

Caliper

IP66 ABS Coolant-Proof Carbon Caliper

User's Manual

No. 99MAD023A
Date of publication: July 1, 2021 (1)

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.

⚠ WARNING Indicates a hazard with a medium level of risk 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 battery alkaline liquid comes in contact with the eyes, flush eyes immediately with clean water and consult a physician. If battery alkaline liquid comes in contact with the skin, flush the exposed area thoroughly with clean water.
- Do not measure the workpiece if it is moving (rotating, etc.). There is a risk of injury by being caught in the machine, etc. Doing so will also increase the rate of wear of the measuring surfaces.

■ Conventions and wording indicating prohibited and mandatory actions

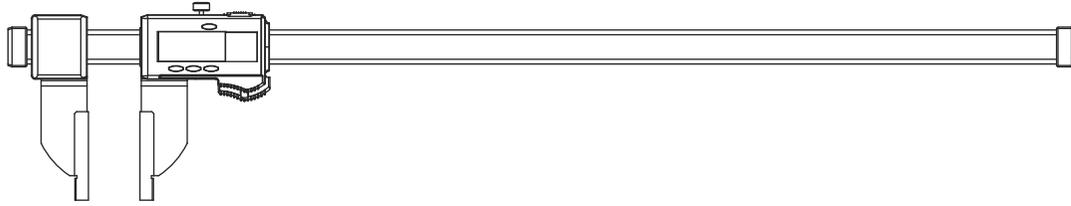
	Indicates concrete information about prohibited actions.		Indicates concrete information about mandatory actions.
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1. Type and Code Number

■ Standard type

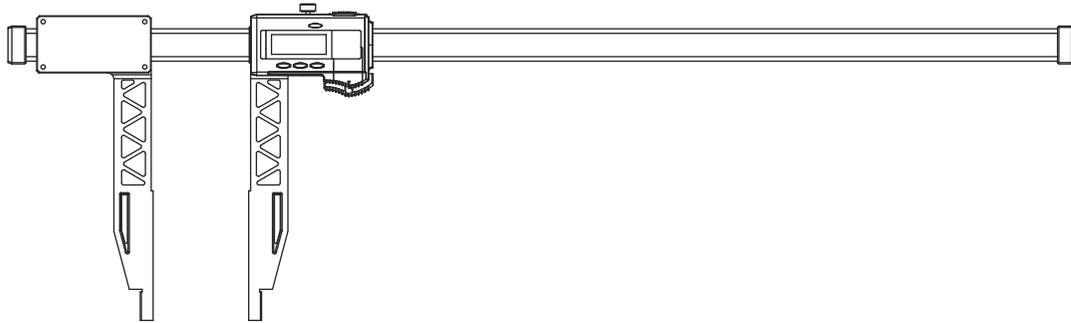


Code No.

552-302-10	552-303-10	552-304-10	552-305-10	552-306-10
552-312-10	552-313-10	552-314-10	552-315-10	552-316-10
552-155-10*	552-156-10*	552-165-10*	552-166-10*	

* Ceramic jaws

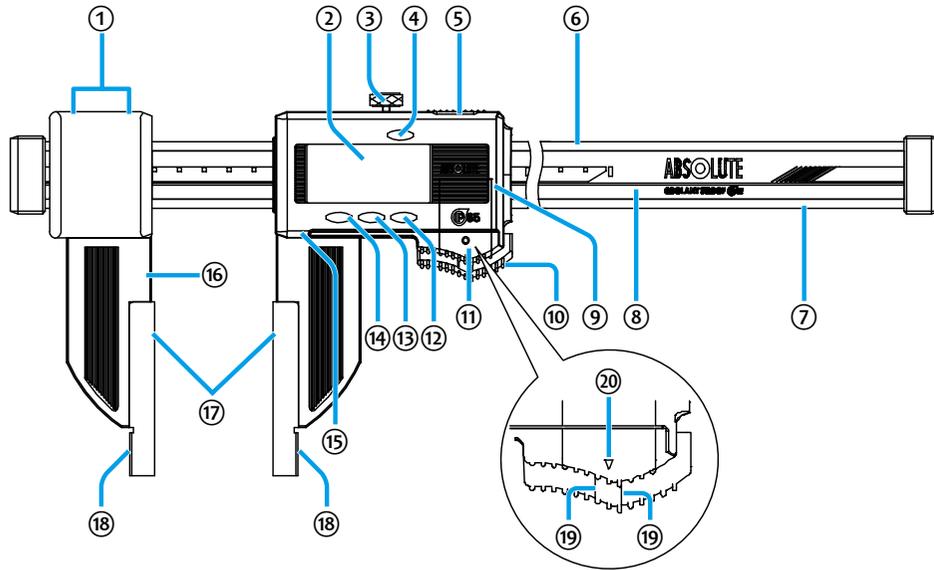
■ Long jaw type



Code No.

552-150-10	552-151-10	552-152-10	552-153-10	552-154-10
552-160-10	552-161-10	552-162-10	552-163-10	552-164-10

2. Names of Components



- | | |
|----------------------------|--|
| ① Jaw main beam screws | ⑫ ZERO/ABS (▶) switch |
| ② LCD display | ⑬ PRESET/ORIGIN (▲) switch |
| ③ Jaw slider screw | ⑭ OFFSET switch (metric models) |
| ④ HOLD switch | OFFSET/in/mm switch (inch/metric models) |
| ⑤ Connector cover | ⑮ Jaw slider |
| ⑥ Beam | ⑯ Jaw main beam |
| ⑦ Sliding surface | ⑰ Outside measuring surfaces |
| ⑧ Scale | ⑱ Inside measuring surfaces |
| ⑨ Detection/Display module | ⑲ Finger rest lines |
| ⑩ Finger rest | ⑳ ▼-mark for finger rest lines |
| ⑪ Battery lid | |

3. Precautions for Use

NOTICE

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



- 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.

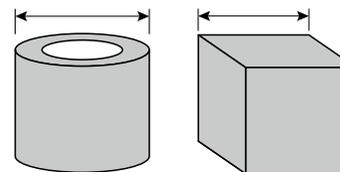


- This product complies with protection degree IP66*. To achieve the most effective protection, firmly tighten the screw on the battery lid or connector cover when you install the battery or connect the connecting cable (optional accessory). Also, confirm that the packing is set correctly. (For details, see "7.1 Installing the Battery" on page 4 and "External output of the displayed value" on page 9.)
 - * Standard for protection against particle and liquid ingress (see IEC60529 standard for details)
- Do not use this product in locations where it may be submerged in water. This product cannot prevent the ingress of substances like coolant.
- Observe the operation temperature and storage temperature.
- After use, take measures to prevent corrosion. Corrosion can cause the product to malfunction.
- If the product will not be used for more than three months, remove the battery and store the product properly. Otherwise, liquid may leak from the battery and damage the product.

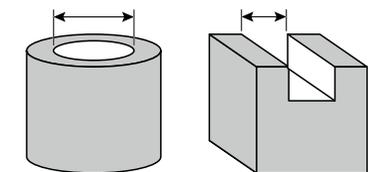
- Before using this product for the first time, wipe the rust-prevention oil from the product with a soft and lint-free cloth soaked with cleaning oil (recommended option: micrometer oil (No. 207000)), and install the included battery.
- If rust-prevention oil on the product dries, the product might not operate smoothly. Wipe the sliding surface with a cloth and then apply a little oil before using the product. This can make the product operate smoothly.

4. Product Applications

Outside measurement



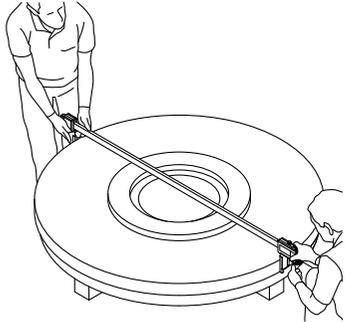
Inside measurement



5. Basic Usage

■ Using the caliper

- Grip the jaw main beam with your left hand, rest the thumb of your right hand on the finger rest of the jaw slider, and perform measurements by moving the jaw slider left and right.
- If you measure a large workpiece with one person, the beam may bend, resulting in a measurement error. In this case, it is recommended that you measure with one person to measure and one person for assistance.



Tips

- A constant-pressure mechanism is located in the finger rest. This mechanism is an assistive device to prevent measurement errors caused by applying too much measurement force. To achieve high-accuracy measurements, apply the least amount of measurement force that is necessary to bring the measuring surfaces of the caliper in contact with the workpiece when measuring.
- For details about how to perform measurements, see "10. Measurement Method" on page 7.

■ Fixing the jaw slider

Normally, you read the measurement value from the LCD display while the caliper is clamped around (or in close contact with) the workpiece. However, there may be situations where it is difficult to read the measurement value due to the measurement location or orientation. In these situations, tighten the jaw slider screw, carefully remove the caliper from the workpiece, and then read the value.

■ Using the switch (about icons)



6. Confirmation before Measurement

■ Confirming jaw slider movement

- Confirm that there is no irregular jaw slider movement and that the jaw slider moves smoothly throughout the measurement range.
- Confirm that there is no vertical wobbling in the jaw slider with respect to the direction of rotation or the sliding surface.

■ Confirming clearance (wear) between the measuring surfaces of the caliper

With the jaws closed, hold the caliper up to a light and confirm that no light is visible between the measuring surfaces or that a faint light is uniformly visible. Also, confirm that the jaw tips are not deformed.

7. Installing the Battery and Setting the Origin

NOTICE

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

- Only use a SR44 battery (silver oxide battery). The included battery is only for confirming functionality and performance. Its usable life-span may be shorter than the rated amount.
- For tightening and removing the screw in the battery lid, use only the size 0 Phillips head screwdriver (No. 05CZA619) that is included with this product. Tighten the screw with a torque from 5 to 8 N·cm. If you apply torque greater than the specified amount, the product may get damaged.



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

7.1 Installing the Battery

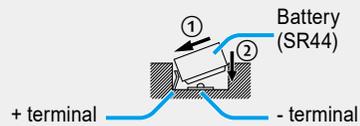
- 1 Using the included size 0 Phillips head screwdriver, remove the mounting screw (M1.7×0.35×5, No. 06ACU912).
- 2 Lift the battery lid straight up to remove it.

3 Install the battery (SR44) with the plus side facing up.

NOTICE

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

If you install the battery by pushing it straight down, there is a risk of damaging the + terminal. Insert the battery by sliding it in so that the + terminal is pushed upward.



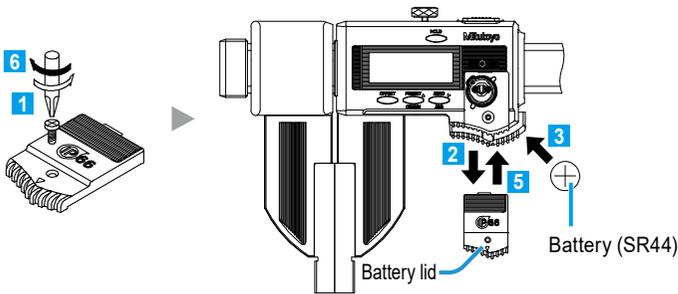
4 Confirm that the packing on the mounting part of the battery lid is set correctly. (Do not remove the packing.)

5 Return the battery lid to its original position.

6 Press down on the end of the battery lid to ensure that there are no gaps between the battery lid and mounting part, and then insert the screw.

» The LCD display lights up.

If nothing appears on the LCD display, reinstall the battery.



Proceed to perform  "7.2 Setting the Origin" on page 5.

● Power on/off (auto power on/off function)

If this product is not used for about 20 minutes, the LCD display will automatically turn off. (The origin setting will be saved.) The power cannot be turned off manually. To turn on the LCD display again, move the jaw slider.

7.2 Setting the Origin

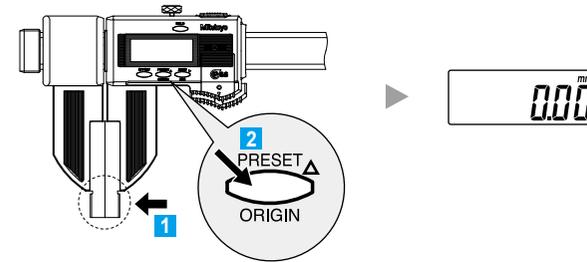
You can set the position of the jaw main beam as the origin.

7.2.1 Setting the Origin with a Zero Value

1 Make sure that the outside measuring surfaces are closed.

2 Press and hold the PRESET/ORIGIN (▲) switch for 1 second or more.

» "0.00" is displayed, and the origin is set.



Tips

Do not move the jaw slider while the origin is being set. Counting may not be performed correctly.

7.2.2 Setting the Origin with a Custom Value

You can register a custom value as the origin (preset). As an example, here we set 25 mm as the preset value.

Tips

To cancel setting the preset, press and hold the OFFSET or OFFSET/in/mm switch for 1 second or more. The setting operation will be canceled, and the product returns to the normal measuring mode.

● Registering Using the HOLD Function

1 Move the jaw slider until the display reads 25 mm.



2 Press the HOLD switch.

» The "H" indicator appears, and the displayed value is fixed.



3 Press the PRESET/ORIGIN (▲) switch.

» The fixed value is displayed, and the "P" indicator blinks.



- 4 Set the outside measuring surfaces around (or, set the inside measuring surfaces into close contact with) a 25 mm reference gauge block prepared separately, and then press the PRESET/ORIGIN (▲) switch.

» The "P" indicator disappears, and registering the preset value is complete.



Tips

If you set a preset in inside measurement mode, a compensation value (see  "Inside measurement" on page 7 for the value) will be added to the preset value for inside measurements. If you switch to outside measurement mode, the added compensation value will be subtracted.

● Registering with Key Operations

- 1 Press the PRESET/ORIGIN (▲) switch.

» The previous preset value is displayed, and the "P" indicator blinks.



Tips

To register the origin with the displayed value, proceed to step [7](#).

- 2 Press the ZERO/ABS (▶) switch.

» The + or - sign blinks.

» You can switch which sign is displayed by pressing the PRESET/ORIGIN (▲) switch.



- 3 Press the ZERO/ABS (▶) switch repeatedly until the digit in the tens place blinks.



- 4 Press the PRESET/ORIGIN (▲) switch repeatedly until "2" is displayed for the tens digit.



- 5 Using the same operations in steps [3](#) and [4](#), display "5" for the ones digit.

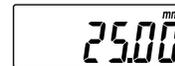


- 6 Press the ZERO/ABS (▶) switch repeatedly until the "P" indicator blinks.



- 7 Set the outside measuring surfaces around (or, set the inside measuring surfaces into close contact with) a 25 mm reference gauge block prepared separately, and then press the PRESET/ORIGIN (▲) switch.

» The "P" indicator disappears, and registering the preset value is complete.



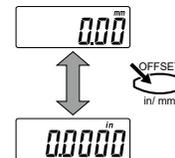
Tips

If you set a preset in inside measurement mode, a compensation value (see  "Inside measurement" on page 7 for the value) will be added to the preset value for inside measurements. If you switch to outside measurement mode, the added compensation value will be subtracted.

8. Switching between Inch and Metric Units (Only for Inch/Metric Models)

- 1 Long-press the OFFSET/in/mm switch.

» Every time it is pressed, the display switches between "in" and "mm."

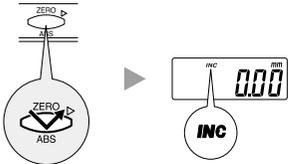


9. Switching between Incremental Measurement (INC) and Absolute Measurement (ABS)

● Incremental measurement (INC)

- 1 Align the measuring surfaces with the location you want to use as the reference (zero), and then short-press the ZERO/ABS (▶) switch (less than 1 second).

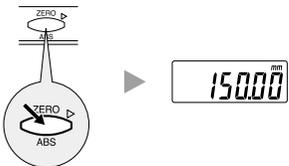
» The displayed value is set as zero, and "INC" is displayed. (Measurement from the reference dimension is possible.)



● Absolute measurement (ABS)

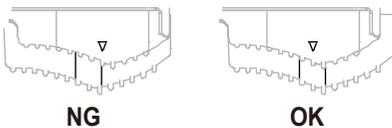
- 1 When "INC" is displayed, long-press the ZERO/ABS (▶) switch (1 second or more).

» "INC" disappears. (Measurement from the origin set with the origin setting or a preset setting is possible.)



10. Measurement Method

You can perform measurements with constant measurement force if you keep the ▼-mark for finger rest lines on the battery lid positioned between the finger rest lines when measuring.

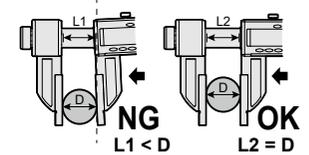


⚠ WARNING Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

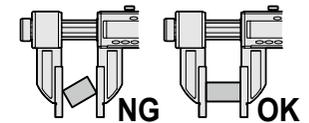
Do not measure the workpiece if it is moving (rotating, etc.). There is a risk of injury by being caught in the machine, etc. Doing so will also increase the rate of wear of the measuring surfaces.

■ Outside measurement

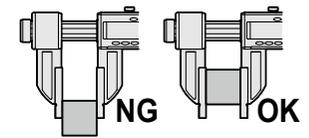
- Do not apply excessive measurement force to the workpiece. Excessive measurement force will cause measurement errors because of the positional deviations of the jaw slider.



- Do not clamp the workpiece diagonally. Any tilting in the jaws will result in measurement errors.



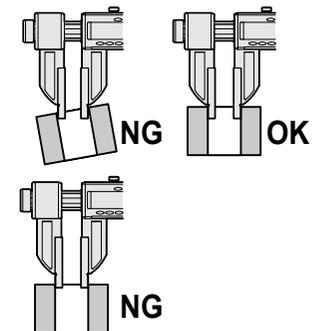
- Clamp the workpiece as close to the sliding surface as possible. Measurement errors are more likely to occur if the workpiece is clamped near the tips of the outside measuring surfaces.



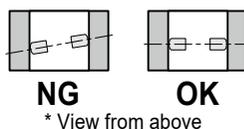
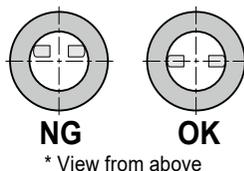
- 1 Clamp the workpiece with the outside measuring surfaces using an appropriate and uniform measurement force.
- 2 Read the measurement value with the workpiece still clamped.

■ Inside measurement

- Insert the inside measuring surfaces into the workpiece as deeply as possible while maintaining a proper orientation.



- For inner diameter measurements, bring the measuring surfaces into close contact with the workpiece, and read the value when the displayed value is at its maximum (that is, when the line between the measuring surfaces passes through the center of the cross section of the workpiece).
- For groove width measurements, bring the measuring surfaces into close contact with the workpiece, and read the value when the displayed value is at its minimum (that is, when the line between the measuring surfaces is perpendicular to the groove inner walls).



1 Press the OFFSET or OFFSET/in/mm switch.

- » appears, and the product switches to inside measurement mode.
- » The compensation value (the size of the tips of the jaws) for inside measurement is displayed.
The value differs depending on the type of model used: 20.00 mm for metric models, 12.7 mm/0.5" for inch/metric models with a measuring length of 600 mm/24" or less, and 25.4 mm/1" for inch/metric models with a measuring length of 1000 mm/40" or greater.



Tips

If you press the OFFSET or OFFSET/in/mm switch again, disappears, and the product switches to outside measurement mode.

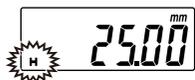
- 2 Bring the inside measuring surfaces into close contact with the inside of the workpiece using an appropriate and uniform measurement force.
- 3 Read the measurement value with the measuring surfaces still in contact with the workpiece.

Fixing the displayed value (HOLD)

You can fix (hold) the value displayed for the measurement result so that it does not change even if the jaw slider is moved.

1 Press the HOLD switch.

- » The "H" indicator appears, and the displayed value is fixed.



2 Read the measurement value.

3 Press the HOLD switch again.

- » The "H" indicator disappears, and the hold on the displayed value is released.



Moving the jaw main beams (except the long jaw type)

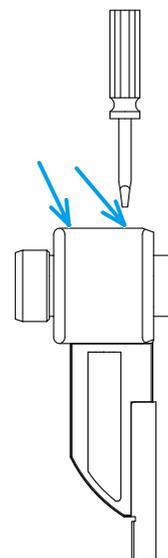
You can move the jaw main beams and measure from an arbitrary position as necessary for your measurement.

Tips

- The jaw main beams of the long jaw type are fixed in place and cannot be moved.
- Never loosen the jaw main beam screws of the long jaw type. If they are loosened, there is a risk that gaps will occur in the measuring surface.
- Set the origin after moving the jaw main beams. (For details, see "7.2 Setting the Origin" on page 5.)

● Type with a measuring length of 600 mm/24" or less

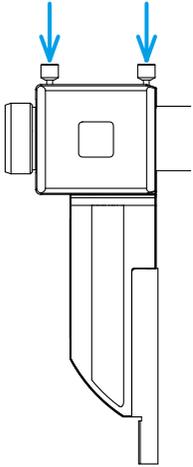
- 1 With the included flathead screwdriver (No. 880083), loosen the two jaw main beam screws.



- 2 Move the jaw main beam to the desired position, and then tighten the jaw main beam screws.

- Type with a measuring length of 1000 mm/40" or greater

- 1 Loosen the jaw main beam screws.



- 2 Move the jaw main beam to the desired position, and then tighten the jaw main beam screws.

External output of the displayed value

By connecting this product to an external device with the connecting cable (optional accessory), you can output the displayed value using our Digimatic method. (For details about output specifications, see  "16. Output Specifications" on page 11.)

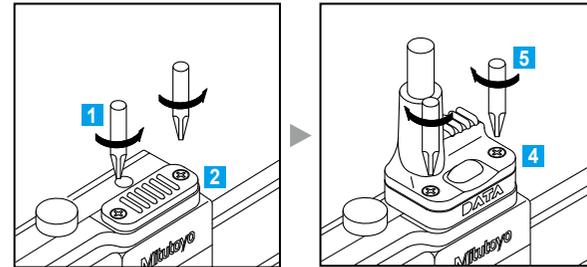
NOTICE

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

- For tightening and removing the screws in the connector cover, use only the size 0 Phillips head screwdriver (No. 05CZA619) that is included with this product. Tighten the screws with a torque from 5 to 8 N·cm. If you apply torque greater than the specified amount, the product may get damaged.
- Make sure that the packing does not stick out when you attach the connecting cable. If the packing is not set correctly, the water-proofing ability will be reduced, which can result in a malfunction due to liquid getting inside, etc.

How to connect the connecting cable (optional accessory)

- 1 Using the included size 0 Phillips head screwdriver, remove the mounting screws (M1.7×0.35×2.5, No. 06ABY841) from the connector cover.
- 2 Remove the connector cover.
- 3 Confirm that the packing on the mounting part of the connector cover is set correctly. (Do not remove the packing.)
- 4 Attach the connecting cable.
- 5 Press down on the end of the connecting cable to ensure that there are no gaps between the lid and mounting part, and then insert the connecting cable mounting screws.



11. Errors and Countermeasures

Minimum digit "E" display

This digit appears if the surface of the scale is dirty to such a degree that counting cannot be performed. Clean the surface of the scale.

(For details about cleaning, see "12. Precautions after Use" on page 10.)



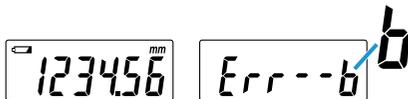
Tips

If "E" still appears even after the surface of the scale is cleaned, reinstall the battery. If it still does not disappear, remove the battery, and then contact the agent where you purchased the product or the nearest Mitutoyo sales office.

Battery "Err--b" display

The battery's voltage is low. Replace the battery immediately.

(For details about replacing the battery, see "7.1 Installing the Battery" on page 4.)



"Err-oF" or "Err-SE" (inch/metric models only) display

This appears if the displayed value or the preset value exceeds $\pm 9999.99 \text{ mm} / \pm 99.9995"$.

"Err-oF": The counter will start again if you return the jaw slider to within the display range. Register a preset value and correctly set the origin again.

"Err-SE": Press the ZERO/ABS (▶) switch, and then register a preset value again.

(For details about registering a preset value, see "7.2.2 Setting the Origin with a Custom Value" on page 5.)



If all six digits have the same number, or if "H" blinks

Remove the battery temporarily, and then reinstall it.

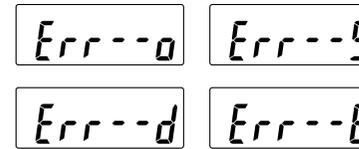
(For details about installing the battery, see "7.1 Installing the Battery" on page 4.)



Other errors

If an error like one shown in the following figures occurs, set the origin again.

(For details about setting the origin, see "7.2 Setting the Origin" on page 5.)



12. Precautions after Use

- If there is dirt on the measuring surfaces, reference surface, sliding surface, etc., wipe it away with a dry cloth or a soft and lint-free cloth slightly moistened with alcohol.
- Take measures to prevent corrosion. Corrosion can cause the product to malfunction.
- For storage, avoid locations that are subject to high temperatures, low temperatures, or high humidity, and locations that are exposed to direct sunlight.
- When storing the product, open the outside measuring surfaces to about 0.2 mm to 2 mm, and do not tighten the jaw slider screw.

13. Specifications

Common specifications

Resolution	0.01 mm/0.0005"
Maximum response speed	No limit (no miscount caused by speed)
Power	SR44 (silver oxide coin battery) 1 pc
Battery life	Continuous use: About 5,000 hours Typical use: About 1 year * Battery life differs depending on the frequency and type of use. Use the figures above as an approximation. The value for 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
Data output	Digimatic output

Individual specifications

Standard type

Code No.	552-302-10 552-155-10 552-312-10 552-165-10	552-303-10 552-156-10 552-313-10 552-166-10	552-304-10 552-314-10	552-305-10 552-315-10	552-306-10 552-316-10
Model	CFC-45G CFC-45GC CFC-18"G CFC-18"GC	CFC-60G CFC-60GC CFC-24"G CFC-24"GC	CFC-100G CFC-40"G	CFC-150G CFC-60"G	CFC-200G CFC-80"G
Measuring range (outside)	0 mm to 450 mm/ 0" to 18"	0 mm to 600 mm/ 0" to 24"	0 mm to 1000 mm/ 0" to 40"	0 mm to 1500 mm/ 0" to 60"	0 mm to 2000 mm/ 0" to 80"
Measuring range (inside) for metric models	20.1 mm to 470 mm	20.1 mm to 620 mm	20.1 mm to 1020 mm	20.1 mm to 1520 mm	20.1 mm to 2020 mm
Measuring range (inside) for inch/metric models	12.8 mm to 462.7 mm/ 0.504" to 18.5"	12.8 mm to 612.7 mm/ 0.504" to 24.5"	25.5 mm to 1025.4 mm/ 1.004" to 41"	25.5 mm to 1525.4 mm/ 1.004" to 61"	25.5 mm to 2025.4 mm/ 1.004" to 81"

Maximum Permissible Error of Indicated Values: See "MPE (E_{MPE} , S_{MPE})".

Long jaw type

Code No.	552-150-10 552-160-10	552-151-10 552-161-10	552-152-10 552-162-10	552-153-10 552-163-10	552-154-10 552-164-10
Model	CFC-45GL CFC-18"GL	CFC-60GL CFC-24"GL	CFC-100GL CFC-40"GL	CFC-150GL CFC-60"GL	CFC-200GL CFC-80"GL
Measuring range	Common to the standard type				

Maximum Permissible Error of Indicated Values: See "MPE (E_{MPE} , S_{MPE})".

14. Standard Accessories

- One size 0 Phillips head screwdriver (No. 05CZA619)
- One flathead screwdriver (No. 880083)
(For products with Code No. 552-302-10/552-303-10/552-312-10/552-313-10/552-155-10/552-156-10/552-165-10/552-166-10 only)
- One warranty card
- One battery (No. 938882)

- One User's Manual (No. 99MAD023M)

15. Optional Accessories

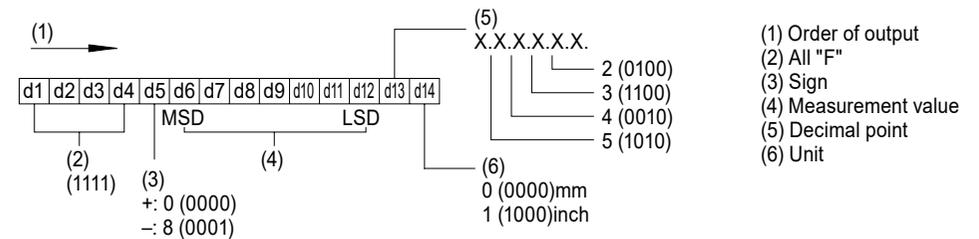
Connecting cable
(with output switch)*

No. 05CZA624 (1 m), No. 05CZA625 (2 m)

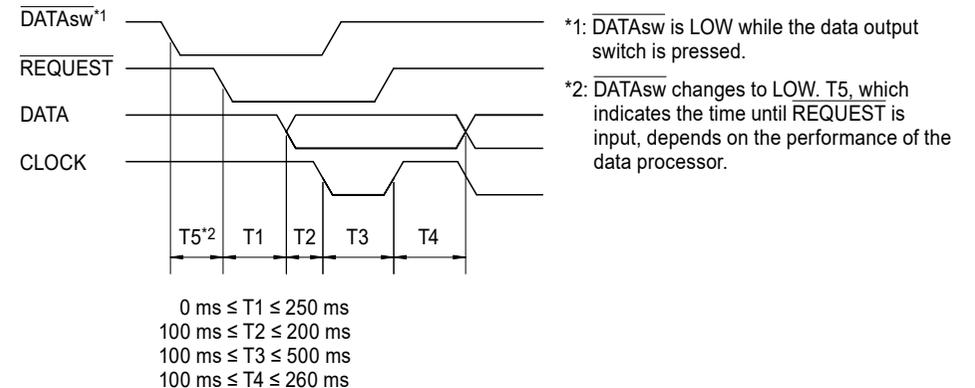
* Example of connectable device: DP-1VA LOGGER (printer with statistics function)

16. Output Specifications

Data format



Timing chart



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No. 99MAD023A

MPE (EMPE, SMPE)

552 Sereis

0.01 mm: 552-150-10, 552-151-10, 552-152-10, 552-153-10, 552-154-10

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 800	±0.06	±0.06
800 < L ≤ 1200	±0.07	±0.07
1200 < L ≤ 1500	±0.11	±0.01
1500 < L ≤ 1700	±0.12	±0.12
1700 < L ≤ 2000	±0.14	±0.14

0.01 mm / 0.0005 in: 552-160-10, 552-161-10, 552-162-10, 552-163-10, 552-164-10

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 800	±0.06	±0.06
800 < L ≤ 1200	±0.07	±0.07
1200 < L ≤ 1500	±0.11	±0.01
1500 < L ≤ 1700	±0.12	±0.12
1700 < L ≤ 2000	±0.14	±0.14

*L (inch)	EMPE (inch)	SMPE (inch)
0 ≤ L ≤ 24	±0.0025	±0.0025
24 < L ≤ 40	±0.0030	±0.0030
40 < L ≤ 48	±0.0040	±0.0040
48 < L ≤ 60	±0.0045	±0.0045
60 < L ≤ 68	±0.0050	±0.0050
68 < L ≤ 80	±0.0055	±0.0055

0.01 mm: 552-302-20, 552-303-20, 552-314-20, 552-315-20, 552-316-20

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 800	±0.04	±0.04
800 < L ≤ 1000	±0.05	±0.05
1000 < L ≤ 1300	±0.07	±0.07
1300 < L ≤ 1500	±0.09	±0.09
1500 < L ≤ 1700	±0.10	±0.10
1700 < L ≤ 2000	±0.12	±0.12

0.01 mm / 0.0005 in: 552-312-20, 552-313-20, 552-314-20, 552-315-20, 552-316-20

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 800	±0.04	±0.04
800 < L ≤ 1000	±0.05	±0.05
1000 < L ≤ 1300	±0.07	±0.07
1300 < L ≤ 1500	±0.09	±0.09
1500 < L ≤ 1700	±0.10	±0.10
1700 < L ≤ 2000	±0.12	±0.12

*L (inch)	EMPE (inch)	SMPE (inch)
0 < L ≤ 40	±0.0020	±0.0020
40 < L ≤ 52	±0.0030	±0.0030
52 < L ≤ 60	±0.0040	±0.0040
60 < L ≤ 68	±0.0045	±0.0045
68 < L ≤ 80	±0.0050	±0.0050

0.01 mm: 552-155-10, 552-156-10

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 600	±0.04	±0.04

0.01 mm / 0.0005 in: 552-165-10, 552-166-10

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 600	±0.04	±0.04

*L (inch)	EMPE (inch)	SMPE (inch)
0 ≤ L ≤ 24	±0.0020	±0.0020

*L

jp 測定長さ
 en Measured length
 de Messlänge
 es Longitud medida
 fr Longueur mesurée
 nl Gemeten lengte
 it Lunghezza misurata

sv Måtlängd
 pt Comprimento medido
 cs Měřená délka
 pl Długość pomiaru
 ru Длина измерения
 tr Ölçme uzunluğu
 ko 측정 된 길이

zh-CN 实测长度
 zh-TW 實測長度
 th ความยาวที่วัดได้
 vi Chiều dài đo được
 ms Panjang yang diukur
 id Panjang terukur