Outside Micrometer Non-Rotating Spindle Type (en)

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 Shows risks that could result in minor or moderate injury.

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

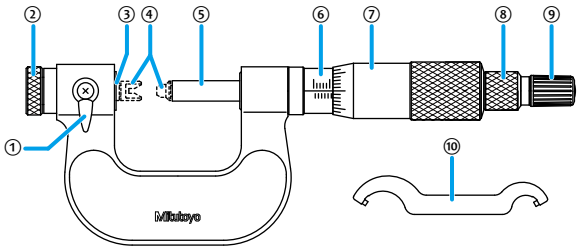
NOTICE Shows risks that could result in property damage.

- Do not disassemble or modify.
- 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.
- Apply anti-rust treatment after use if the product is used in a place where it is directly exposed to splashes of coolant, etc. Rust may cause malfunction.
- Do not apply excessive force or subject to sudden impacts such as dropping.
- Remove dust, cutting chips, etc. before and after use.
- Dirt on the spindle may lead to malfunction. If the spindle becomes dirty, wipe it clean with a cloth containing a small amount of alcohol and apply a small amount of micrometer oil (Part No. 207000).

Contents

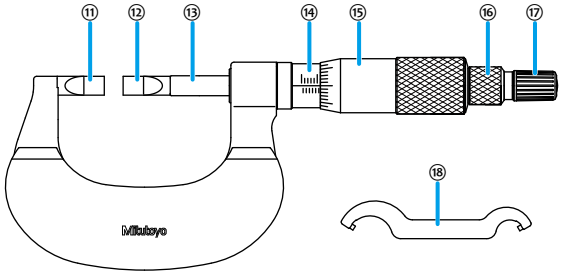
1. Names of Components

■ **116 Series**
MCN

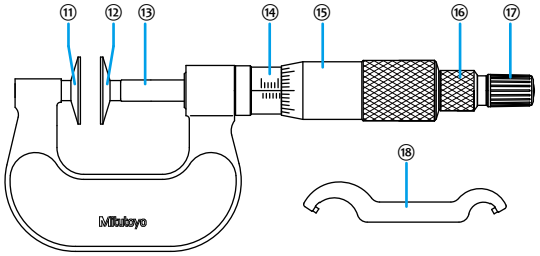


① Swivel clamp (to secure adjustment bush)
② Adjustment nut (to adjust adjustment bush extension)
③ Adjustment bush (with interchangeable anvil / spindle tip hole)
④ Interchangeable anvils / spindle tips (option)
⑤ Spindle (with interchangeable anvil / spindle tip hole)
⑥ Sleeve
⑦ Thimble
⑧ Thimble cap
⑨ Ratchet stop
⑩ Key wrench

■ **122 Series**
BLM



■ **169 Series**
PDM
PPM

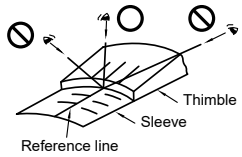


⑪ Anvil
⑫ Contact point
⑬ Spindle
⑭ Sleeve
⑮ Thimble
⑯ Thimble cap
⑰ Ratchet stop
⑱ Key wrench

2. Precautions for Use

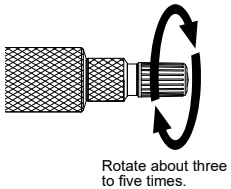
■ **Parallax**

- When using a micrometer, 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 vary depending on the position of your eyes. When reading measured values, do so perpendicular from the point where the reference line on the sleeve matches the graduation line on the thimble.
- If looking from a different direction (as in the figure), there will be a parallax of roughly 2 µm.



■ **Measuring Force**

- Use the ratchet stop to ensure consistent measuring force.
- The appropriate measuring force is achieved with the following procedure: make light contact between the measurement surfaces and the workpiece, stop momentarily, and then manually turn the ratchet stop about three to five times.



■ **Errors Due to Orientation**

- This will not be a problem with a small measurement length. However, the reference point will change slightly if the orientation is changed for a medium (300 to 500 mm) or large (500 mm or larger) micrometer.
- Align the reference point and use the same orientation when making the actual measurement.

■ **Precautions after Use**

- After use, clean the entire product and check that none of the parts are damaged. If using in places exposed to water-based cutting fluid, always apply anti-rust treatment after cleaning.
- For storage, leave a gap of 0.2 to 2 mm open for the measurement surfaces.
- For long-term storage, apply anti-rust treatment to the spindle using micrometer oil (Part No. 207000).

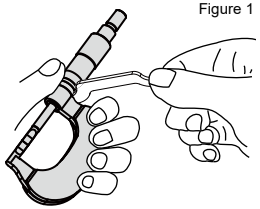
3. Reference Point Setting

- For reference point setting, use a periodically inspected (calibrated) gage (gauge block, setting standard for outside micrometer, etc.).
- Reference point setting and measurement should be made in the same orientation and conditions with the procedure as below.

1 Clean both anvil and spindle measurement surfaces, together with the gage if it is used, to remove all debris or dust.

2 For 0 to 25 mm measurement range:
After making light contact with both measurement surfaces, stop momentarily, and then apply the appropriate measuring force (see "■ Measuring Force" in "2. Precautions for Use").
For above the 0 to 25 mm measurement range:
After clamping the gage between the measuring surfaces, bring the spindle measurement surface into light contact with the gage, stop momentarily, and then apply the appropriate measuring force (see "■ Measuring Force" in "2. Precautions for Use").

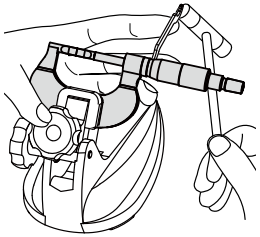
Figure 1



3 Begin measuring if the zero graduation line on the thimble matches the reference line on the sleeve.
If they do not match, adjust as follows.

- If the reference point difference is ±0.01 mm or less (Figures 1 and 2)
Insert the included key wrench into the hole on the rear of the reference line on the sleeve, and then rotate the sleeve until the reference line is aligned with the zero graduation line on the thimble.

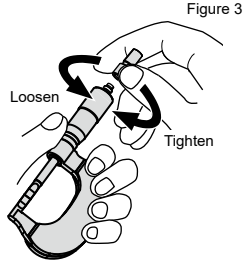
Figure 2



Watch the reference video.

- If the reference point difference is around ±0.01 mm or higher (Figure 3)
  1 Loosen the thimble cap.
  2 Push the thimble to the outside (in the direction of the thimble cap) so that it can be moved freely, and then align the zero graduation line with the reference line on the sleeve.
  3 Tighten the thimble cap and secure the thimble back into place.
  If the zero point is slightly off, adjust according to "If the reference point difference is ±0.01 mm or less".

Figure 3



4. Measurement Method

- Be sure to perform reference point setting before measurement.
- Bring the measuring surface of the spindle slowly into contact with the workpiece. Moving too quickly could deform the workpiece and affect measurement results.

Gradually and lightly bring the measurement surfaces into contact with the workpiece in the same orientation and conditions as for reference point setting, apply the appropriate measuring force, and then read the display value (see "■ Measuring Force" in "2. Precautions for Use").

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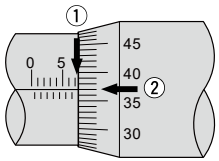
5. How to Read Graduations

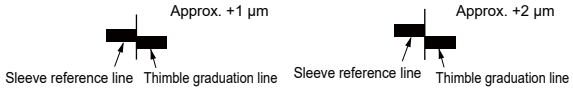
■ Micrometer with standard scale (graduation: 0.01 mm)



① Sleeve reading:	7 mm
② Thimble reading:	+0.37 mm
Micrometer reading:	7.37 mm

0.37 (②) is read at the position where the sleeve reference line is aligned to the thimble graduations.

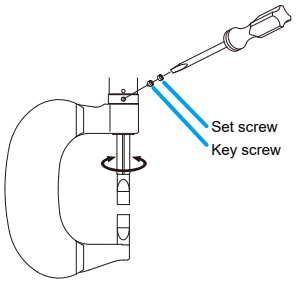
This is normally read up to a graduation of 0.01 mm (as shown in the figure above). However, it is also visually possible to read up to a graduation of 0.001 mm (as shown in the figure below).



6. Adjusting Spindle Looseness

If the spindle is loose in the circumferential direction, adjust it as follows. Do not adjust if it is only slightly loose.

Remove the set screw on the rear of the frame, tighten the key screw until there is no more looseness, and then install the set screw. Note that tightening too much will make the thimble operate more heavily.



Tips

It may be impossible to obtain the specified accuracy depending on the adjustment method. If this occurs, it will require off-site repairs.

7. Specifications

■ Common Specifications

Temperature range: 5 ˚C to 40 ˚C (operating temperature), -10 ˚C to 60 ˚C (storage temperature)
Standard accessories: Wrench (No.301336), standard bar (see the individual specifications below for applicable products)

■ Individual Specifications

Series No.	Maximum measuring length	Graduation	Maximum permissible error J_{MPE}*1	Measuring force	Standard bar
122	25 mm	0.01 mm	±3 µm	3 - 8 N	
	50, 75 mm				✓
	100 mm		±4 µm		
	125, 150 mm	0.01 mm	±4 µm	5 - 10 N	✓
	175, 200, 225 mm		±5 µm		
	250, 275, 300 mm		±6 µm		
	1 in	0.0001 in	±0.00015 in	3 - 8 N	
	2 in, 3 in				✓
	4 in		±0.0002 in		

Series No.	Maximum measuring length	Graduation	Maximum permissible error J_{MPE}*1	Measuring force	Standard bar
169	25 mm	0.01 mm	±4 µm	3 - 8 N *2	
	50 mm				✓
	75, 100 mm		±6 µm		
	1 in	0.001 in	±0.0002 in	3 - 8 N *2	
	2 in				✓
	3 in, 4 in		±0.0003 in		

*1: Maximum permissible error for indicated value via contact with full measuring face J_{MPE} (20 ˚C).
*2: The measuring force for code No.169-101-10 and code No.169-103-10 is 8.02 ± 0.8 N.

Series No.	Maximum measuring length	Graduation	Spindle feed error (20 ˚C)	Measuring force	Standard bar
116 *3	25 mm	0.01 mm	3 µm	5 - 10 N	
	50 mm				✓ *4
	1 in	0.001 in	0.00015 in	5 - 10 N	
	2 in				✓ *4

*3: See the General Catalog for options (interchangeable anvils / spindle tips and thread-measuring interchangeable contact points).
*4: Two types included: for outside and for screw 60˚.

8. Off-Site Repairs (Subject to Charge)

Off-site repair (subject to charge) is required in the case of the following malfunctions. Please contact the agent where you purchased the product or a Mitutoyo sales representative.

- Faulty spindle operation
  If the spindle is scratched, these scratches may interfere while the spindle is retracting, causing faulty operation.
  Operation may also suffer if the spindle is rusted.
- Inconsistent measured values
  If there are burrs or nicks generated by an impact on the measuring surfaces, it may affect measurement repeatability.

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