Mitutoyo

ABS Digimatic Caliper

IP67 ABS Coolant Proof Caliper

User's Manual

No. 99MAD030A
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.

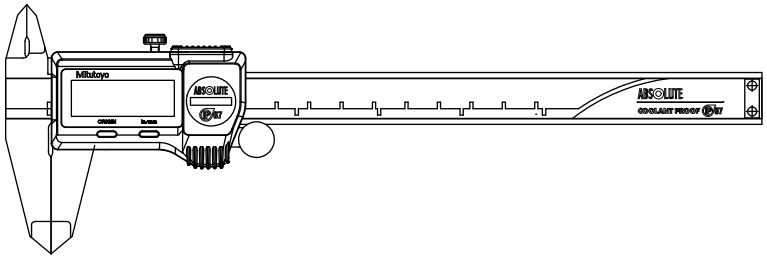
■ Conventions and wording indicating prohibited and mandatory actions

Indicates concrete information about prohibited actions.	Indicates concrete information about mandatory actions.

Contents

1. Type and Code Number

■ Standard type: with output function and thumb roller



Code No. 500-712-20 500-713-20 500-714-20 500-719-20* 500-762-20
500-763-20 500-764-20 500-768-20 500-769-20*

*Depth bar: ø1.9 mm rod

● Model with carbide-tipped jaws for outside measurement

Code No. 500-721-20 500-722-20 500-731-20* 500-732-20* 500-735-20
500-736-20

*without output function

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

Code No. 500-723-20 500-724-20 500-733-20* 500-734-20* 500-737-20
500-738-20

● Model without output function

Code No. 500-702-20 500-703-20 500-704-20 500-752-20 500-754-20
500-768-20*

*Depth bar: ø1.9 mm rod

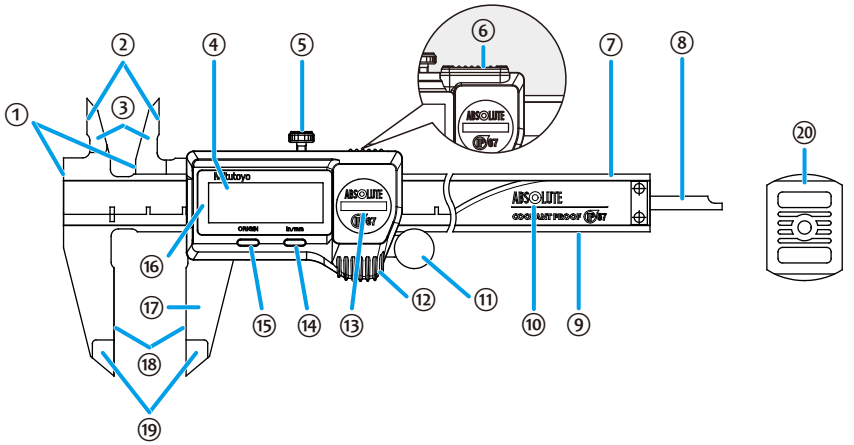
● Model without thumb roller

Code No. 500-716-20 500-717-20 500-718-20

● Model without output function and thumb roller

Code No. 500-706-20 500-707-20 500-708-20

2. Names of Components



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

3. Precautions for Use

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

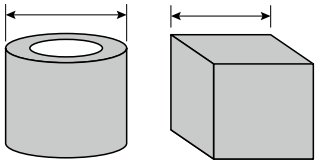
- Do not use an electric engraver to put marks on the product such as numbers.
- Do not drop the product or apply excessive force to it.
- Do not scratch the main scale surface.

- 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.
- For protecting the detection/display module from dust and water sufficiently, tighten the setscrews to secure the battery compartment lid. Also do not remove the packing seal.

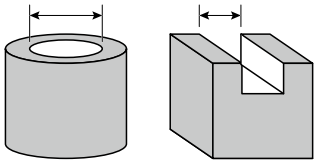
- - Before using this product for the first time, wipe the rust preventive oil from the product with a soft cloth soaked with cleaning oil, and install the supplied battery.
- - If rust preventive oil is dried, the product might not operate smoothly. Wipe a sliding surface with a cloth and then apply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

4. Product Applications

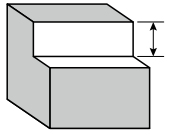
Outside measurement



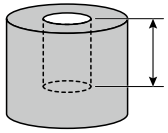
Inside measurement



Step measurement



Depth measurement



5. Basic Usage

■ Using the caliper

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

■ 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)

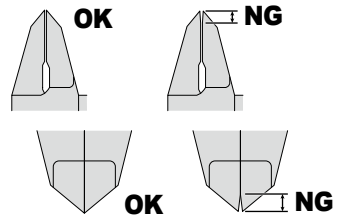
6. Confirmation before Measurement

■ 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

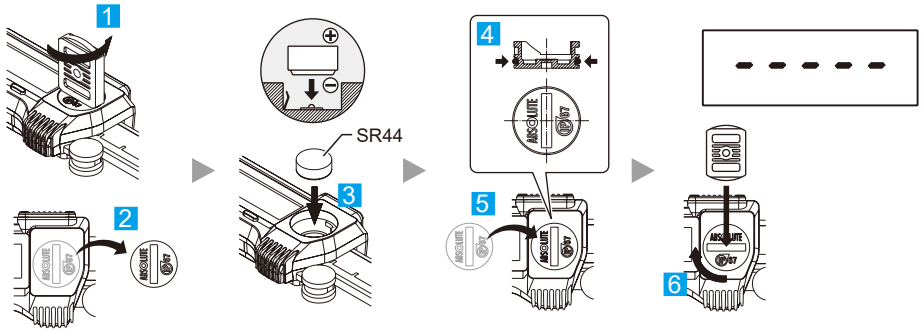
NOTICE Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

- 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 the battery, comply with ordinances and regulations.

7.1 Setting the battery

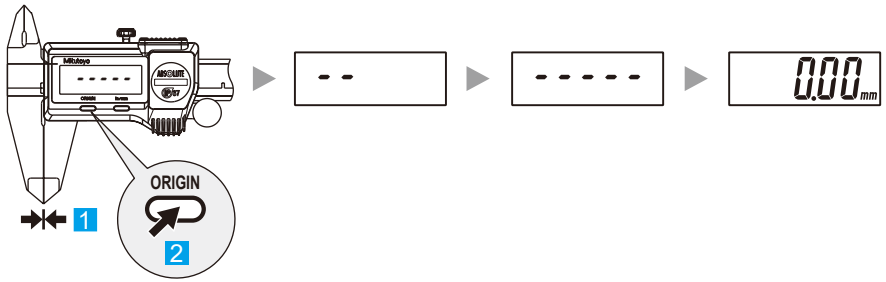
1. **Insert the supplied battery lid key into the groove on the battery lid, press and rotate counterclockwise until the groove becomes vertical.**
2. **Remove the battery lid loosen.**
3. **Install the battery (SR44) with its positive side facing upward.**
4. **Make sure that the packing is attached in place on the battery lid without kinks.**
5. **Put the battery lid on with its groove vertical as shown in the figure.**
6. **Insert the battery lid key into the groove on the battery lid, press and rotate clockwise until the groove becomes horizontal.**
   » “-----” blinks immediately. Continue to set the origin.



Tips
Be sure to set the origin after installing the battery.

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.



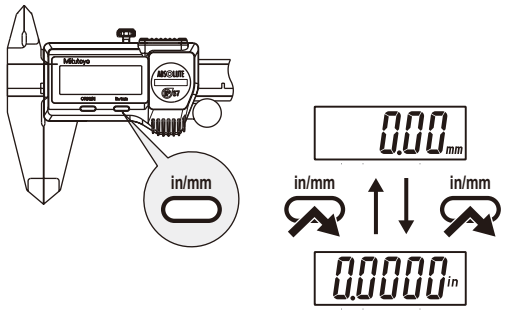
Tips
When the battery has been installed, do not move the slider until “0.00” appears as the origin. Otherwise, the product might not count values correctly.

■ Auto-sleep, Auto-on Function

The LCD automatically goes off after approximately 20 minutes of idle time. (However, the origin point will be stored.) Move the slider to activate the LCD

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.”

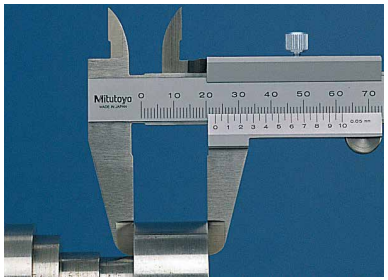


9. Measurement Method

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

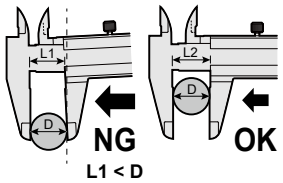
Do not measure the workpiece with the caliper if it is rotating, etc.
Measuring surfaces will be worn out.

■ Outside measurement

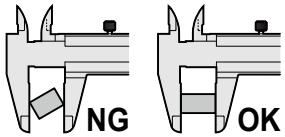


Picture: Vernier caliper

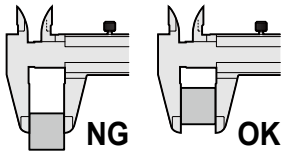
- Do not apply excessive force to the workpiece. Excessive measuring force will cause measurement error because of the positional deviations of the jaws.



- Do not clamp the workpiece diagonally. Measurement error will ensue if tilted.



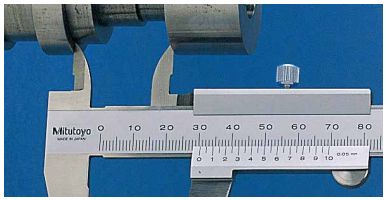
- Clamp the workpiece as close to the sliding surface as possible. Measurement error is more likely to increase if clamped near the outside measuring jaw tips.



1 **Insert the workpiece into the outside measuring jaws and bring jaws into close contact with the workpiece, using appropriate and uniform measuring force.**

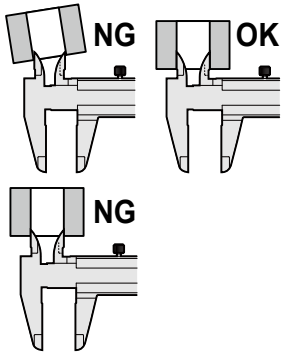
2 **Read the display while keeping the outside measuring surfaces in close contact.**

■ Inside measurement

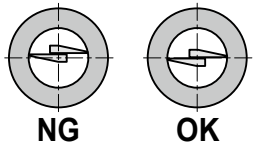


Picture: Vernier caliper

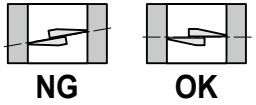
- Insert the inside measuring jaws as deeply as possible into the workpiece.



- 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.



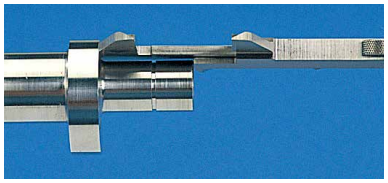
- For groove width measurement, bring the inside measuring surfaces into close contact, and read the display when it is minimum: a direct line between the faces is perpendicular to the groove inner wall.



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.**

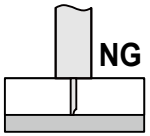
2 **Read the display while keeping the inside measuring surfaces in close contact.**

■ Step measurement

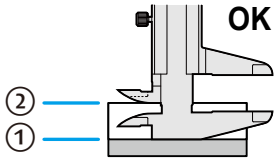


Picture: Vernier caliper

- 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.

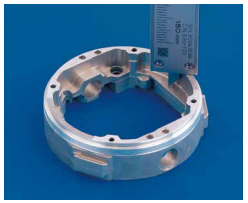


- For a stepped workpiece, bring the entire step measuring surfaces (①, ②) into close contact with the workpiece.



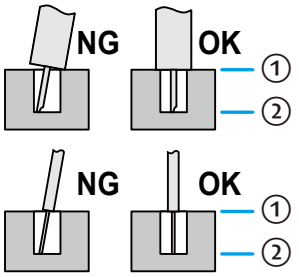
1. **Bring the step measuring surface (①, beam side) into close contact with the workpiece.**
2. **Move the slider until the step measuring surface (②, slider side) strikes the workpiece (stepped surface).**
3. **Read the display while keeping the step measuring surfaces in close contact.**

■ Depth measurement



Picture: Vernier caliper

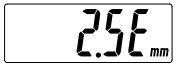
The depth measuring surface of the caliper is narrow and unstable. Bring it into contact perpendicular with the workpiece.



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.**

10. Errors and Countermeasures

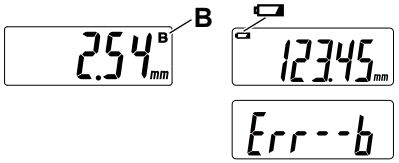
■ Minimum digit “E” display



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

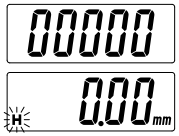
If “E” still appears even after the surface of the scale cover is cleaned, reinstall the battery. Nevertheless, if it does not disappear, remove the battery, and then contact your distributor or sales office.

■ “B”, “▭” and “Err--b” display



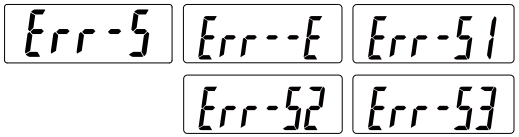
“B” indicates the voltage drop of the battery. Replace the battery immediately. (For instructions on replacing the battery, see “8.”).

■ 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.

11. 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.

12. Specifications

Resolution	0.01 mm
Maximum permissible error E_{MPE} (outside measurement) S_{MPE} (inside measurement)	📖 See “MPE (E_{MPE}, S_{MPE})”.
Protection level	IP67* *IP67 protection level (See IEC 60529 for details.) - Protection against foreign matter (level 6) : Foreign matter does not enter - Protection against water (level 7) : The module is protected against water damage to a depth of one meter for 30 minutes.
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 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

The display of this product may flicker or turn off due to electromagnetic interference by electrostatic charge, but it returns to the normal state after the electromagnetic interference is cleared.

13. Standard Accessories

- SR44 silver oxide battery (No. 938882, 1 pc)
- Phillips screwdriver (No. 05CZA619, 1 pc)
- Warranty (1 copy)
- User's Manual (No. 99MAD030M, 1 copy)

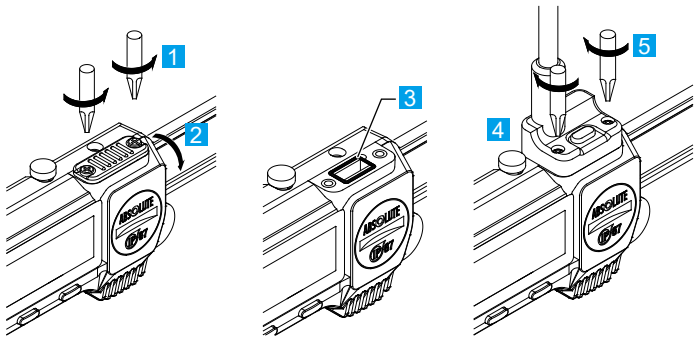
14. Optional Accessories *only for the type with the output function

Connection cable (with the output switch)	No. 05CZA624 (1 m), No.05CZA625 (2 m)

● Setting the connection cable

Set the connection cable by following the procedure below.
To fasten or remove screws, use the supplied screwdriver (No. 05CZA619) (recommended) or a commercial No. 0 screwdriver with a 5 to 8 N•cm tightening torque. Excessive tightening may degrade performance.

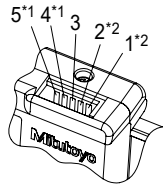
1. **Remove the connector cover mount screws (M1.7 x 0.35 x 2.5/No. 09GAA376) with the above screwdriver.**
2. **Remove the connector cover.**
3. **Make sure that the packing is attached in place (Do not remove it).**
4. **Connect the connection cable.**
5. **Tighten the plug of the connection cable with the mount screws by holding down it with your fingers.**

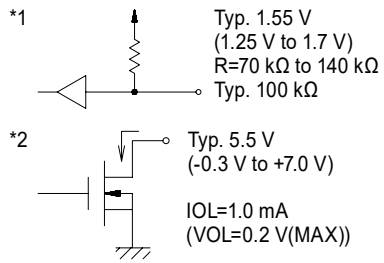


15. Output Specifications *only for the type with the output function

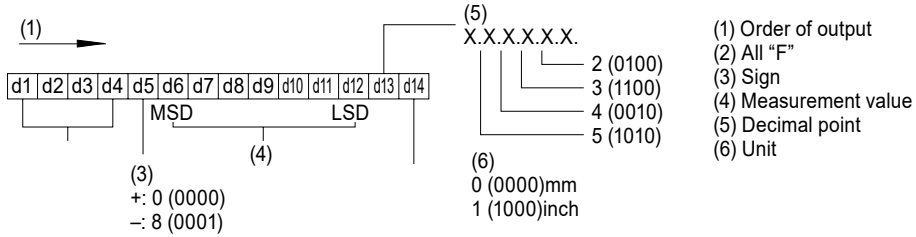
■ Connector pin alignment

Pin No.	I/O	Signal
1	-------	GND
2 (*2)	O	DATA
3 (*2)	O	CLOCK
4	-------	-------
5 (*1)	I	$\overline{\text{REQUEST}}$

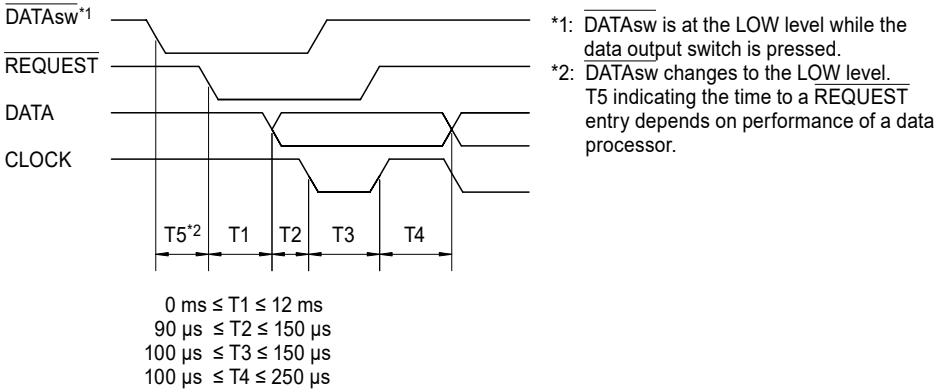




■ Data format



■ Timing chart



0 ms ≤ T1 ≤ 12 ms
90 µs ≤ T2 ≤ 150 µs
100 µs ≤ T3 ≤ 150 µs
100 µs ≤ T4 ≤ 250 µs

Mitutoyo Corporation

20-1, Sakado 1-Chome, Takatsu-ku, Kawasaki-shi, Kanagawa 213-8533, Japan
URL: https://www.mitutoyo.co.jp

Printed in Japan

MPE (*E*MPE, *S*MPE)

500 Sereis

0.01 mm

*L (mm)	*E*MPE (mm)	*S*MPE (mm)
0 ≤ L ≤ 200	±0.02	±0.04
200 < L ≤ 300	±0.03	±0.05

0.01 mm / 0.0005 in

*L (mm)	*E*MPE (mm)	*S*MPE (mm)
0 ≤ L ≤ 200	±0.02	±0.04
200 < L ≤ 300	±0.03	±0.05

*L (inch)	*E*MPE (inch)	*S*MPE (inch)
0 ≤ L ≤ 8	±0.0010	±0.0020
8 < L ≤ 12	±0.0015	±0.0025

*L

jp	測定長さ	sv	Mätlängd	zh-CN	测量长度
en	Measruing length	pt	Comprimento de medição	zh-TW	量測長度
de	Messlänge	cs	Měřená délka	th	ความยาวในการวัดสูงสุด
es	Longitud de medición	pl	Długość pomiaru	vi	Độ dài đo lường
fr	Longueur de mesure	ru	Длина измерения	ms	Panjang pengukuran
nl	Meetlengte	tr	Ölçme uzunluğu	id	Panjang pengukuran
it	Lunghezza di massima	ko	대 측정 길이		