



# Outside Micrometer

## Safety Precautions

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

Use under other conditions may compromise safety.

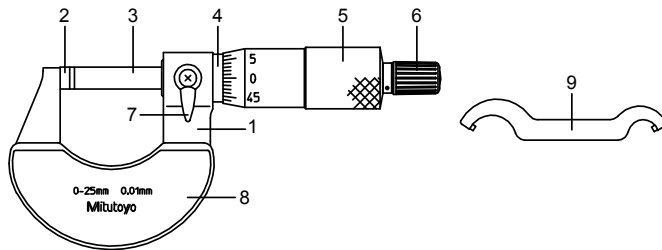
### CAUTION

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

### NOTICE

- Do not disassemble or modify this product. It can cause failure.
- Avoid using or storing this product where there is significant temperature change. Prior to use, thermally stabilize the product at room temperature.
- Avoid storing this product in a humid or dusty place.
- If this product is used where it will be directly splashed with coolant or the like, take rust prevention measures after use. Rust can cause failure.
- Do not apply sudden shocks (such as dropping) or excessive force to this product.
- Be sure to perform reference point adjustment before measurement.
- Remove dust, chips, etc. before and after use.
- Dirt on the spindle may cause operation failure. If the spindle is dirty, wipe the dirt off using a cloth slightly dampened with alcohol, and apply a small amount of oil for micrometer (part No. 207000).

## 1. Part Names and Functions

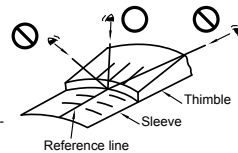


- |   |   |
|---|---|
| 1 Frame                                   | 6 Ratchet stop                                |
| 2 Anvil                                   | 7 Clamp                                       |
| 3 Spindle                                 | (used to lock the movement of the spindle)    |
| 4 Sleeve                                  | 8 Frame cover (varies depending on the model) |
| 5 Thimble (varies depending on the model) | 9 Key spanner                                 |

## 2. Precautions for Use

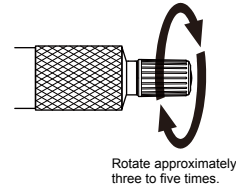
### 1) Parallax

- For the micrometer, the reference line on the sleeve and the graduations on the thimble are not on the same plane, so the coincidence point of two lines changes depending on the eye position. Read the measured value from vertically above the coincidence point of the reference line on the sleeve and a graduation on the thimble.
- If you change the eye position as shown in the figure, a parallax of approximately 2 μm will be generated. Pay particular attention when using a micrometer with vernier scale.



### 2) Measuring force

- Be sure to perform the measurement with a constant measuring force by using the ratchet stop.
- An appropriate measuring force can be applied by bringing the measuring surfaces into light contact with the workpiece, stopping spindle movement, and then rotating the ratchet stop approximately three to five turns with your fingers.
- The ratchet stop is generally used as a mechanism for applying a constant measuring force. However, the friction thimble is also provided for the same purpose.



Rotate approximately three to five times.

### 3) Error due to posture

- The posture of the micrometer is not a problem when the measuring length is short. For a medium size (300 to 500 mm) or large size (500 mm or more) micrometer, the reference point slightly varies by the posture.
- Before use, perform the reference point adjustment in the same posture as for the actual measurement.

### 4) Precautions after use

- After use, check for damaged parts and clean the product thoroughly. If this product is used in a place where water-soluble cutting oil can adhere to it, be sure to take rust prevention measures after cleaning.
- When storing this product, leave a gap of approximately 0.2 to 2 mm between the measuring surfaces and release the clamp.
- When storing this product for a long period, apply rust prevention measures to the spindle using oil for micrometer (part No. 207000).

## 3. Reference point Adjustment

### NOTICE

- Use a periodically inspected gauge block or a setting standard for outside micrometer to perform the reference point adjustment.
- Use the same posture and conditions for both the reference point adjustment and the measurement, following the steps below.

- 1) Wipe off the measuring surfaces of both the anvil and spindle and also the gage (if it is used) to remove dirt and dust.
- 2) When the measuring range is 0 to 25 mm:
 

Bring the two measuring surfaces into light contact with each other, stop spindle movement, and then apply the specified measuring force. (See "2 Measuring force" in "2. Precautions for Use".)

When the measuring range is other than 0 to 25 mm: Hold the gage between the two measuring faces, bring the spindle into light contact with the gage, stop the spindle movement, and then apply the specified measuring force. (See "2 Measuring force" in "2. Precautions for Use".)
- 3) If the zero graduation on the thimble is aligned with the reference line on the sleeve, start the measurement. Otherwise, perform the following adjustment.

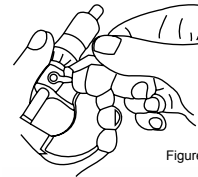


Figure 1

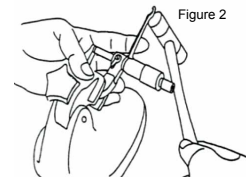


Figure 2

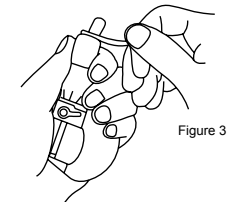


Figure 3

- When the alignment error is ±0.01 mm or less (Figure 1 and 2) Insert the supplied key spanner into a hole on the back of the reference line on the sleeve, and turn the sleeve to align the reference line with the zero graduation line on the thimble.
- When the alignment error is around ±0.01 mm or more (Figure 3)
  - 1 Loosen the ratchet stop with the key spanner.
  - 2 Press the thimble to the outside (toward the ratchet stop) to allow it to move freely, and align the zero graduation line on the thimble with the reference line on the sleeve.
  - 3 Tighten the ratchet stop with the key spanner again to fix the thimble.

If the reference point is slightly misaligned, perform the adjustment described in "When the alignment error is ±0.01 mm or less".

## 4. How to Measure

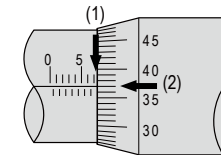
Bring the two measuring surfaces slowly into contact with the workpiece with the same posture and conditions as when the reference point adjustment was made, and apply the specified measuring force to read the graduation.

### NOTICE

If you bring the measuring surface of the spindle strongly into contact with the workpiece, the workpiece may be deformed and the measurement result may be affected.

## 5. How to Read Graduations

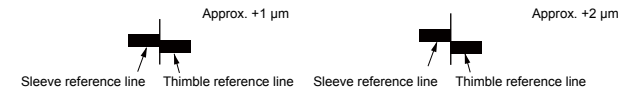
### 1) When reading standard graduations (graduation interval: 0.01 mm)



|                            |           |
|----------------------------|-----------|
| (1) Reading on the sleeve  | 7 mm      |
| (2) Reading on the thimble | + 0.37 mm |
| Reading on the micrometer  | 7.37 mm   |

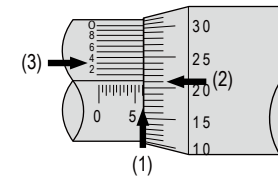
Note) 0.37 mm (in above (2)) is read at the position where the reference line on the sleeve is aligned to the thimble graduation.

Usually, the value can be read to the graduation interval of 0.01 mm as shown in the figure above. It is possible to estimate the value by eye to the 0.001 mm level as shown in figure below.



### 2) When reading vernier scale graduations (graduation interval: 0.001 mm)

A micrometer with vernier scale has the vernier graduations above the reference line on the sleeve.



|  |            |
|--|------------|
| (1) Reading on the sleeve              | 6 mm       |
| (2) Reading on the thimble             | 0.21 mm    |
| (3) Reading on the vernier and thimble | + 0.003 mm |
| Reading on the micrometer              | 6.213 mm   |

Note) 0.21 mm (in above (2)) is read at the position where the reference line on the sleeve is aligned to the thimble graduation, and 0.003 mm (in above (3)) is read at the position where the vernier graduation is aligned to the thimble graduation.

## 6. Specifications

- Operation temperature range: 5 °C to 40 °C
- Storage temperature range: -10 °C to 60 °C

## 7. Offsite Repair (Charged)

If any of the following problems occurs, the product needs to be done offsite repair (charged). Please contact the nearest distributor or Mitutoyo sales office.

- Spindle malfunction
 

If the spindle is scratched, the scratched part causes interference when the spindle moves backward, which causes malfunction.

Rust on the spindle would cause malfunction.
- Unstable measured values
 

If an impact is applied to the measuring surfaces, burrs and chippings are generated on the measuring surfaces and may affect the accuracy.