

Mitutoyo



ABS Digimatic Caliper

ABS Digimatic Caliper

User's Manual

No. 99MAD027A

Date of publication: July 1, 2021 (1)

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.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

- Always keep batteries out of reach of children, and if swallowed, consult a physician immediately.
- Batteries should never be short-circuited, disassembled, deformed or come in contact with extreme heat or flames.
- If alkaline liquid contained in the battery does come in contact with your eyes, flush them immediately with plenty of clean water and consult a physician. If the liquid adheres to the skin or clothes, immediately flush it with plenty of clean water.
- Do not measure the workpiece if it is rotating. There is a risk of injury due to being caught in the machine, etc.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

- The outside and inside measuring jaws of this caliper have sharp edges. Handle it with great care to avoid injury.

■ Conventions and wording indicating prohibited and mandatory actions



Indicates concrete information about prohibited actions.



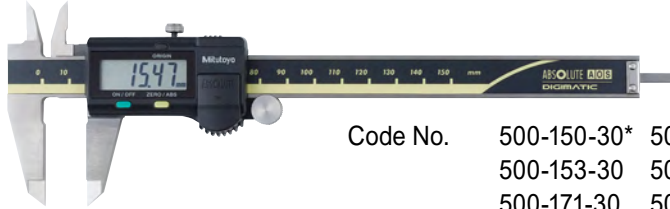
Indicates concrete information about mandatory actions.

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1. Type and Code Number

■ Standard type: with output function and thumb roller



Code No.	500-150-30*	500-151-30	500-152-30
	500-153-30	500-158-30*	500-170-30*
	500-171-30	500-172-30	500-173-30
	500-178-30*	*Depth bar: ϕ 1.9 mm rod	

● Model with carbide-tipped jaws for outside measurement

Code No.	500-154-30	500-156-30	500-159-30*	500-163-30*	500-165-30*
	500-167-30	500-174-30	500-176-30	*without output function	

● Model with carbide-tipped jaws for outside and inside measurement

Code No.	500-155-30	500-157-30	500-175-30	500-160-30*	500-164-30*
	500-166-30*	500-168-30	500-175-30	500-177-30	

*without output function

● Model without output function

Code No.	500-193-30	500-195-30	500-196-30	500-197-30
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● Model without output function and thumb roller

Code No.	500-180-30*	500-181-30	500-182-30	*Depth bar: ϕ 1.9 mm rod
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■ Long type:

with output function and without thumb roller and depth bar

Code No.	500-500-10	500-501-10	500-502-10	500-505-10	500-506-10
	500-507-10				

■ Type with nib style jaws:

with output function and without thumb roller and depth bar

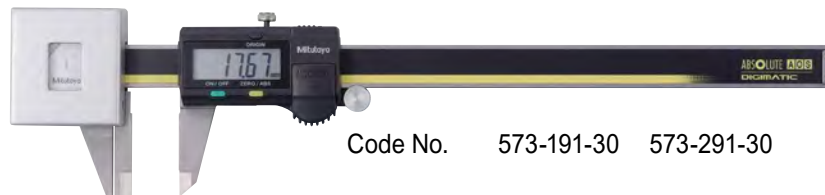
Code No.	550-203-10	550-205-10	550-207-10	550-223-10	550-225-10
	550-227-10				

■ Type with nib style and standard jaws:

with output function and without thumb roller and depth bar

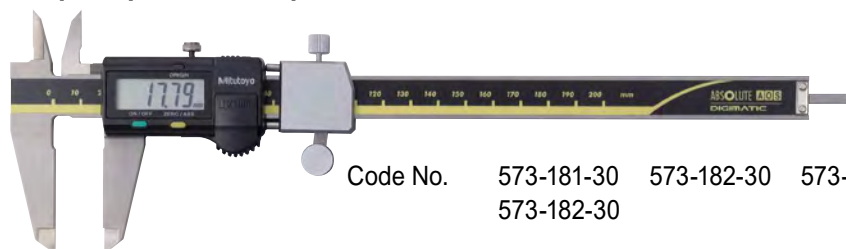
Code No.	551-204-10	551-206-10	551-207-10	551-224-10	551-226-10
	551-227-10				

■ Constant force caliper: with output function and without depth bar



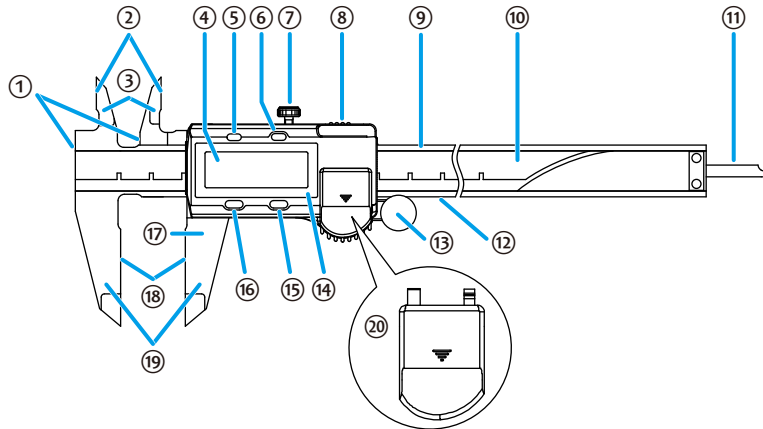
Code No.	573-191-30	573-291-30
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■ Snap caliper: with output function and without thumb roller



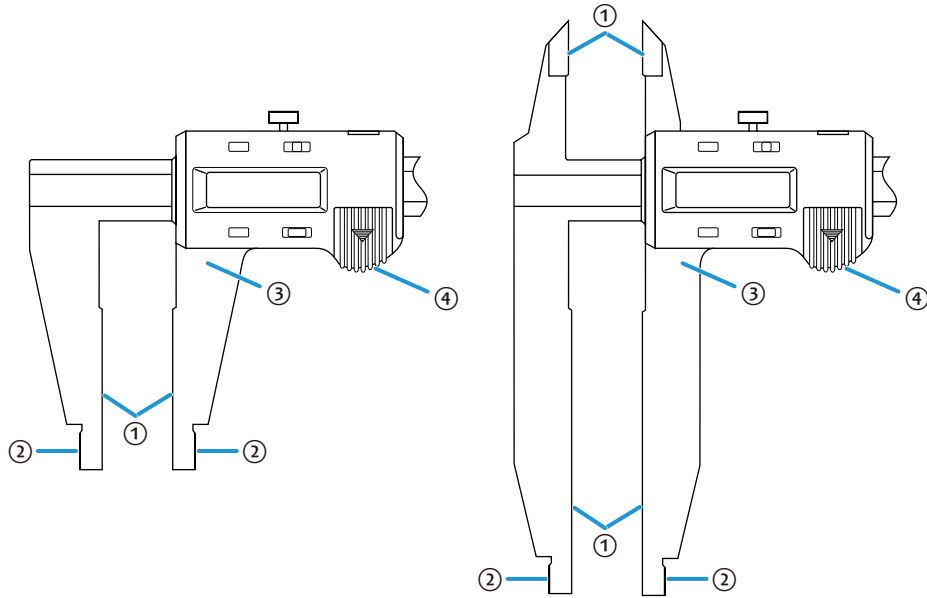
Code No.	573-181-30	573-182-30	573-182-30
	573-182-30		

2. Names of Components



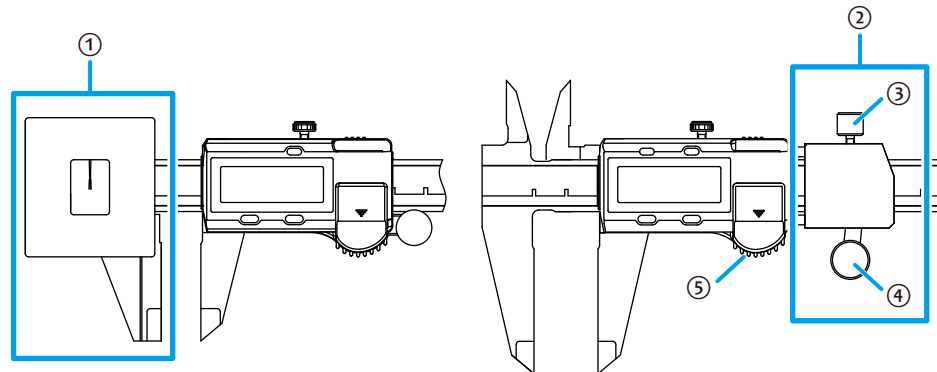
- | | |
|---|---|
| ① Step measuring surface | ⑪ Depth bar |
| ② Inside measuring surface | ⑫ Sliding surface (reference surface) |
| ③ Inside measuring jaws | ⑬ Thumb roller (only for the type with the thum roller) |
| ④ LCD part | ⑭ Module part |
| ⑤ [in/mm] switch (only for the model using inches) | ⑮ [ZERO/ABS] switch |
| ⑥ [ORIGIN] switch | ⑯ Battery ON/OFF switch |
| ⑦ Slider clamp screw | ⑰ Slider |
| ⑧ Connector cap (only for the model with the output function) | ⑱ Outside measuring surface |
| ⑨ Beam | ⑲ Outside measuring jaws |
| ⑩ Scale | ⑳ Battery lid |

■ **Type with nib style jaws**
Type with nib style and standard jaws



- ① Outside measuring surface
- ② Inside measuring surface
- ③ Compensation value
- ④ Thumb rest

■ **Constant force caliper**



- ① Constant force device
- ② Snap part
- ③ Snap part clamp
- ④ Thumb lever
- ⑤ Thumb rest

3. Precautions for Use

NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.



- Do not use this product where it could be splashed with water and oil.
- Do not use an electric engraver to put marks on the product such as numbers.
- Do not drop the product or apply excessive force to it.
- Do not scratch the main scale surface.

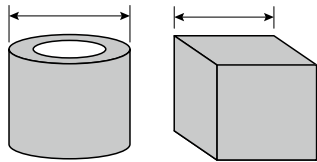


- Keep the operation temperature and storage temperature.
- After use, take corrosion prevention measures. Corrosion can cause the product to malfunction.
- If the product will not be used for more than three months, remove the battery from and store it properly. Otherwise, liquid may leak from the battery and damage the product.

- - Before using this product for the first time, wipe the rust preventive oil from the product with a soft cloth soaked with cleaning oil, and install the supplied battery.
- - If rust preventive oil is dried, the product might not operate smoothly. Wipe a sliding surface with a cloth and then apply a little oil to use the product. This can make the product operate smoothly.

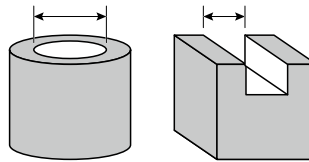
4. Product Applications

Outside measurement



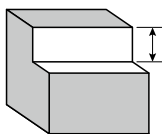
Inside measurement

Except for constant force caliper



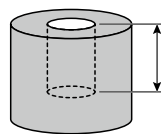
Step measurement

Except for types with nib style jaws and constant force caliper



Depth measurement

Except for types without depth bar



5. Basic Usage

■ Using the caliper

Grasp the beam lightly with your right hand, put your right thumb on the slider finger rest, and move the slider horizontally to measure.

Tips

For the measuring method details, refer to “7. Measurement Method”.

■ Fixing the slider

The measurement value readings are usually taken with the workpiece clamped (or in close contact). However, depending on the measuring location, the orientation during measurement and so on, it may be difficult to get a reading in this position. In this case, tighten the slider clamp screw, move the caliper carefully away from the workpiece, and read the display.

■ Using the thumb roller

The thumb roller is a fine feeding device, and not a constant-force device. Measuring force tends to be large when measuring with the thumb roller. Carefully apply an appropriate and even measuring force when using the thumb roller.

■ Using the switch (about Icons)



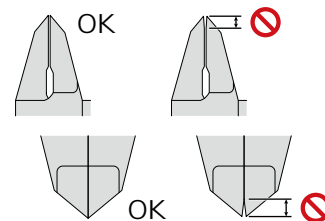
6. Confirmation before Measurement

■ Confirming Slider Movement

- Confirm that there is no irregular slider movement and that the slider moves smoothly throughout the measurement range.
- Confirm that there is no play of the slider in the vertical direction against the sliding surface.

■ Confirming Clearance (Wear) between Measuring surfaces

- When the outside measuring jaws are closed and held to the light, confirm that there is no slit observed between the jaws against the light, or that a faint light is uniformly visible. As well, confirm that the jaw tips are not deformed.
- When the inside measuring jaws are closed and held to the light, observing the jaws obliquely, confirm that a light is uniformly visible, and that the tips are not deformed.



7. Installing the Battery and Setting the Origin

NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

- Be sure to use SR44 (a silver oxide battery). The supplied battery is used to check functions and performance. Therefore, it might not provide the specified life.
- Be careful not to damage battery terminals when installing the battery.



When disposing of a used battery, follow all local laws and regulations.

7.1 Setting the battery

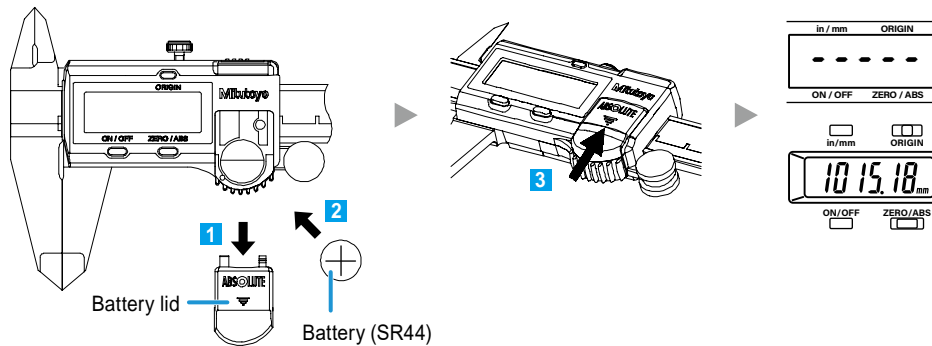
- 1 Slide the battery lid to the specified direction (▼) and remove it.
- 2 Install the battery (SR44) with its positive side facing upward.

NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

- Be sure to use SR44 (a silver oxide battery). The supplied battery is used to check functions and performance. Therefore, it might not provide the specified life.

- 3 Return the battery lid to the original position.
 - » “-----” blinks immediately. Continue to set the origin.
 - » If “-----” does not blink, reinstall the battery.

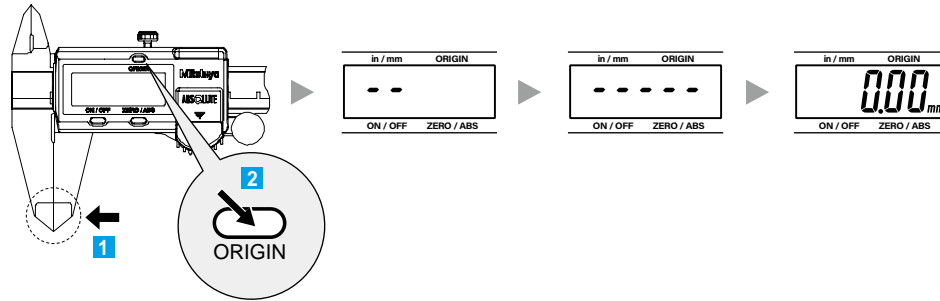


Tips

- Be sure to set the origin after installing the battery.
- Immediately after inserting the battery, a meaningless number or “E” may be displayed, however this is not a malfunction. Set the origin as it is.

7.2 Setting the origin

- 1 Make sure that the outside measuring surface is closed.
- 2 Hold down the [ORIGIN] switch for one second or more.
 - » “0.00” appears indicating that the origin has been set.

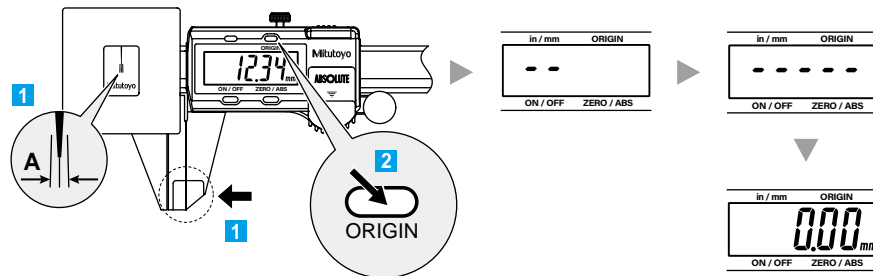


Tips

When the battery has been installed, do not move the slider until “0.00” appears as the origin. Otherwise, the product might not count values correctly.

■ When using constant force caliper (how to use the constant force device)

- 1 Close the outside measuring surface so that the pointer of the constant force device is aligned with the center line.
- 2 Hold down the [ORIGIN] switch for one second or more.
 - » “0.00” appears indicating that the origin has been set.



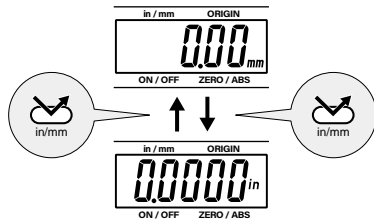
Tips

For measurement, insert the workpiece into the outside measuring jaws, and move the slider so that the pointer of the constant force device is within the constant force range (A). Read the display while keeping the outside measuring surfaces in close contact.

8. In/mm Conversion *only for using inches

1 Press the [in/mm] switch.

- » Every time it is pressed, the display switches between “in” and “mm.”



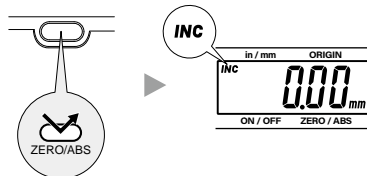
9. INC Mode and ABS Mode

An absolute value always appears at the time of power-on.

● INC mode (comparison measurement)

1 Open the jaws to the position to be specified as a zero point, and press the [ZERO/ABS] switch short (for less than one second).

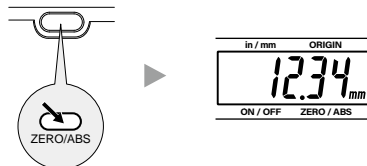
- » The reading is set to zero, and then “INC” appears (measurement can be performed from the zero point).



● ABS mode (absolute measurement)

1 With “INC” displayed, hold down the [ZERO/ABS] switch (for two seconds or more).

- » “INC” disappears (absolute value measurement can be performed).



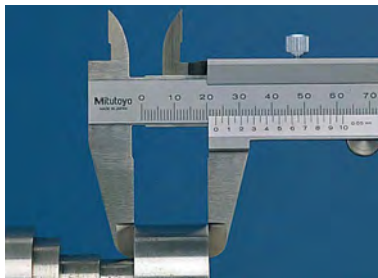
10. Measurement Method

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



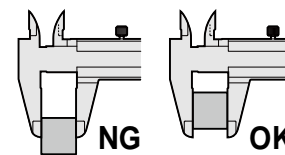
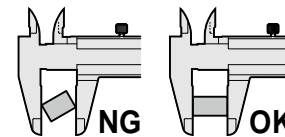
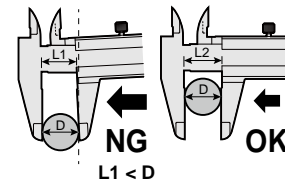
Do not measure the workpiece with the caliper if it is rotating, etc. Measuring surfaces will be worn out.

■ Outside measurement



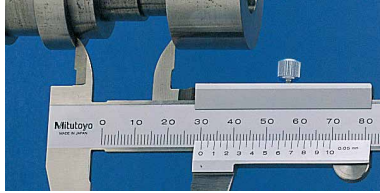
Picture: Vernier caliper

- Do not apply excessive force to the workpiece. Excessive measuring force will cause measurement error because of the positional deviations of the jaws.
- Do not clamp the workpiece diagonally. Measurement error will ensue if tilted.
- Clamp the workpiece as close to the sliding surface as possible. Measurement error is more likely to increase if clamped near the outside measuring jaw tips.



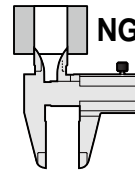
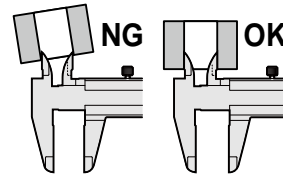
- 1** Insert the workpiece into the outside measuring jaws and bring jaws into close contact with the workpiece, using appropriate and uniform measuring force.
- 2** Read the display while keeping the outside measuring surfaces in close contact.

■ Inside measurement

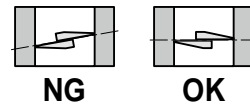
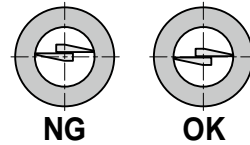


Picture: Vernier caliper

- Insert the inside measuring jaws as deeply as possible into the workpiece.

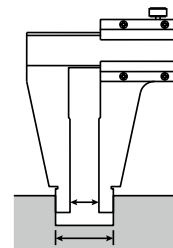


- For inner diameter measurement, bring the inside measuring surfaces into close contact, and read the display when it is maximum: a direct line between the measuring surfaces passes through the center of the cross-section.
- For groove width measurement, bring the inside measuring surfaces into close contact, and read the display when it is minimum: a direct line between the faces is perpendicular to the groove inner wall.



- 1 Insert the inside measuring jaws into the workpiece, and bring jaws into close contact with the workpiece interior using appropriate and uniform measuring force.**
- 2 Read the display while keeping the inside measuring surfaces in close contact.**

For the type with nib style jaws, there will be a difference between the displayed value and the actual value. Add the compensation value (jaw width: 20 mm) to the displayed value.

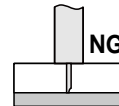


■ Step measurement

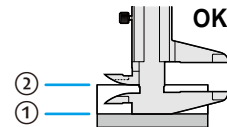


Picture: Vernier caliper

Do not use a depth bar for step measurement, as the small contact area with the workpiece makes it difficult to retain a stable orientation.



For a stepped workpiece, bring the entire step measuring surfaces (①, ②) into close contact with the workpiece.



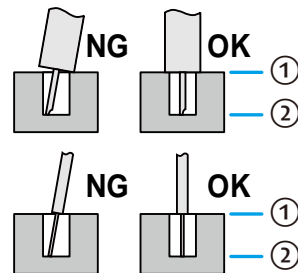
- 1** Bring the step measuring surface (①, beam side) into close contact with the workpiece.
- 2** Move the slider until the step measuring surface (②, slider side) strikes the workpiece (stepped surface).
- 3** Read the display while keeping the step measuring surfaces in close contact.

■ Depth measurement



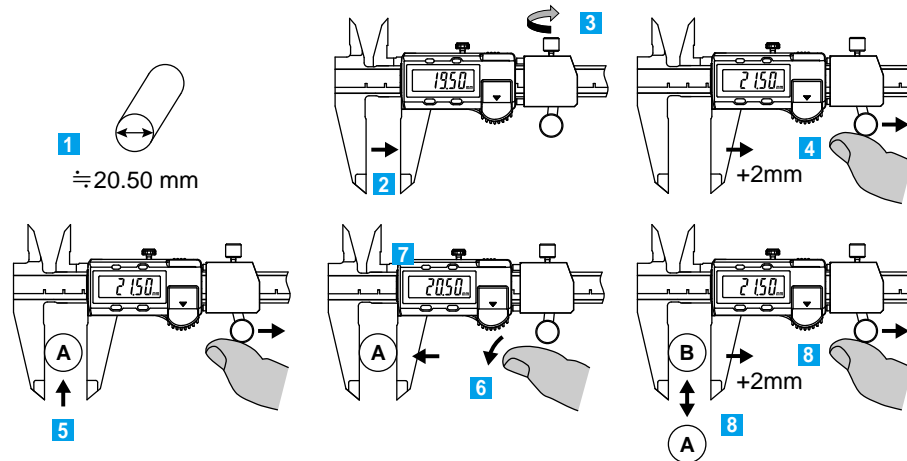
Picture: Vernier caliper

The depth measuring surface of the caliper is narrow and unstable. Bring it into contact perpendicular with the workpiece.



- 1** Bring the depth measuring surface (beam side) into close contact with the workpiece.
- 2** Move the slider until the depth measuring surface (depth bar side) makes contact.
- 3** Read the display while keeping the depth measuring surfaces in close contact.

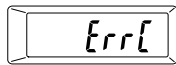
■ **Continuous outside measurement of mass-production parts (snap caliper)**



- 1** Make sure the approximate dimension of the workpiece.
If it is not available, measure the dimension by referring to “■ Outside measurement” (page 6).
- 2** Move the slider so that the displayed value is about 1 mm smaller than the approximate dimension of the workpiece.
- 3** Tighten the snap part clamp to fix the snap part.
» The minimum measurable dimension is set.
- 4** Pull the thumb lever to the right.
» The slider moves 2 mm to the right.
- 5** Insert the workpiece into the outside measuring jaws.
- 6** Release the thumb lever to bring jaws into close contact with the workpiece.
» The slider returns to the left by spring force. (measuring force: 7 - 14N)
- 7** Read the display while keeping the outside measuring surfaces in close contact.
- 8** Pull the thumb lever to the right, and replace the workpiece.

11. Errors and Countermeasures

- **“ErrC” display and display flickering**
(Long type, type with nib style jaws, and type with nib style and standard jaws)



This digit appears if the surface of the scale is dirty to an immeasurable degree. Clean the surface of the scale cover.

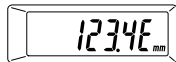
- **Minimum digit “E” display**



This digit appears if the surface of the scale is dirty to an immeasurable degree. Clean the surface of the scale cover.

If “E” still appears even after the surface of the scale cover is cleaned, reinstall the battery. Nevertheless, if it does not disappear, remove the battery, and then contact your distributor or sales office.

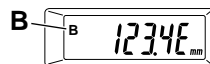
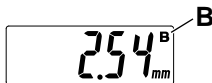
- Long type, type with nib style jaws, and type with nib style and standard jaws



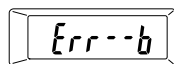
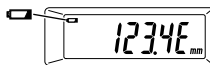
This digit appears if the slider is moved at a high speed. This does not affect measurement results.

If “E” is displayed when the slider is not being moved, the caliper is in the same state as that of “ErrC”. Use the “ErrC” remedy.

- **“B”, “” and “Err--b” display**



“B” indicates the voltage drop of the battery. Replace the battery immediately. (For instructions on replacing the battery, see “8.”).



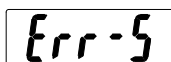
- **If all five digits have the same number, or if “H” blinks**



Remove the battery temporarily, and then reinstall it.



- **Other errors**



If the error shown in the figure occurs, set the origin again.

12. Precautions after Use

- If there is dirt on the measuring surface, reference surfaces, sliding surface, etc., wipe it away with a dry cloth or a cloth slightly moistened with alcohol.
- For long-term disuse, wipe away any dirt carefully and apply a light coating of rust preventive oil before storage.
- Do not store in locations with high temperatures, low temperatures, high humidity, or exposure to direct sunlight.

13. Specifications

Resolution	0.01 mm
Maximum permissible error (MPE) E_{MPE} (outside measurement) S_{MPE} (inside measurement)	See "MPE (E_{MPE} , S_{MPE})".
Maximum response speed	No limit (no miscount caused by speed)
Power supply	SR44 (silver oxide battery) 1 pc
Battery life	A continuous use of about 18,000 hours, A typical use of about 3.5 years The battery life depends on how many times and in which ways it is used. Remember that the above values are a guideline. The value of the typical use has been calculated assuming that the product is used for about five hours per day.
Operating temperature	0 °C to 40 °C
Storage temperature	-10 °C to 60 °C

14. Standard Accessories

- Warranty (1 copy)
- SR44 silver oxide battery (No. 938882, 1 pc)
- User's Manual (No. 99MAD027M, 1 copy)

15. Optional Accessories

***only for the type with the output function**

Connection cable (with the output switch)	No. 959149 (1 m), No.959150 (2 m)
Hold unit (with [HOLD] switch)	No. 959143 (capable of holding readings)

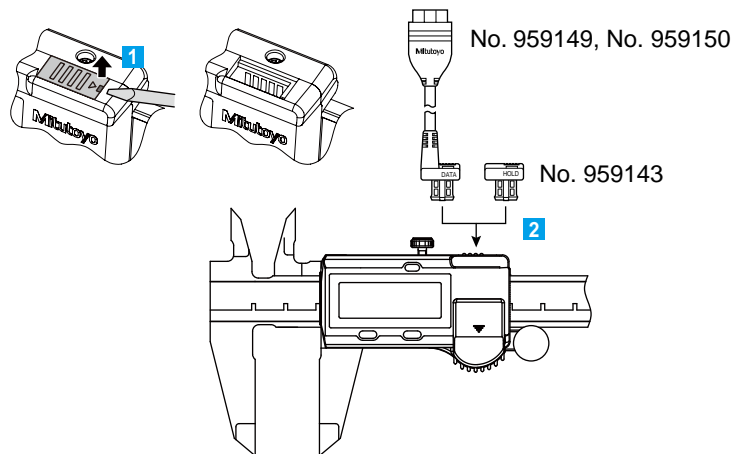
NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Do not use a pointed object or excessive force to remove the connector cap. This may damage the connector cap.

● Setting the connection cable/hold unit

- 1** Remove the connector cap by using a flathead screwdriver or similar.
- 2** Attach the connection cable/holder unit to the product.

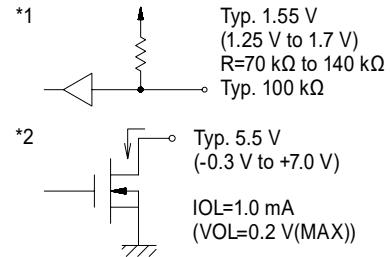
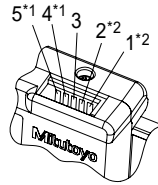


16. Output Specifications

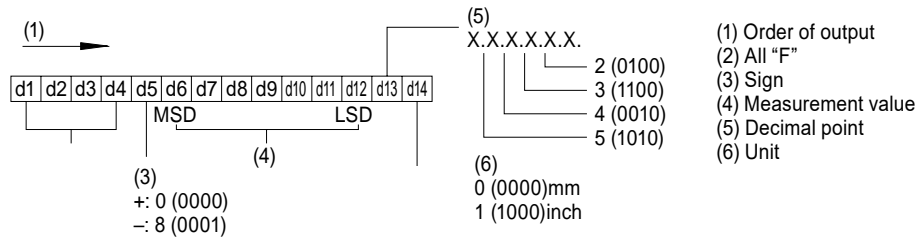
**only for the type with the output function*

■ Connector pin alignment

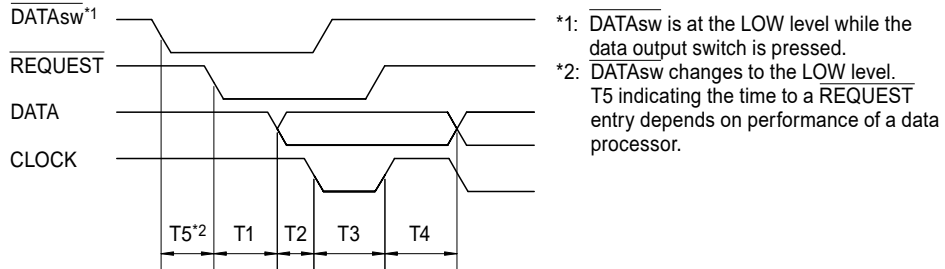
Pin No.	I/O	Signal
1	-----	GND
2 (*2)	O	DATA
3 (*2)	O	CLOCK
4	-----	-----
5 (*1)	I	REQUEST



■ Data format



■ Timing chart



$$0 \text{ ms} \leq T1 \leq 12 \text{ ms}$$

$$90 \text{ } \mu\text{s} \leq T2 \leq 150 \text{ } \mu\text{s}$$

$$100 \text{ } \mu\text{s} \leq T3 \leq 150 \text{ } \mu\text{s}$$

$$100 \text{ } \mu\text{s} \leq T4 \leq 250 \text{ } \mu\text{s}$$

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MPE (EMPE, SMPE)

500 Sereis

0.01 mm

*L (mm)	EMPE (mm)	SMPE (mm)
$0 \leq L \leq 200$	± 0.02	± 0.04
$200 < L \leq 300$	± 0.03	± 0.05
$300 < L \leq 400$	± 0.04	± 0.06
$400 < L \leq 600$	± 0.05	± 0.07
$600 < L \leq 800$	± 0.06	± 0.08
$800 < L \leq 1000$	± 0.07	± 0.09

0.01 mm / 0.0005 in

*L (mm)	EMPE (mm)	SMPE (mm)
$0 \leq L \leq 200$	± 0.02	± 0.04
$200 < L \leq 300$	± 0.03	± 0.05
$300 < L \leq 400$	± 0.04	± 0.06
$400 < L \leq 600$	± 0.05	± 0.07
$600 < L \leq 800$	± 0.06	± 0.08
$800 < L \leq 1000$	± 0.07	± 0.09

*L (inch)	EMPE (inch)	SMPE (inch)
$0 \leq L \leq 8$	± 0.0010	± 0.0020
$8 < L \leq 16$	± 0.0015	± 0.0025
$16 < L \leq 24$	± 0.0020	± 0.0030
$24 < L \leq 32$	± 0.0025	± 0.0035
$32 < L \leq 40$	± 0.0030	± 0.0040

550 Sereis

0.01 mm

*L (mm)	EMPE (mm)	SMPE (mm)
$0 \leq L \leq 200$	± 0.03	± 0.03
$200 < L \leq 400$	± 0.04	± 0.04
$400 < L \leq 600$	± 0.05	± 0.05
$600 < L \leq 800$	± 0.06	± 0.06
$800 < L \leq 1000$	± 0.07	± 0.07

0.01 mm / 0.0005 in: 550-223-10, 550-225-10

*L (mm)	EMPE (mm)	SMPE (mm)
$12.8 (0) \leq L \leq 200$	± 0.03	± 0.03
$200 < L \leq 400$	± 0.04	± 0.04
$400 < L \leq 600$	± 0.05	± 0.05

*L (inch)	EMPE (inch)	SMPE (inch)
$0.501 (0) \leq L \leq 8$	± 0.0015	± 0.0015
$8 < L \leq 24$	± 0.0020	± 0.0020

0.01 mm / 0.0005 in: 550-227-10

*L (mm)	EMPE (mm)	SMPE (mm)
$25.5 \leq L \leq 200$	± 0.03	± 0.03
$200 < L \leq 400$	± 0.04	± 0.04
$400 < L \leq 600$	± 0.05	± 0.05
$600 < L \leq 800$	± 0.06	± 0.06
$800 < L \leq 1000$	± 0.07	± 0.07

*L (inch)	EMPE (inch)	SMPE (inch)
$1.01 (0) \leq L \leq 8$	± 0.0015	± 0.0015
$8 < L \leq 24$	± 0.0020	± 0.0020
$24 < L \leq 32$	± 0.0025	± 0.0025
$32 < L \leq 40$	± 0.0030	± 0.0030

551 Sereis

0.01 mm

*L (mm)	EMPE (mm)	SMPE (mm)
20.1 (0) ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 800	±0.06	±0.06
800 < L ≤ 1000	±0.07	±0.07

0.01 mm / 0.0005 in: 551-224-10, 551-226-10

*L (mm)	EMPE (mm)	SMPE (mm)
12.8 (0) ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 600	±0.06	±0.06

*L (inch)	EMPE (inch)	SMPE (inch)
0.501 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 16	±0.0020	±0.0020
16 < L ≤ 30	±0.0025	±0.0025

0.01 mm / 0.0005 in: 551-227-1

*L (mm)	EMPE (mm)	SMPE (mm)
25.5 ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 800	±0.06	±0.06
800 < L ≤ 1000	±0.07	±0.07

*L (inch)	EMPE (inch)	SMPE (inch)
1.01 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 16	±0.0020	±0.0020
16 < L ≤ 32	±0.0025	±0.0025
32 < L ≤ 40	±0.0030	±0.0030

573 Sereis

0.01 mm: 573-181-30, 573-182-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 150	±0.02	±0.04

0.01 mm: 573-191-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 200	±0.05	-----

0.01 mm / 0.0005 in: 573-281-30, 573-282-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 150	±0.02	±0.04

*L (inch)	EMPE (inch)	SMPE (inch)
0 ≤ L ≤ 6	±0.0010	±0.0020

0.01 mm / 0.0005 in: 573-291-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 200	±0.05	-----

*L (inch)	EMPE (inch)	SMPE (inch)
0 ≤ L ≤ 8	±0.0020	-----

*L

Measured length