.01 mm (as shown above). However, it is also visually possible to read up to a graduation of 0.001 mm (as shown in the figure below).



8. Specifications

Maximum allowable error J_{MPE}^* :	Series No.	Maximum measuring length	Maximum permissible error J_{MPE}^*
133		75 mm	$\pm 3 \mu\text{m}$
		100 mm	$\pm 4 \mu\text{m}$
		125-225 mm	$\pm 5 \mu\text{m}$
		255-300 mm	$\pm 6 \mu\text{m}$
		325-375 mm	$\pm 7 \mu\text{m}$
		400-450 mm	$\pm 8 \mu\text{m}$
		475-525 mm	$\pm 9 \mu\text{m}$
		550-600 mm	$\pm 10 \mu\text{m}$
		625-675 mm	$\pm 11 \mu\text{m}$
		700-750 mm	$\pm 12 \mu\text{m}$
		775-825 mm	$\pm 13 \mu\text{m}$
		850-900 mm	$\pm 14 \mu\text{m}$
		925-975 mm	$\pm 15 \mu\text{m}$
	1000 mm	$\pm 16 \mu\text{m}$	
	3 in	± 0.00015 in	
	4 in	± 0.0002 in	
	5 - 9 in	± 0.00025 in	
	10 - 12 in	± 0.0003 in	

*1: Maximum permissible error for indicated value via contact with full measuring face J_{MPE} (20 °C).

Plunger feed error	Series No.	Plunger feed error (20 °C)
137, 139		3 μm
		0.00015 in
140		6 μm
		0.0003 in

- Graduation : 0.01 mm
0.001 in
- Operating temperature : 5 °C to 40 °C
- Storage temperature : -10 °C to 60 °C

9. Paid Maintenance

We recommend periodic inspections to check and maintain the product's accuracy. Also, if any of the following defects occur, please contact the agent where you purchased the product or a Mitutoyo sales office.

- Inconsistent measured values
Burr or nicks generated by an impact on the measurement surfaces may affect measurement repeatability.