No.99MAJ004B7
SERIES No.511

Operation Manual

511 series

Digimatic bore gage

Mitutoyo

Table of Contents

Introduction

Digimatic Bore gage is the dedicated ID measuring instrument. To take full advantage of this gage, read this manual thoroughly before using it. After reading, retain this manual for future reference. Specifications of the Digimatic Bore gage and the information in this manual are subject to change without notice.

Warranty: In the event that the Mitutoyo Digimatic Bore gage should prove defective in workmanship or material, within one year from the date of original purchase for use, it will be repaired, at our option, free of change upon its prepaid return to us. Please contact your Mitutoyo sales office.

Export Control Compliance

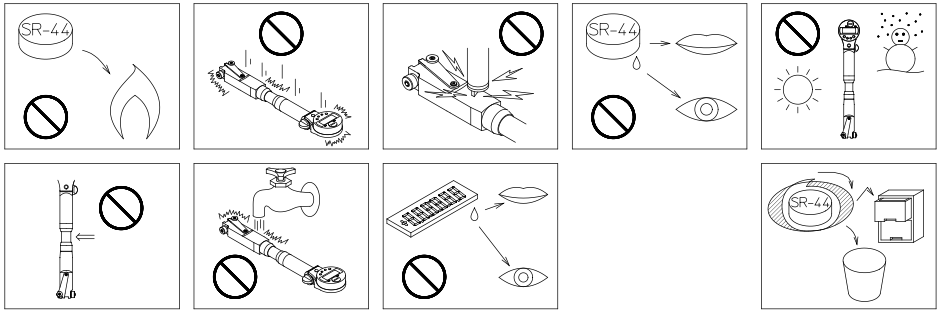
The goods, technologies or software described herein may be subject to National or International, or Japanese Export Controls.

To export directly or indirectly such matter without due approval from the appropriate authorities may therefore be a breach of export control regulations and the law.

Features

- Capable of holding the minimum value. This provides simple, accurate and stable inside diameter measurement easily.
- Capable of tolerance judgment for the minimum value.
- The analog bar shows the minimum value, upper/lower limit values (in the tolerance judgment) and the current value.
- Capable of presetting 3 reference values (master values), and setting a corresponding tolerance value for each.
- By connecting a data processor, measurement value can be recorded.

Precautions on use



WARNING

- Always keep the battery out of the reach of infants and toddler to prevent it from being swallowed. If it is swallowed, consult a physician immediately.
- The battery should never be short-circuit, disassembled or deformed, heated or exposed to 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.

CAUTION

- Never charge the battery since it is a primary battery. Never reverse the positive and negative terminals when mounting. Improper handling of the battery could lead to leakage or explosion, causing bodily injury or malfunction.
- The measuring faces of this product have a sharp edge. Handle it with great care to avoid injury.

IMPORTANT

- Do not disassemble and modify this indicator.
- Do not bump any part of the instrument.
- If the indicator is not used for more than three months, remove the batteries from the indicator to store them separately. Otherwise, the liquid leaked from the battery may damage the indicator.

NOTE

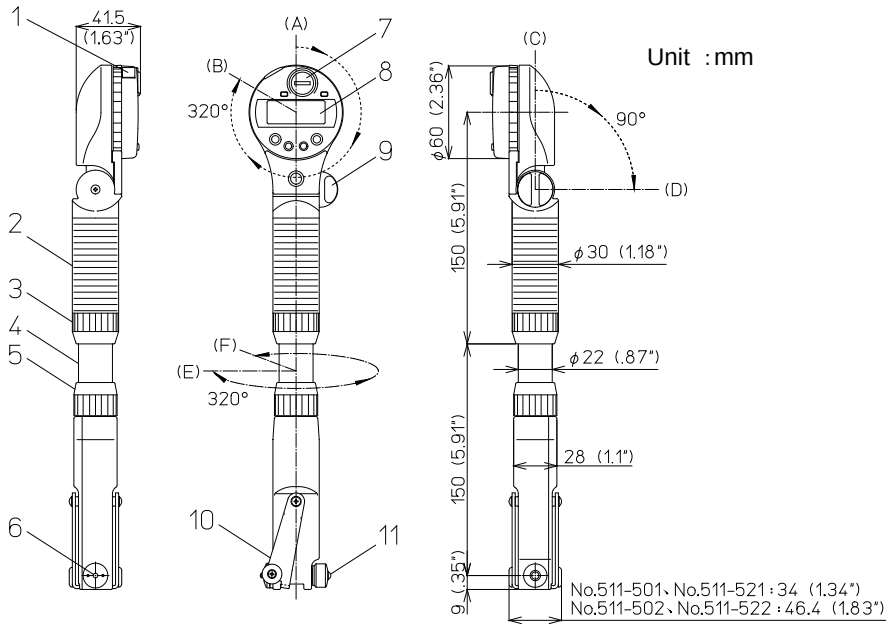
- Use only the supplied interchangeable washer, anvil and other accessories. Do not use them with other instruments.
- Use the instrument in a temperature-controlled room that has minimum temperature fluctuation. Allow a sufficient time for the instrument and workpiece to thermally stabilize if it is moved to an environment with a different temperature.
- Wipe off outside stains with a soft dry cloth or soaked with neutral detergent or alcohol. Do not use other organic solvents (such as thinner or benzene) for resin parts.

Warning on disposal

WARNING

- For this instrument the LCD and a silver oxide battery are used. When disposing them, follow the local ordinances or regulations of respective local governments.
- The LCD part contains irritating substance. Should the liquid content accidentally come into contact with the eye or skin, rinse with water immediately and consult a physician. Should it get into the mouth, immediately rinse inside the mouth, swallow plenty of water, vomit, then consult a physician.

1. Names of each part, Dimensions and adjustment of angle



1.1 Names of each part

1	Output connector (with a rubber cap)	2	Holder (grip)	3	Holder nut	4	Pipe
5	Pipe nut	6	Contact nut	7	Battery cap	8	LCD
9	Clamp knob	10	Guide	11	Anvil		

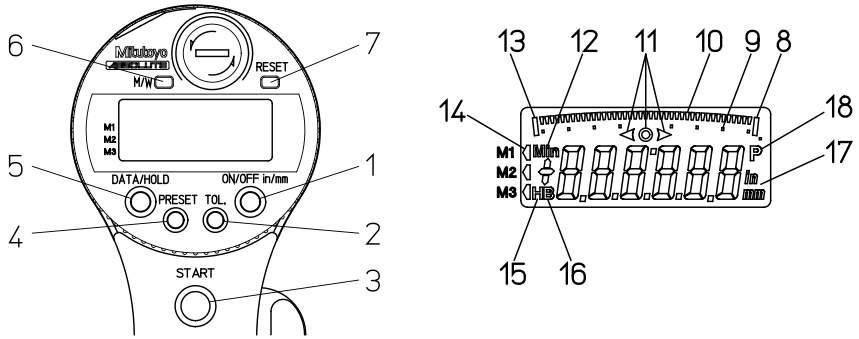
1.2 Adjustment of angle

- The display unit rotates 320° (B) clockwise from the position (A).
- 90-degree adjustment (seven positions) of the display unit can be carried out from (C) to (D). Please loosen a clamp knob and adjust to a legible angle. Please fasten a clamp knob, if adjustment finishes.
- The 320 degrees of the directions of a contact point can be rotated from (E) to (F). Please loosen a holder nut and adjust in the direction which is easy to measure. Please fasten a holder nut,if adjustment finishes.

Important

- It will become the cause of failure if it turns by force exceeding the stopper in each position.
- It will become the cause of failure if a display unit is drawn out or pushed in. when combination extension rod.

2. Names and Functions of display parts



2.1 Function of switches

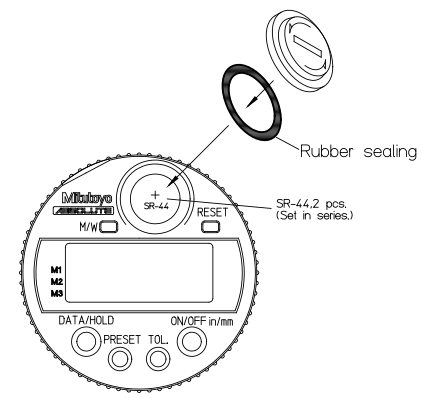
Switchs	Valid modes/Conditions (pressing time)	Functions
1 in/mm ON/OFF	always valid (＜2 s)	Turns the power ON/OFF
	Measurement mode and initial state (≧2 s)	Switches inch/mm display. (unique to inch/mm model)
2 TOL.	Tolerance judgment ON	To the initial state. (tolerance judgment OFF)
	Tolerance judgment OFF	To tolerance setting mode
	Tolerance setting mode (2 s)	Set the Upper/lower limit value
	Tolerance setting mode (2 s)	Changes the active digit. (in the upper/lower limit value setting)
3 START	Measurement mode and initial state	Starts workpiece measurement.
	Master setting mode	Starts setting with a master ring.
4 PRESET	Master setting mode (＜2 s)	Set the master value.
	Master setting mode (≧2 s)	Change the active digit. (in the master setting)
	When installing battery	To the initial state.
5 DATA/HOLD	Measurement mode and initial state	Output the date. (if a data processor is connected)
		Hold/release the display. (if no data processor is connected)
	Master setting mode	Hold/release the display.
6 M/W	Master setting mode (＜2 s)	To the initial state.
	Master setting mode (≧2 s)	Switching the master (M1→M2→M3→M4)
	Measurement mode and initial state	To the Master setting mode.
7 RESET	When combination extension mode	To the initial state.

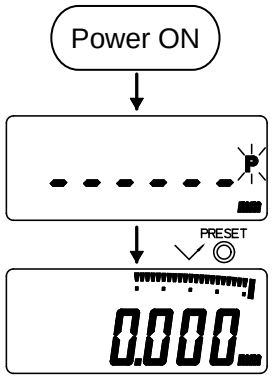
2.2 Names of LCD

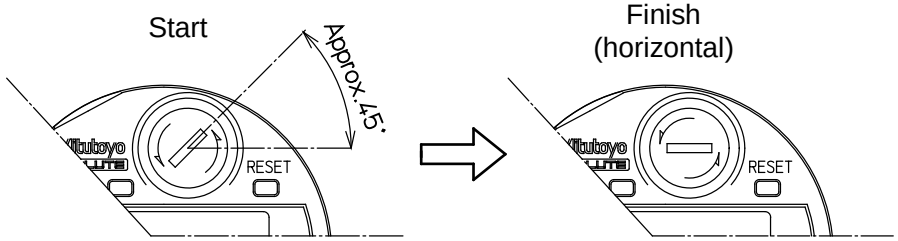
8 Upper over range　9 Graduation　10 Analog bar　11 Tolerance judgment result
12 Minimum value (Min) measurement　13 Lower over range　14 Master No.
15 Hold　16 Battery warning　17 Unit　18 During the master setting

3. Setup

3.1 Battery replacement







Set two silver oxide batteries (SR-44) in series with the positive (+) side facing up.

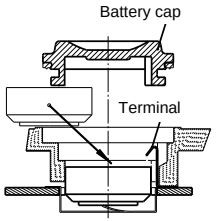
Step1Remove the battery cap by turning it counterclockwise (arrow direction) with a coin set in the groove. Then replace the batteries by new ones.

Step2 Put back the battery cap and turn it clockwise to secure (upper right 45° to horizontal). Be careful not to allow the seal to protrude. [------]appears, and the sign “P” blinks.

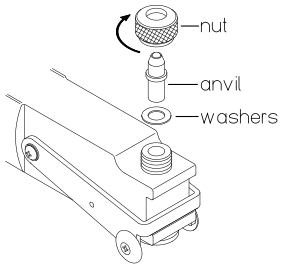
Step3 Press the [PRESET] switch shortly, then the display will change to “0.000 mm” in initial state. The inch/mm displays “0.00000 in” or “0.0000 in”.
Move to the master setting.

Important

- Install the batteries in the direction described on the right, so as not to damage the battery terminal.
- Replace the 2 batteries together. Do not install the used and fresh batteries mixed.
- If an abnormal display appears, remove the batteries, then install them again.
- All of the setting values (master value and upper/lower limit values) are already set to “0.000 mm”(“0.00000 in”or”0.0000 in” for inch/mm model).

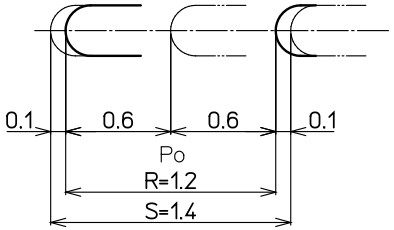


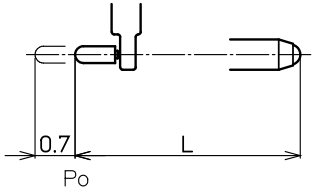
3.2 Setting the measuring dimension



For the required measuring dimension select the appropriate interchangeable washers and the anvil and set them on the main unit. If performing measurement with the interchangeable washers, and the anvil assembled, use a minimum number for each.

Although there is 1.4 mm of all a contact point strokes, effective measurement length is ±0.6 mm (a total of 1.2 mm) on the basis of P0(neutral point), as shown below. Before and after all strokes, every 0.1 mm, since accuracy is not guaranteed in a free stroke, please be careful. In measurement, we recommend you set the center of all tolerance ranges as a zero point (neutral point) as much as possible.

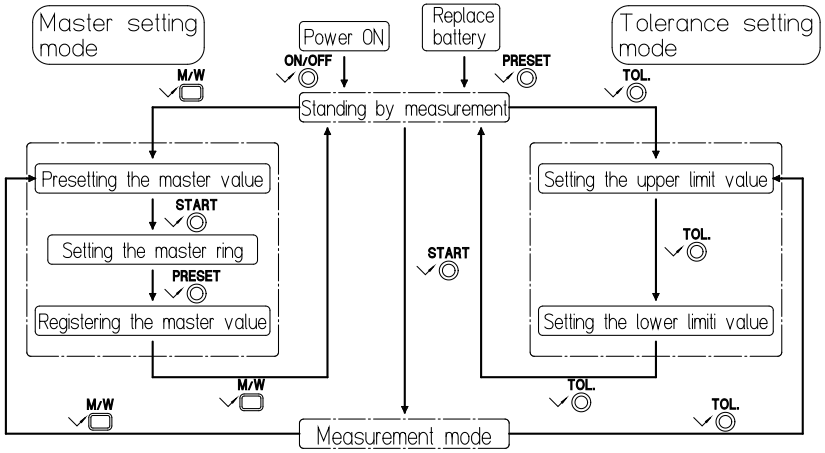




4. Measurement

4.1 Outline

Operation Flowchart



・Turn the power on (or replace the batteries), then it stands by measurement (initial state). If the master setting is completed. Press the [START] button shortly to measure workpieces. In the initial state, the current position of the contact point is shown on the digital display and the analog bar, but the minimum value cannot be held.

・This instrument has 3 modes, Master setting mode. Tolerance setting mode, and Measurement mode.

・Master setting mode：Calibrate this instrument using the master ring. The calibration procedures are as follows.

Presetting the master value：Preset the value of the master ring.

Setting the master ring：Put this instrument into the master ring, then probe the minimum value. On the digital display the minimum value is held.

Registering the master value：Register the master value where the minimum value is detected by probing the master ring.

・Tolerance setting mode：Set the tolerance limit (upper/lower limits). They are shown on the analog bar, and the tolerance judgment result (“◂”, “○”, “▸”) is displayed.

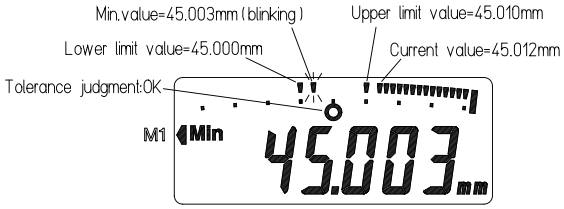
・Measurement mode：Measure the inside diameter (minimum value) of the workpiece. The minimum value is held on the digital display.

・ If extension rod attachment or removal, or if changing the anvil or washer, calibrate this instrument with a reference such as a master ring.

・Set the upper/lower limits in the tolerance setting mode to perform the tolerance judgment.

・The display has the following features while measuring a workpiece or setting the master ring.

The digital display holds the minimum value, which makes it easy to confirm the minimum value. The analog bar shows the current as well as the minimum value (linked).



If the tolerance limits are set, the analog bar also shows the upper/lower values. Therefore, the state of the diameter to the tolerance limit can be checked easily. The example on the left shows a measurement result of a workpiece, the minimum value = 45.003 mm (current value = 45.012 mm), with the setting of the upper limit = 45.010 mm and the lower limit = 45.000 mm

4.2 Operation

Following the flowchart, here explains the procedures in order of the Master ring measurement mode, Tolerance setting mode and Measurement mode.

NOTE

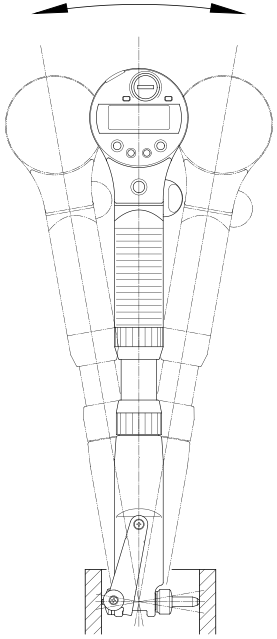
Two ways of key operation are represented by the following illustrations.

Press shortly (less than 2 s).　　Press and hold (2 s or more)

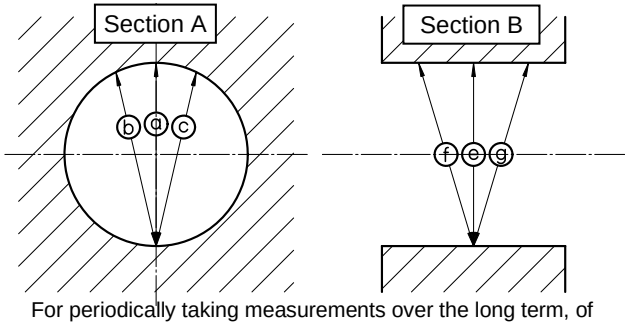
4.2.1 The method of master setting

・This instrument is a comparison measurement machine.

Please be sure to perform master adjustment by the following methods in measurement. When the time of extension rod attachment or removal or anvil, and a substitute washer are changed, master adjustment is surely required.

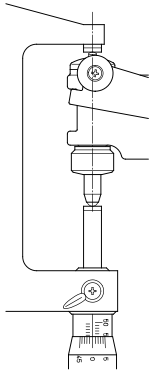


a) Master setting with the setting ring or mastering



For periodically taking measurements over the long term, of mass-produced parts for example from work-pieces with identical specifications, it is recommended that a master ring is prepared. The setup procedure for the Bore Gage is the same as that for actual measurement. Diameter(e) is maximized when intersection(A) is perpendicular to the axis to the objective cylinder, thus the Bore Gage will take the minimum reading. In contrast, diameter(e) is minimized at intersection(B), which includes the cylinder axis, so that the Bore Gage will take the maximum reading. Therefore, when using the bore gage, adjust the moving direction of the contact point along(a) on intersection (A), and along(e) on intersection(B).

In this instrument, diameter (a) is automatically calculated by the guide. In order to make diameter (e) agree, the point which this instrument is shaken as shown in the right figure, and shows the minimum value is looked for.



b) Master setting with outside micrometer

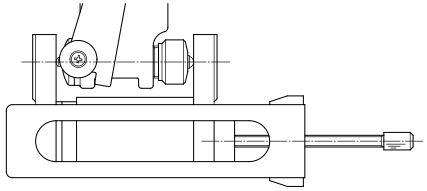
Micrometer is fixed to a stand and it opens to required length. As shown in the right figure, this instrument is inserted between two measurement sides of micrometer, and the point which shows the minimum value is looked for. Master adjustment by micrometer needs skill to some extent, in order that the automatic centripetalism by the guide may not work.

NOTE

・Hold the micrometer vertically so that the micrometer head facing downward.

・Do not clamp the micrometer while performing this adjustment.

c) Master setting with gauge blocks

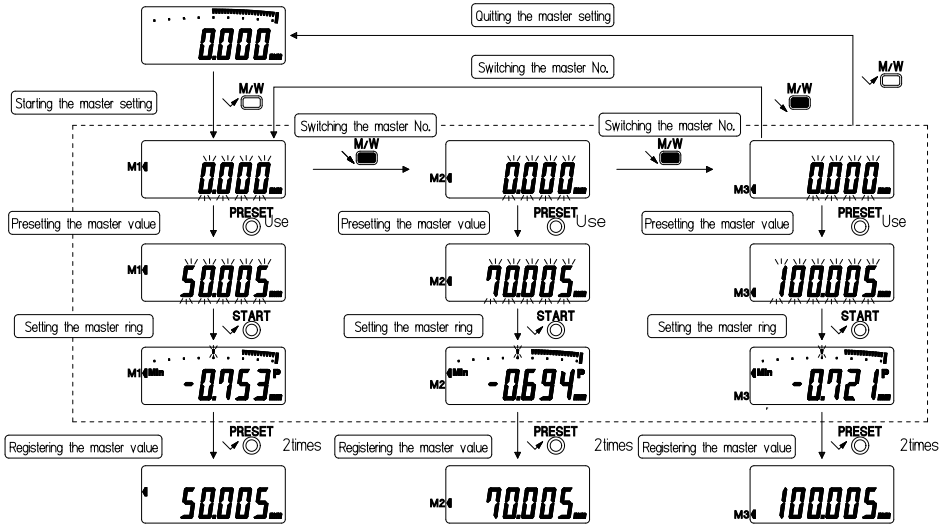


Master setting can be carried out combining gauge blocks and accessories.
Experience is needed for this method as is so for the outside micrometer.

Please ask nearby a Mitutoyo sales office about the combination of gauge blocks and accessories.

4.2.2 Master setting mode

Using the master ring of 50.005 mm, preset the master value to the master No.M1.



a) Presetting the master value

Select the master No., then preset the value of the master ring (master value).

Step 1 Press the [ON/OFF] button shortly to turn the power on. (Initial state)
If it is in the measuring mode, skip this step.

Step 2 Press the [M/W] button shortly. The analog bar disappears, then the previous master value registered at the M1 blinks. When presetting the master value at M2 or M3, hold the [M/W] button to switch the master No.. The master No. will switches M1 - M2 - M3 - M1.

Step 3 Press the [PRESET] button ("P" blinks.), then preset the master value. If no need to change the value, move to the step 6.

Step 4 Press the [PRESET] button to preset the master value into each digit.
Holding the [PRESET] button: The blinking digit moves on. Hold the [PRESET] button until a desired digit starts blinking.
Pressing the [PRESET] button shortly: Every press of the button switches display value. The sign switches between + and - and the figure changes from 0 - 1 - 2 ... 9. Repeat this procedure to preset the master value correctly to each digits.

Step 5 Hold the [PRESET] button until the sign "P" starts blinking again.

Step 6 Press the [PRESET] button shortly. The new preset value starts blinking.

To register this value as the master value, move to the b) Setting the master ring and c) Registering the master value.

NOTE

- If the master No. is changed, execute the master setting to register the master value again.
- The unit (inch/mm) cannot be changed in the middle of the master setting. If the master setting is started in the inch state, the master value registered in metric is converted and displayed in inch.

b) Setting the master ring

Put this instrument into the master ring, and probe a minimum value. This can be performed after the step 6 of a) Presetting the master value.

Step 1 Put this instrument is mounted into the master ring.

Step 2 Press the [START] button shortly to be on the waiting for detecting a minimum value. The sign "Min" and "P" are turned on, the digital display shows "0.000 mm", and the center analog bar ("0.000 mm") blinks.

NOTE

- Before pressing the [START] button, put this instrument into the master ring.

Step 3 Probe the minimum value of the master ring. When a minimum value is detected/updated, the digital display holds its value and the analog bar leaves a blinking cell at the position.

Step 4 Finish detecting the minimum value. The digital display holds minimum value, and the analog bar shows the minimum value (blinks) and the current value (light).

Step 5 To confirm the minimum value detected in the step 4, press the [START] button again. The minimum value position will be "0.000 mm" (at the center of analog bar), then a minimum value can be detected again.

Step 6 Probe this instrument to detect a minimum value again. The difference to the minimum value detected in the step 4 is displayed. Check whether the calibration is correctly performed or not.

Step 7 If there is a possibility of an accidental change of the minimum value detected, press the [DATA/HOLD] button shortly to hold the display value, then move to the c) Registering master value. (The sign "H" is turned on.) To release the display value press again the [DATA/HOLD] button shortly.

NOTE

- Until the master value is registered, checking the master value (step 5) can be repeated.
- If the value exceeds the display range during the detection, the analog bar indication will be changed so that the minimum value comes at the center of the bar.

c) Registering the master value

This can be performed after the step 7 of b) Setting the master ring. If this is not performed, the preset value set in the a) Presetting the master value is not registered as the master value.

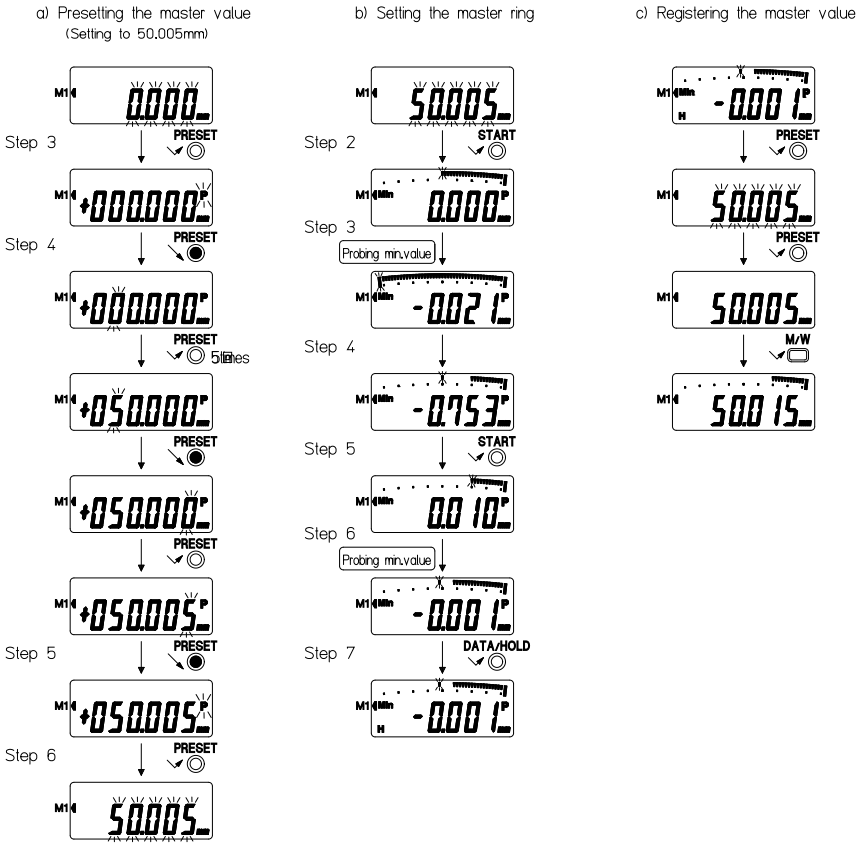
Step 1 Press the [PRESET] button shortly to call the preset value (blink) set in the a) Presetting the master value. Then sign "P" and "Min" disappear.

Step 2 Press the [PRESET] button again shortly to register the master value. The figure stops blinking (light).

NOTE

- To check the calibration, press the [START] button shortly after registering the master value. Then prove a minimum value of the master ring. If the minimum value equals the master value, moves to the step 3, for other cases repeat from the step 1 again.

Step 3 Press the [M/W] button shortly to quit the master setting mode. If becomes on the initial state, the new master value comes at the center of the analog bar.



4.2.3 Tolerance setting mode

In this mode the upper/lower limit values can be set for the master values of M1, M2 and M3 registered in the section 4.2.1 Master setting mode. After setting the tolerance value, the analog bar shows the upper and lower limits. Here explains how to set the upper limit (50.010 mm) and the lower limit (50.000 mm) to the master No. M1 (50.005 mm).

Step 1 Be sure that it is on the initial state or in the measurement mode.

Step 2 Press the [TOL.] button shortly. The analog bar disappears and the previous upper limit value of M1 is displayed. (“▶” blinks.)

Step 3 Press the [TOL.] button to set the upper limit value into each digit. (“▶” lights.)

Holding the [TOL.] button: The blinking digit moves on. Hold the button until a desired digit starts blinking.

Pressing the [TOL.] button shortly: Every press of the button switches display value. The sign switches between + and - and the figure from 0 - 1 - 2 ... 9.

Repeat this procedure to set the upper limit value correctly to each digit.

Step 4 Hold the [TOL.] button until the sign “▶” starts blinking.

Step 5 Press the [TOL.] button shortly. The previous lower limit value set to M1 is displayed. (“◀” blinks.)

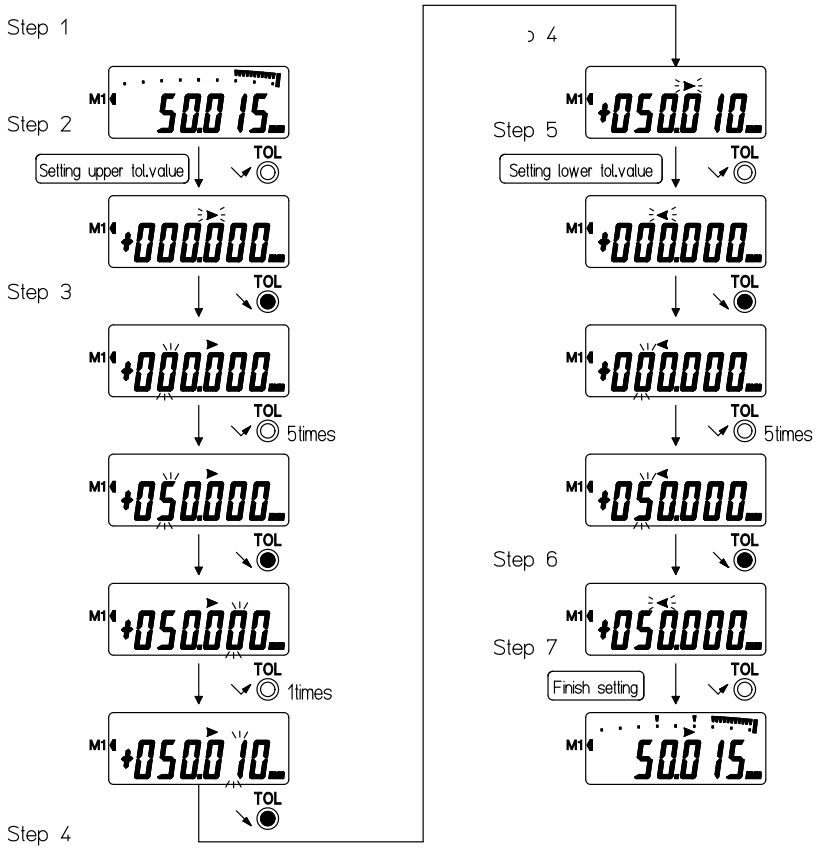
Operate the [TOL.] button to set the lower limit value to each digit, following the step 3.

Step 6 Hold the [TOL.] button until the sign “◀” starts blinking.

Step 7 Press the [TOL.] button shortly to quit the tolerance setting mode. The tolerance judgment is started on the initial state.

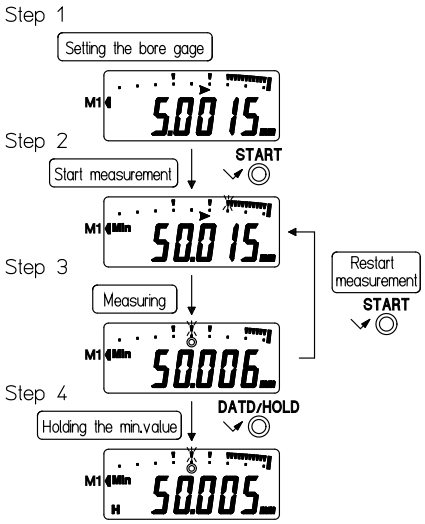
NOTE

- If the upper limit is smaller than the lower limit, “E--SE” (tolerance setting error) is displayed. Set the tolerance limit again returning to the step 2. The value set can be confirmed by pressing the [TOL.] button shortly.
- The weight of the analog bar is automatically determined (display range is fixed), according to the difference between the upper and the lower limits, so that the both limit values can fit in the display range.
- The upper/lower limits set are maintained together with the master value until next setting.
- When setting the tolerance value to M2 or M3, first perform the master setting.

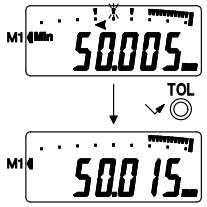


4.2.4 Measurement mode

Measure the workpiece inside diameter (minimum value). The analog bar shows a different display, depending on whether the tolerance judgment is performed or not.



・Tolerance judgment ON/OFF



a) If tolerance judgment is performed

Ex. If the upper limit (50.010 mm) and the lower limit (50.000 mm) are set to the master No. M1 (50.005 mm)

Step 1 Put this instrument into a workpiece

The digital display shows the current position of the contact point, and the analog bar displays the upper/lower limits and the current position. The midpoint of the upper/lower limits (50.005 mm) is on the center of the analog bar.

NOTE

・The analog bar weight is determined, according to the difference between the upper and the lower limits.

Step 2 Press the [START] button shortly to start measurement. The sign “Min” lights, and the analog bar for the current position blinks.

NOTE

・Press the [START] button shortly after this instrument is put into the workpiece.

Step 3 Probe the workpiece to measure the minimum value.

If a new minimum value is detected during the measurement, it is held on the digital display, and its Position on the analog bar blinks. Therefore, it is easy to confirm the state of the inside diameter (Minimum value) to the tolerance limits.

The tolerance judgment result (“◀”, ”○”, ”▶”) will be displayed.

To measure the next workpiece or the same workpiece again, press the [START] button shortly.

Step 4 If there is a possibility of an accidental change of the minimum value detected, press the [DATA/HOLD] button shortly to hold the display value. (The sign “H” is turned on.) To release the display value press again the [DATA/HOLD] button shortly.

If a data processor is connected, it works differently. Pressing the [DATA/HOLD] button shortly outputs the display value to the external device.

b) If tolerance judgment is not performed

The analog bar shows the minimum value (blinks) and current value. The analog bar weight (reading per bar) is 0.001 mm, 0.00005 in or 0.0001 in.

For the operating procedures, follow the procedures above.

NOTE

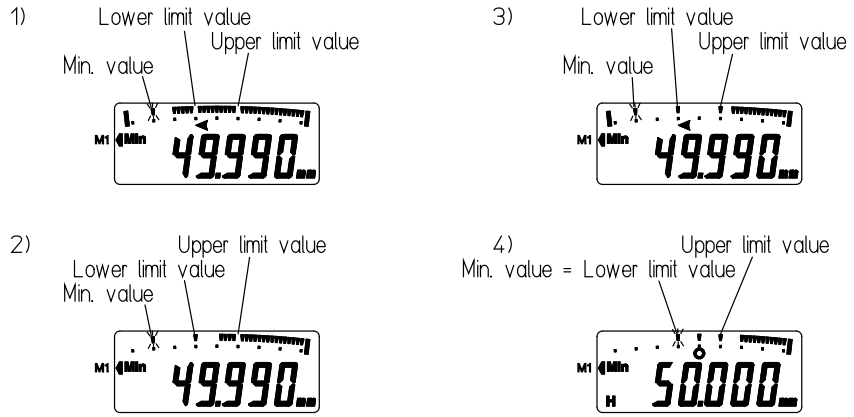
・During the measurement if the minimum value is over the analog bar range (lower over range bar light), it is automatically repositioned in the center of the analog bar. Therefore, the minimum value would be always displayed in the display range of the analog bar.

・If the [TOL.] button is pressed shortly in the tolerance judgment state, it is restored to the initial state (tolerance judgment OFF).

5. Analog bar

5.1 Analog bar display

- The analog bar shows the current position of the contact point with the bar indication. When measuring a minimum value, if the minimum value is detected, the bar for that position blinks.
- If tolerance values are set, the upper/lower limits are displayed on the analog bar. Therefore, the state of the minimum value to the upper/lower limits can be easily checked. If the upper or lower limit is the same as the current value, the bar overlapped disappears.



The example as stated above shows a measurement result, the minimum value=49.990 mm (No.4) =50.000 mm), setting the upper limit=50.010 mm, lower limit=50.000 mm.

1) If the current value (=49.995 mm) <lower limit value (=50.000 mm), the both upper and lower limits disappears.
2) If the lower limit (=50.000 mm) <current value (=50.006 mm) <upper limit value (=50.010 mm), the lower limit will light, but the upper limit disappears.
3) If the upper limit (=50.010 mm) <current value (=50.013 mm), the both upper and lower limits will light.
4) If the upper or lower limits is the same as the current value (=50.000 mm), the bar overlapped disappears.

5.2 Weight of the analog bar (reading per bar)

The weight of the analog bar means the reading per bar. The weight differs, depending on the cases whether the tolerance judgment is performed or not.

- If tolerance judgment is not performed:
  The weight of the analog bar is the resolution of the digital display.
- If the tolerance judgment is performed:
  The upper/lower limits are displayed within the range of ±10 reading form the center of the analog bar.
  The weight differs, according to the differences of the upper/lower limits.

NOTE

- The weight of the analog bar differs, according to the differences of the upper/lower limits. Therefore, if there is a great difference (big reading per bar), the movement of the analog bar is very slow.

Difference of the upper/lower limit	Weight of the analog bar	Analog bar range
Less than 0.019mm	0.001mm/bar	-0.020mm -0.010mm 0.000mm 0.010mm 0.020mm
0.020mm - 0.039mm	0.002mm/bar	-0.040mm -0.020mm 0.000mm 0.020mm 0.040mm
0.040mm - 0.059mm	0.003mm/bar	-0.060mm -0.030mm 0.000mm 0.030mm 0.060mm
Less than .00095"	.00005"/bar	-.00100" -.00050" .00000" .00050" .00100"
.00100" - .00195"	.00010"/bar	-.00200" -.00100" .00000" .00100" (.0020")
.00200" - .00295"	.00015"/bar	-.00300" -.00150" .00000" .00150" .00300"

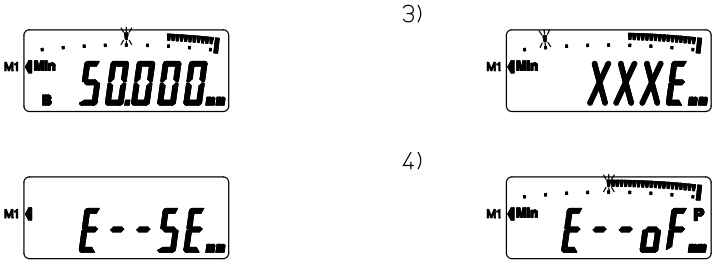
5.3 Resetting the analog bar

When not performing the tolerance judgment in the measurement mode or setting the master ring, the weight of the analog bar is equal to the resolution of the digital display. The detected minimum value might be over the analog bar range, and the position could be lost. To avoid this problem, if a minimum value is over the analog bar range, the analog bar is reset automatically, so that the minimum value is repositioned in the center.

NOTE

- When performing the tolerance judgment, the analog bar cannot be reset.

6. Error message and Corrective measures



1) Sign “B” : Voltage of the battery has dropped. Replace the batteries.
2) Tolerance setting error : Tolerance limits are set with the upper limit being smaller than the lower limit.
3) ABS data composition error : If it occurs temporarily when the spindle is moved too fast, you can continue the measurement since this does not imply measurement error.(“E” is displayed on the last digit until the data counting catches up with the spindle movement. The display will be restored, if the moving speed returns to normal.)

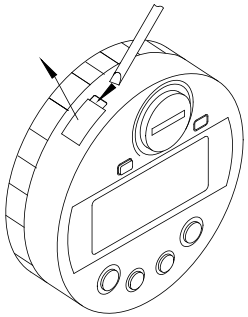
IMPORTANT

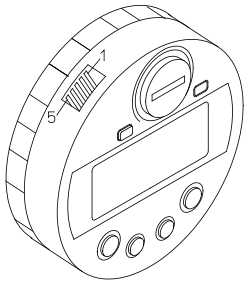
- If this error occurs while the spindle is stopped, or if the count jump occurs, it could be due to a sensor failure.

Contact a Mitutoyo sales office or representative.

4) Overflow : Preset value is improper. Check the set value and set it again.

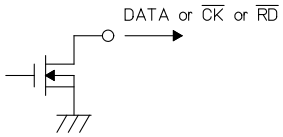
7. Data output



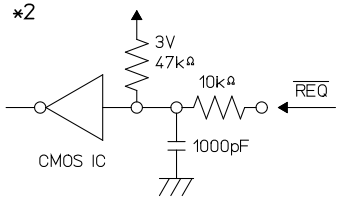


Pin No.	Signal	I/O
1	GND	——
2 *1	DATA	O
3 *1	$\overline{CK}$	O
4 *1	$\overline{RD}$	O
5 *2	$\overline{REQ}$	I

*1



*2

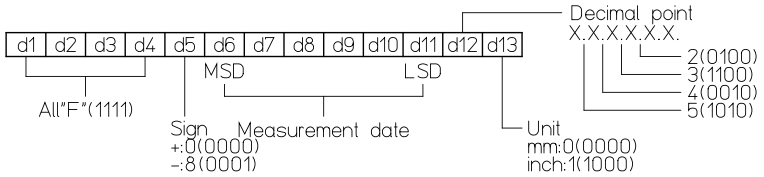


Vital SPC data is available by connecting the to a data processing equipment with an optional SPC cable. Remove the cap of the output connector using a slotted screwdriver and insert the SPC cable fully to the end. Put the removed cap in a small bag and store in safe place.

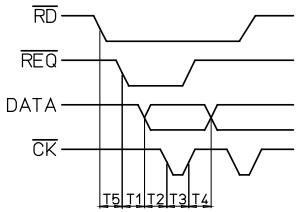
NOTE

- Read the manual of the data processor thoroughly for proper operation.
- Data output may be disabled if an output request (REQ) is received while the spindle is in motion or if REQ are made at short intervals during a continuous data output.

Data output format



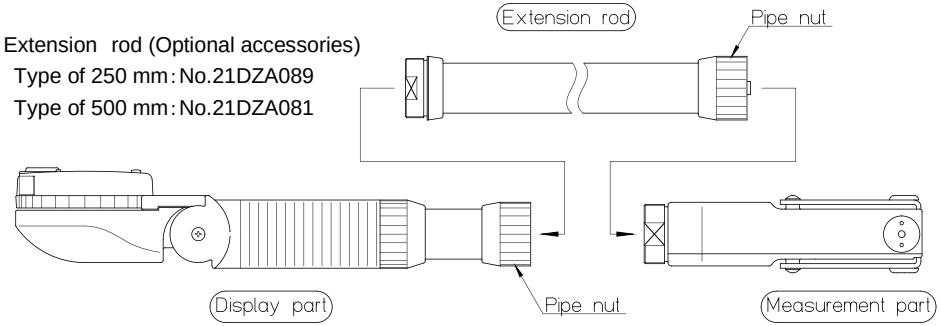
Timing chart



500μs≦ T1 ＜70 ms
200μs≦ T2 ≦280 μs
200μs≦ T3 ≦280 μs
200μs≦ T4 ≦280 μs
T5: It depends on the capacity of the data processing device connected.

8. Connection to Extension rod

Extension rod (Optional accessories)
Type of 250 mm : No.21DZA089
Type of 500 mm : No.21DZA081

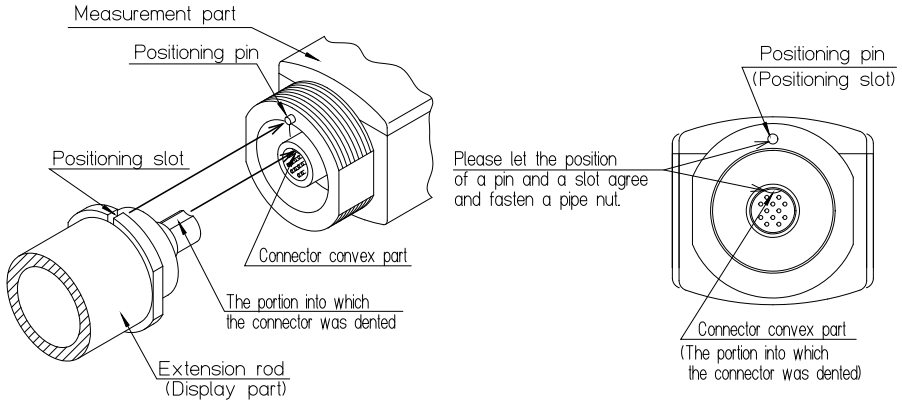


When a deep bore is to be measured, the Digimatic Bore Gage can be extended by the use of the Ex.-rod.
Set the Ex.-rod in the following steps.

(1) Press the [ON/OFF] button shortly to turn the power off.
(2) The pipe nut of a main part is loosened, and it separates into a display part and a measurement part.
(3) Insert the convex of an Extension rod in the connector (the shape of a concave) of a measurement part. and fasten a pipe nut.
(4) Insert the convex from of a display part in the connector (the shape of a concave) of an Extension rod, and fasten a pipe nut.
(5) Press the [ON/OFF] button to turn the power on.
(6) Press the [RESET] button. The digital display [- - - - -] appears, and the signs “P” blinks.
(7) Press the [PRESET] button shortly, then the display will change to “0.000 mm” in the initial state. Move to the master setting.

IMPORTANT

- Make sure positioning pin if when it connection. Don't connect it too hard.
- When connection finished, don't forget to press the [PRESET] button, and move to the master setting, or display latch the data, run away.
- Display part and measurement part are possible to divide for connection to Extension rod, be sure to combine same serial number, or it is not guaranteed.
- Connection of up to 2 m maximum extension rod, consolidation will be up to 4 pcs.



9. Specifications

9.1 Specifications of the main unit

	Metric model	Inch/Metric model
Effective stroke of contact point	1.2 mm	0.048 in / 1.2 mm
Resolution	0.001 mm	0.00005 in / 0.001 mm
Wide-range accuracy *1	0.003 mm or less	0.00012 in (=0.003 mm) or less
Adjacent error	0.002 mm or less	0.00008 in (=0.002 mm) or less
Repeatability	0.002 mm or less	0.00008 in (=0.002 mm) or less
Quantizing error	±1 count	
Battery	Silver oxide cell (SR44) 2 pcs. (standard accessory)	
Battery life	Approx. 9 months under normal use (contact point Pause:Move=4:1)	
Detection method	Capacitance type Absolute linear encoder	
Sampling frequency *2	50 times/s	
Dust/Water protection level *3	IP-53	
Display	・7 segments 6 digits decimal numeric with minus sign, in/mm ・Tolerance judge indication ・Analog bar	
Operation keys	・ON/OFF(common with in/mm) ・DATA/HOLD ・PRESET ・TOL ・M/W(master setting/ work measuring) ・START ・RESET	
Alarms	"B":Voltage down "E--oF":Over flow "E--SE":Limit setting error	
Data interface	Digimatic	
Operation temperature	0 ℃ to 40 ℃	
Storage temperature	-10 ℃ to 60 ℃	

*1: A quantizing error is excluded.
*2: If the contact point detecting speed is over 50 μm/s, the peak value may not be displayed correctly.
*3: Protection level (IP: International Protection) according to IEC 60529/ JIS C0920.
The level indicated is valid only if the output connector cap is installed.

9.2 Standard accessories

1)	Anvil	No.511-501,No.511-521:12 pcs. No.511-502,No.511-522:13 pcs.
2)	Washers	4 pcs.
3)	Spanner	1 pc.
4)	Silver oxide cell (SR44)	2 pcs. (For monitor)

9.3 Optional accessories

No.21DZA089	Extension rod (250 mm / 10 in)
No.21DZA081	Extension rod (500 mm / 20 in)
No.905338	SPC cable (1 m)
No.905409	SPC cable (2 m)

Mitutoyo Corporation

20-1, Sakado 1-Chome, Takatsu-ku, Kawasaki-shi, Kanagawa 213-8533, Japan
Tel: +81 (0)44 813-8230 Fax: +81 (0)44 813-8231
Home page: https://www.mitutoyo.co.jp/global.html

For the EU Directive, Authorized representative and importer in the EU:
Mitutoyo Europe GmbH
Borsigstrasse 8-10, 41469 Neuss, Germany

For the UK Regulation, Authorized representative and importer in the UK:
Mitutoyo (UK) Ltd.
Joule Road, West Point Business Park, Andover, Hampshire SP10 3UX,
UNITED KINGDOM

English

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)
This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. To reduce the environmental impact of WEEE (Waste Electrical and Electronic Equipment) and minimize the volume of WEEE entering landfills, please reuse and recycle.
For further information, please contact your local dealer or distributors.

Disposal of waste batteries and accumulators (as applied in the European Union and other European countries with separate collection systems)
Batteries and accumulators containing heavy metals such as mercury, lead and cadmium may contaminate the environment if improperly discarded. When incinerated, certain chemicals are released into the air or concentrated in the ash residue from the combustion process; this may lead to a health risk to humans, animals and the environment in general.
In compliance with legal requirements, the symbol of a 'crossed-out wheeled bin' is either applied on the battery or on its packaging. This symbol indicates that disposal of the batteries in household waste is strictly prohibited;instead the batteries have to be disposed of by separate collection and recycling means. Additional marking identifies the heavy metal content (i.e. Cd =cadmium, Hg = mercury, Pb = lead) as contained within the battery if over prescribed levels.
End users are obliged by law to comply with the discarding procedure for waste batteries. At Mitutoyo facilities, or at its appointed distributors, receptacles will be provided to accept, at no charge, the disposal of previously supplied batteries.

Electromagnetic compatibility
This product complies with the EMC Directive below. Note that in environments where electromagnetic interference exceeds EMC requirements defined in this directive, appropriate countermeasures are required to assure the product performance.
• A display value on this product may flicker or disappear temporarily due to electromagnetic interference caused by electrostatic discharge. However, this product will return to normal after removing the interference.

CE marking / UKCA marking
EMC Directive / Electromagnetic Compatibility Regulation: EN IEC 61326-1
Immunity test requirement: Clause 6.2 Table 2
Emission limit: Class B
RoHS Directive / Regulation Restricting Use of Specified Hazardous Substances in Electric / Electronic Devices: EN IEC 63000

Français

Mise au rebut des anciens appareils électriques et électroniques (Valable dans l'Union européenne et les autres pays européens pourvus de systèmes de collecte séparés)
Ce symbole sur le produit ou sur son emballage indique que ce produit ne doit pas être traité comme une ordure ménagère. Veuillez réutiliser et recycler les produits pour réduire l'incidence sur l'environnement des WEEE (appareils électriques et électroniques à mettre au rebut) et pour minimaliser la quantité de WEEE qui va à la décharge.
Pour de plus amples informations, veuillez contacter votre revendeur ou vos distributeurs locaux.

Mise au rebut des piles et accumulateurs usagés (Valable dans l'Union européenne et les autres pays européens pourvus de systèmes de collecte séparés)
Les piles et accumulateurs contenant des métaux lourds comme le mercure, le plomb et le cadmium peuvent contaminer l'environnement s'ils sont jetés de manière incorrecte. Lorsqu'ils sont incinérés, certains produits chimiques sont rejetés dans l'air ou concentrés dans les résidus de cendre par le processus de combustion, cela peut conduire à des risques pour la santé des être humains et des animaux.
Dans le respect des exigences légales, le symbole d'une 'poubelle barrée' est soit présente sur la pile soit sur son emballage. Ce symbole indique que la mise au rebut des piles dans les ordures ménagères est interdite et qu'elles doivent être mises au rebut séparément et recyclées. Des repères supplémentaires identifient la capacité de la pile, et si cela dépasse les niveaux prescrits, la teneur en métaux lourds. (p.ex. Cd=cadmium, Hg=mercure, Pb=plomb).
Les utilisateurs finaux sont obligés de respecter la loi pour la mise au rebut des piles usagées. Dans les usines Mitutoyo ou chez ses distributeurs agréés, un collecteur sera fournit pour y mettre gratuitement au rebut les piles fournies précédemment.

Compatibilité électromagnétique
Ce produit est conforme à la norme EMC ci-dessous. Remarquez que dans un environnement ou les interférences électromagnétiques excèdent les paramètres définis dans cette norme, des contre-mesures sont requises pour assurer le bon fonctionnement du produit.
• Une valeur affichée sur ce produit pourrait mal s'afficher ou disparaître temporairement à cause d'interférences electro-magnétiques. Cependant, le produit se rétablira dès la fin des interférences.

Label CE
Directive EMC: EN IEC 61326-1
Test d'immunité requis: Clause 6.2 Table 2
Limite d'émission: Classe B
Directive RoHS: EN IEC 63000

Deutsch

Entsorgen alter elektrischer & elektronischer Geräte (Gültig in der Europäischen Union und in anderen europäischen Ländern mit separaten Sammelsystemen)
Dieses Symbol auf dem Produkt oder auf seiner Verpackung weist darauf hin, dass dieses Produkt nicht als Hausmüll behandelt werden soll. Zur Reduzierung der Umgebungseinflüsse durch WEEE (zu entsorgende elektrische und elektronische Geräte) und zum Minimieren der WEEE-Menge, die auf Deponien kommt, bitte wieder verwenden und recyceln.
Weitere Informationen erhalten Sie bei Ihrem Händler oder Ihren Vertriebshändlern vor Ort.

Entsorgung von (leeren) Batterien und Akkumulatoren (in der Europäischen Union und anderen europäischen Ländern mit Abfalltrennsystemen)
Batterien und Akkumulatoren, die Schwermetalle wie z.B. Quecksilber, Blei und Kadmium enthalten, können die Umwelt verschmutzen, wenn sie nicht vorschriftsgemäß entsorgt werden. Bei Veraschung entweichen bestimmte Chemikalien in die Luft oder konzentrieren sich in Aschenresten aus dem Verbrennungsprozess - dies kann Gesundheitsrisiken für Menschen, Tiere und Pflanzen zur Folge haben.
Gemäß den gesetzlichen Bestimmungen befindet sich das Symbol eines 'durchgestrichenen Behälters mit Rädern' entweder auf der Batterie oder auf ihrer Verpackung. Dieses Symbol weist darauf hin, dass es strengstens verboten ist, Batterien im Hausmüll zu entsorgen und dass sie separat entsorgt und recycelt werden müssen. Eine zusätzliche Markierung gibt den Schwermetallgehalt (d.h. Cd =Cadmium, Hg = Quecksilber, Pb = Blei) der Batterie an, wenn sie die vorgeschriebenen Grenzwerte überschreitet.
Endbenutzer sind dazu verpflichtet, die gesetzlichen Bestimmungen für die Entsorgung von (leeren) Batterien einzuhalten. Bei Mitutoyo-Einrichtungen oder bei Mitutoyo-Vertragshändlern wird ein Behälter aufgestellt, um die zuvor zur Verfügung gestellten Batterien kostenlos zu entsorgen.

Elektromagnetische Verträglichkeit
Dieses Produkt entspricht der unten aufgeführten EMV-Richtlinie. Beachten Sie, dass in Umgebungen, in denen elektromagnetische Störungen die EMV-Anforderungen im Sinne dieser Richtlinie übersteigen, entsprechende Gegenmaßnahmen erfordern, um die Produktleistung zu gewährleisten.
• Die Anzeige im Display von diesem Produkt kann flackern oder wird zeitweise nicht dargestellt aufgrund von elektromagnetischen Störungen durch elektrostatische Entladung. Wird die Störgröße entfernt, ist die Anzeige wieder normal.

CE-Kennzeichnung
EMV-Richtlinie: EN IEC 61326-1
Störfestigkeit Testanforderung: Ziffer 6.2 der Tabelle 2
Emissionsgrenzwerte: Klasse B
RoHS-Richtlinie: EN IEC 63000

Italiano

Smaltimento di vecchie apparecchiature elettriche ed elettroniche (Applicabile nell'unione europea e negli altri paesi europei con sistemi di raccolta differenziata)
L'applicazione di questo simbolo sui prodotti o sui loro imballaggi indica che questo prodotto non deve essere trattato come un rifiuto domestico. Per ridurre l'impatto ambientale delle apparecchiature elettriche ed elettroniche di rifiuto (WEEE (Waste Electrical and Electronic Equipment)) e per minimizzare il volume dei WEEE che entra nelle discariche, si prega di procedere al riutilizzo e al riciclaggio.
Per ulteriori informazioni, porsi in contatto con il proprio rivenditore locale o con i distributori.

Smaltimento delle batterie e degli accumulatori scarichi (valido per l'Unione Europea e altri paesi europei con sistemi di raccolta separati)
Le batterie e gli accumulatori, contenenti metalli pesanti quali mercurio, piombo e cadmio, possono contaminare l'ambiente se non sono smaltiti in modo appropriato. Se inceneriti, determinate sostanze chimiche sono liberate nell'aria o sono concentrate nelle ceneri residue che derivano dal processo di combustione. Questo porta a pericoli per la salute delle persone e degli animali.
In accordo con le normative legali, il simbolo che rappresenta un "bidone con ruote cancellato" è applicato sulla batteria o sul suo imballaggio. Questo simbolo indica che è severamente proibito smaltire le batterie con i rifiuti domestici; esse infatti devono essere eliminate mediante un processo di raccolta separato e riciclate. Un contrassegno aggiuntivo specifica, se supera i livelli prescritti, il tipo di metallo pesante che contiene (Cd = Cadmio, Hg= mercurio, Pb = piombo).
Gli utenti finali sono obbligati per legge a procedere allo smaltimento delle batterie scariche in maniera conforme. Nelle sedi Mitutoyo o presso i distributori autorizzati è presente un contenitore di raccolta, gratuito, per lo smaltimento delle batterie precedentemente fornite.

Compatibilità Elettromagnetica
Questo prodotto è conforme alla direttiva della Comunità Europea riguardante la compatibilità elettromagnetica (EMC) secondo la norma sotto indicata. Si faccia attenzione che in ambienti ove le interferenze elettromagnetiche sono al di là di quanto previsto da questa direttiva comunitaria, è necessario adottare opportune precauzioni per garantire le prestazioni del prodotto.
• Il valore visualizzato su questo prodotto potrebbe lampeggiare o scomparire temporaneamente a causa di interferenze elettromagnetiche causate da scariche elettrostatiche. Tuttavia, il prodotto tornerà a funzionare normalmente dopo la rimozione delle interferenze.

Marchio CE
Direttiva EMC: EN IEC 61326-1
Requisiti test di immunità: Clausola 6.2 Tabella 2
Limiti di emissione: Classe B
Direttiva RoHS: EN IEC 63000

Español

Desecho de equipos eléctricos y electrónicos viejos (Aplicable para la Unión Europea y otros países europeos con sistemas de almacenaje por separado)
El símbolo en el producto o en su embalaje indica que este producto no debe tratarse como un desecho común. Para reducir el impacto ambiental de los residuos de equipos electrónicos y eléctricos (WEEE) y minimizar el volumen de residuos de equipos eléctricos y electrónicos en vertederos, vuelva a utilizar y recicle.
Para más información, contacte con su distribuidor local.

Desecho de baterías residuales y acumuladores (aplicable a la Unión Europea y otros países europeos con sistemas de almacenamiento por separado)
Las baterías y acumuladores que contienen metales pesados, como mercurio, plomo y cadmio, podrían contaminar el medioambiente si no se desechan de forma correcta. Al incinerarlos, ciertas sustancias químicas se liberan o se concentran en las cenizas resultantes del proceso de combustión, lo que conllleva riesgos para la salud de personas y animales.
En cumplimiento con las normas legales, cada batería o en el embarque lleva impreso el símbolo de "un bote de basura tachado". Este símbolo indica que desechar baterías como si se tratasen de desechos comunes queda estrictamente prohibido y dichos residuos deberían eliminarse mediante un proceso de separación y de reciclaje. Una marca adicional especifica si prescriben niveles superiores, el tipo de metal pesado que contienen (Cd = Cadmio, Hg= mercurio, Pb = plomo).
Los usuarios finales están obligados por ley a cumplir correctamente con la separación de baterías residuales. En las instalaciones de Mitutoyo o con determinados distribuidores, se suministrará un recipiente, sin cargo alguno, para el desecho de baterías suministradas.

Compatibilidad electromagnética
Este producto cumple con la Directiva EMC indicada abajo. Tenga en cuenta que en entornos donde la interferencia electromagnética excede los requisitos de EMC definidas en la presente Directiva, se requieren medidas adecuadas para asegurar el rendimiento del producto.
• El valor visualizado en este producto podría parpadear o desaparecer temporalmente caso de producirse interferencias electromagnéticas causadas por posibles descargas electrostáticas. Sin embargo, el producto se restablecerá al desaparecer la interferencia producida.

Marca CE
Directiva EMC: EN IEC 61326-1
Requisito de la prueba de inmunidad: Cláusula6.2 Tabla 2
Límite de emisión: Clase B
Directiva RoHS: EN IEC 63000

Nederlands

Weggooien van oude elektrische & elektronische apparaten (van toepassing in alle landen van de Europese Unie en overige Europese landen waar afval gescheiden wordt)
Dit symbool op het product of op de verpakking geeft aan dat deze producten niet als huisvuil worden weggegooid. Om vervuiling van het milieu met elektronische apparaten (WEEE, Waste Electrical and Electronic Equipment) en de hoeveelheid daarvan te verminderen, moet u ze niet weggooien maar inleveren bij de daarvoor bestemde instantie. Indien bij dit product batterijen zijn geleverd, dienen deze als KCA te worden ingeleverd.
Voor overige informatie kunt u kontact opnemen met uw lokale gemeentelijke instantie.

Afvoer van verbruikte batterijen en accu's (zoals van toepassing in de Europese Unie en andere Europese landen met gescheiden ophaalsystemen)
Batterijen en accu's die zware metalen zoals kwik, lood en cadmium bevatten kunnen het milieu verontreinigen wanneer deze niet op correcte wijze worden afgevoerd. Bij het verbranden komen bepaalde chemicaliën vrij in de lucht of geconcentreerd in de asresten van het verbrandingsproces; dit kan leiden tot gezondheidsrisico's voor zowel mens als dier.
Om aan de wettelijke voorschriften te voldoen wordt op de batterij of de verpakking een symbool aangebracht van een "doorgestreepte vuilnisemmer". Dit symbool geeft aan dat de afvoer van batterijen via het huishoudelijk afval streng verboden is en dat deze gescheiden dienen te worden afgevoerd en gerecycled. Aanvullende markeringen geven indien deze boven het voorgeschreven niveau ligt, de soorten zware metalen (b.v. cd = cadmium, Hg = kwik, Pb = lood) die de batterij bevat.
Eindgebruikers zijn wettelijk verplicht de afvoer van verbruikte batterijen na te leven. Bij Mitutoyo-faciliteiten of aangewezen dealers is een verzamelcontainer aanwezig waar kosteloos eerder verstrekte batterijen kunnen worden ingeleverd.

Electromagnetische compatibiliteit
Dit produkt voldoet aan onderstaande EMC Richtlijn. Echter als dit produkt wordt blootgesteld aan elektromagnetische interferentie, die de eisen van deze EMC Richtlijn overschrijdt, de nauwkeurigheid en werking van dit produkt niet kan worden gegarandeerd zolang de storingsbron niet wordt weggenomen.
• De waarde op het beeldscherm kan flikkeren of tijdelijk verdwijnen, vanwege elektromagnetische interferentie. Echter het produkt zal normaal functioneren als de storingsbron is weggenomen.

CE-keurmerk
EMC Richtlijn: EN IEC 61326-1
Immuniteitsproef eisen: Clausule 6.2, Tabel 2
Emissie limiet: Klasse B
RoHS Richtlijn: EN IEC 63000

Svenska

Omhändertagning av uttjänt elektrisk & elektronisk utrustning (gäller för Europeiska unionen och övriga europeiska länder med källsortering av avfall)
Denna symbol på produkten eller dess förpackning indikerar att produkten inte ska behandlas som hushållsavfall. för att minska inverkan på miljön genom WEEE (avfall från elektrisk och elektronisk utrustning) och minimera mängden av WEEE som hamnar i omgivningen, var vänlig återanvänd och återvinn.
För närmare information, var god kontakta din lokala återförsäljare eller distributör.

Destruktion av uttjänta batterier och ackumulatorer (enligt praxis inom Europeiska unionen och andra europeiska länder med avfallsseparering)
Batterier och ackumulatorer som innehåller tungmetaller som t.ex. kvicksilver, bly och kadmium kan föroreana miljön om de inte tas omhand på korrekt sätt. Om de förbränns frisätts vissa kemikalier i luften eller finns koncentrerade i askan efter förbränningen; detta kan leda till hälsorisker för både människor och djur.
I enlighet med gällande lagstiftning, finns symbolen med en 'överkorsad soptunna' tryckt antingen på batteriet eller dess förpackning. Denna symbol indikerar att det är strängt förbjudet att kasta batterier i hushållsavfallet och att de ska tas omhand genom separat uppsamling och återvinnas. Ytterligare markeringar beskriver batteriets kapacitet, och halten av tungmetaller som finns i batteriet, om dessa överskrider en viss mängd (dvs. Cd =kadmium, Hg = kvicksilver, Pb = bly).
Konsumenten är enligt lag förpliktad att följa föreskrifterna om avfallshantering av batterier. Tidigare levererade batterier kan lämnas in utan kostnad vid alla Mitutoyo´s kontor, och hos företagets auktoriserade distributörer i därför avsedda behållare.

Elektromagnetisk kompatibilitet
Denna produkt uppfyller direktiv EMC nedan. Observera att i omgivningar där elektromagnetiska störningar överskrider EMC kraven so är definierade i direktivet, är det nödvändigt att vidta lämpliga åtgärder för att säkerställa produktens prestanda.
• Displayvärdet på denna produkt kan flimra eller försvinna tillfälligt på grund av elektromagnetiska störningar som orsakas av elektrostatiska urladdningar. Emellertid kommer produkten att återgå till det normala efter avlägsnande av störningar.

CE-märkning
EMC direktivet: EN IEC 61326-1
Immunitetstest krav: Klausul 6.2 tabell 2
Emissionsgräns: Klass B
RoHS direktivet: EN IEC 63000

China RoHS Compliance Information

This Product meets China RoHS requirement. See the table below.

电器电子产品有害物质限制使用管理办法

产品名称：数显内径表

产品中有害物质的名称及含量

部件名称	有害物质									
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚	邻苯二甲酸二正丁酯	邻苯二甲酸二异丁酯	邻苯二甲酸丁基苄酯	邻苯二甲酸二(2-乙基已)酯
	(Pb)	(Hg)	(Cd)	(Cr (VI))	(PBB)	(PBDE)	(DBP)	(DIBP)	(BBP)	(DEHP)
本体	×	○	○	○	○	○	○	○	○	○
配件	○	○	○	○	○	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

环保使用期限标识是根据《电器电子产品有害物质限制使用管理办法》以及 《电器电子产品有害物质限制使用标识要求(SJ/T11364—2024)》制定的，适用于中国境内销售的电子电气产品的标识。
电器电子产品只要按照安全及使用说明内容在正常使用情况下，从生产日期算起，在此期限内产品中含有的有毒有害物质不致发生外泄或突变，不致对环境造成严重污染或对其人身、财产造成严重损害。
产品使用后，要废弃在环保使用年限内或者刚到年限的产品，
请根据国家标准采取适当的方法进行处置。
另外，此期限不同于质量/功能的保证期限。