

# Bore Gage



## 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.

### NOTICE

- Do not modify or disassemble this product except for described in this document. It may cause damage.
- Do not use or store the product in a place with sudden temperature changes. Sudden temperature changes may cause errors or deterioration. Condensation caused by temperature changes may cause rusting.
- Use in a location with minimal dust, oil, and oil mist, away from direct sunlight. This may cause damage.
- Do not store the product in a place with high humidity or a lot of dust. This may cause rusting or damage.
- Do not apply impact or excessive force to this product. This may cause damage.
- Avoid sudden operation of the contact point or usage outside the specified measuring range. This may cause damage.

### Tips

- The bore gage is a comparator. It requires an indicator such as a dial indicator and a reference gage such as a setting ring or micrometer. It will not function as a measuring instrument if used alone.
- To obtain correct measurement results, remove any dust, cutting chips, etc. and adapt the product to room temperature prior to measuring, and be sure to set the reference point.
- After use, clean and perform anti-rust treatment for the body, contact point, etc. Insufficient cleaning may cause accuracy or operation to suffer.
- For periodic calibration or precision measurement, wear thick gloves in order to reduce changes in the indicated value caused by the transmission of body temperature.
- Indicators with rubber bellows such as waterproof dial indicators cannot be used.
- If the product is accidentally dropped, check its accuracy and operation. If problems persist, contact your nearest dealer or our sales office for repair.

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CG-MX



CG-A

## Model/Code No. List

### CG-MX

#### ● Metric

Model Name	No. of contact points	No. of measuring pins	No. of setting rings	No. of indicators	No. of dial protection covers	Code No.
CG-1.55MX1	5	1	0	0	0	526-170-10
CG-3.95MX1	9	2	0	0	0	526-160-10
CG-7.30MX1	7	1	0	0	0	526-150-10
CG-1.55MX1/2046AB	5	1	0	1	1	526-173-20
CG-1.55MX1/2109AB-10	5	1	0	1	1	526-172-20
CG-3.95MX1/2046AB	9	2	0	1	1	526-163-20
CG-3.95MX1/2109AB-10	9	2	0	1	1	526-162-20
CG-7.30MX1/2046AB	7	1	0	1	1	526-153-20
CG-7.30MX1/2109AB-10	7	1	0	1	1	526-152-20
CG-1.55MX2	5	1	5	0	0	526-170-11
CG-3.95MX2	9	2	9	0	0	526-160-11
CG-7.30MX2	7	1	7	0	0	526-150-11
CG-1.55MX2/2046AB	5	1	5	1	1	526-173-21
CG-1.55MX2/2109AB-10	5	1	5	1	1	526-172-21
CG-3.95MX2/2046AB	9	2	9	1	1	526-163-21
CG-3.95MX2/2109AB-10	9	2	9	1	1	526-162-21
CG-7.30MX2/2046AB	7	1	7	1	1	526-153-21
CG-7.30MX2/2109AB-10	7	1	7	1	1	526-152-21

#### ● Inch

CG-0.06"MX1	5	1	0	0	0	526-175-10
CG-0.15"MX1	9	2	0	0	0	526-165-10
CG-0.28"MX1	7	1	0	0	0	526-155-10
CG-0.06"MX1/2923AB-10	5	1	0	1	1	526-176-20
CG-0.15"MX1/2923AB-10	9	2	0	1	1	526-166-20
CG-0.28"MX1/2923AB-10	7	1	0	1	1	526-156-20
CG-0.06"MX2	5	1	5	0	0	526-175-11
CG-0.15"MX2	9	2	9	0	0	526-165-11
CG-0.28"MX2	7	1	7	0	0	526-155-11
CG-0.06"MX2/2923AB-10	5	1	5	1	1	526-176-21
CG-0.15"MX2/2923AB-10	9	2	9	1	1	526-166-21
CG-0.28"MX2/2923AB-10	7	1	7	1	1	526-156-21

### CG-A

#### ● Metric

Model Name	No. of contact points	No. of setting rings	No. of indicators	No. of dial protection covers	Code No.
CG-10A	6	0	0	0	526-101
CG-18A	8	0	0	0	526-102
CG-10A/2046AB	6	0	1	1	526-126-20
CG-10A/2109AB-10	6	0	1	1	526-124-20
CG-18A/2046AB	8	0	1	1	526-127-20
CG-18A/2109AB-10	8	0	1	1	526-125-20

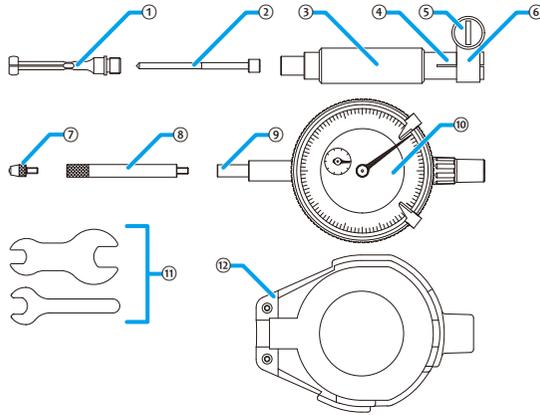
#### ● Inch

CG-.4"A	6	0	0	0	526-103
CG-.7"A	8	0	0	0	526-104
CG-.4"A/2923AB-10	6	0	1	1	526-122-20
CG-.4"A/2922AB	6	0	1	1	526-119-20
CG-.7"A/2923AB-10	8	0	1	1	526-123-20
CG-.7"A/2922AB	8	0	1	1	526-120-20

## 1. Names of Components

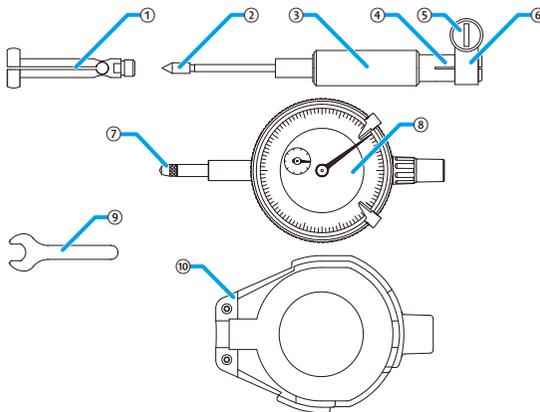
Refer to the User's Manual for the indicator for information on indicator part names, accessories, and handling.

### ■ CG-MX



- ① Contact point
- ② Measuring pin
- ③ Grip
- ④ Indicator holder
- ⑤ Clamp screw
- ⑥ Clamp holder
- \*Optional depending on the model.
- ⑦ Indicator\* contact point
- ⑧ Extension rod
- ⑨ Indicator spindle\*
- ⑩ Indicator\*
- ⑪ Wrench (one or the other)
- ⑫ Dial protection cover\*

### ■ CG-A

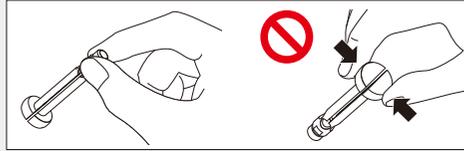


- ① Contact point
- ② Measuring pin
- ③ Grip
- ④ Indicator holder
- ⑤ Clamp screw
- ⑥ Clamp holder
- \*Optional depending on the model.
- ⑦ Indicator\* contact point
- ⑧ Indicator\*
- ⑨ Wrench
- ⑩ Dial protection cover\*

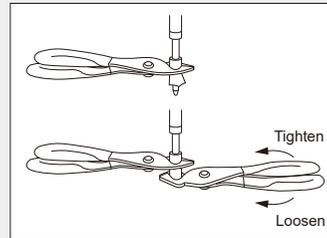
## 2. Mounting the Contact Point and Indicator

### NOTICE

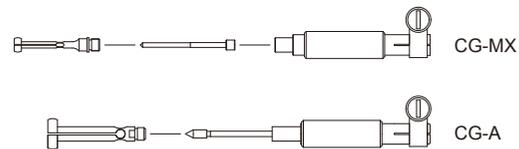
- Use a wrench to mount or remove the contact point. Tightening a contact point by hand may lead to damage.
- Hold the screw side when handling the contact point. If holding the opening/closing side, or opening and closing by hand, the contact point may be deformed. If the contact point is deformed, the appropriate measuring range may become unattainable.



- Do not rotate the CG-A measuring pin. This may cause damage.
- If using indicator 543-310B or 543-312B (ABS Digimatic Indicator dedicated for bore gages), when mounting or removing the contact point, cover the spindle with a rag and fix it in place with a pair of pliers, and then use another pair of pliers to rotate the contact point in order to prevent damage.

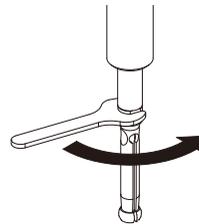


- 1 Select a contact point and measuring pin (CG-MX only) that match the dimensions being measured. Refer to "6. Specifications" for details on the measuring range of each contact point.
- 2 For CG-MX, insert the measuring pin into the contact point, and then screw the contact point into the bore gage body. For CG-A, screw the contact point into the bore gage body.

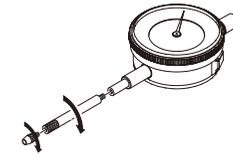


### Tips

Be sure to use the supplied wrench to ensure proper mounting.



- 3 For CG-MX, mount an extension rod between the indicator body and the contact point on the indicator.

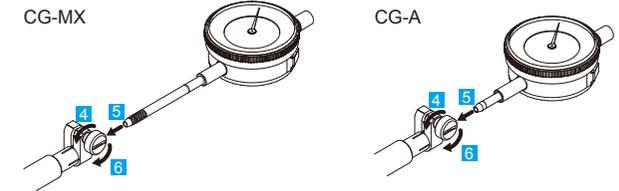


- 4 Loosen the clamp screw.
- 5 Slowly insert the indicator into the dial holder until it can be fixed in place.

### Tips

- Insert gradually while watching the pointer movement on the indicator.
- Especially for an indicator with a narrow measuring range, adjust the insertion of the indicator so that the workpiece dimensions to be measured fit within the measuring range of the indicator.

- 6 Tighten the clamp screw to fix the indicator.



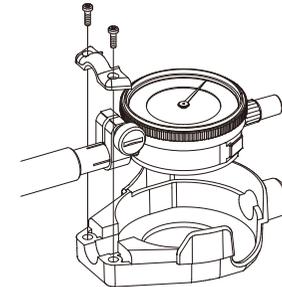
### NOTICE

Do not forcibly insert, remove, or turn the indicator with the clamp screw tightened, as it will lead to breakage.

### Tips

- If the insertion hole of the indicator holder is accidentally deformed, restore it by inserting a  $\varnothing 8$  mm rod for the metric type and a  $\varnothing 9.53$  mm rod for the inch type.
- Secure fixation may be impossible when the indicator, the indicator holder insertion hole interior or the clamp screw is dirty. Clean them in advance.
- Firm tightening is possible by turning with an object such as a coin inserted in the groove on the clamp screw. Be careful to avoid overtightening.

- 7 When required, attach a dial protection cover (optional).

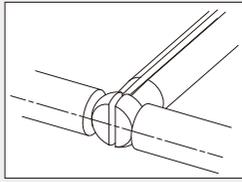


### 3. Reference Point Setting

Use a reference gage (such as a setting ring or cylindrical master gage) or a micrometer to set the reference point.



When setting the reference point with the bore gage horizontal, do not execute with the gap in the contact point facing vertically. The center of the measuring pin will deviate downward from the central axis of the contact point and may cause an error.



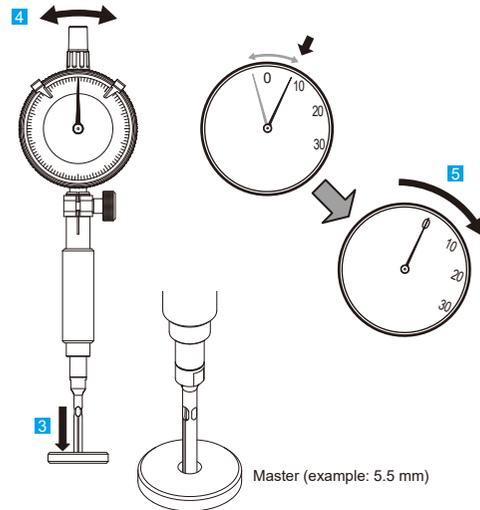
Be sure to perform reference point setting before measurement. Even during continuous measurement, set the reference point as often as possible.

#### Tips

If using indicator 543-310B or 543-312B (ABS Digimatic Indicator dedicated for bore gages), refer to the User's Manual included with the indicator for information on reference point setting.

#### 1) Reference point setting with a setting ring or cylindrical master gage

- 1 Confirm that the screw is not loosened.
- 2 Clean the reference gage.
- 3 While holding the grip, insert the bore gage into the reference gage (setting ring or cylindrical master gage).
- 4 Oscillate the bore gage forward/backward or left/right.
- 5 Set the position where the indicator shows the maximum value (where the contact point is the closest) as zero or the preset value.



### 2) Reference point setting with micrometer

#### Tips

Reference point setting with a micrometer requires expertise, since centripetal effects cannot be utilized.

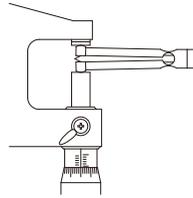
#### ■ When not using a gauge block

- 1 Fix the micrometer vertically as in the illustration below.
- 2 Align the opening of the measuring surfaces to the reference dimension (for example, 5.5 mm).

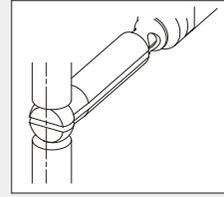
#### Tips

Do not clamp the micrometer.

- 3 While holding the grip, insert the bore gage between the measuring surfaces of the micrometer and then oscillate the bore gage forward/backward or left/right.
- 4 Set the position where the indicator shows the maximum value (where the contact point is the closest) as zero or the preset value.

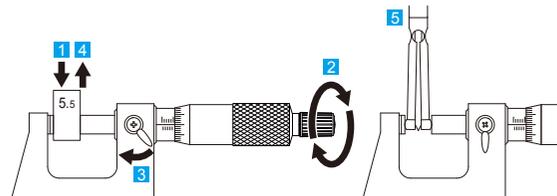


Make sure the gap in the contact point is facing to the side.



#### ■ When using a gauge block

- 1 Insert a gauge block corresponding to the reference dimension (for example, 5.5 mm) between the measuring faces of the micrometer.
- 2 Apply measuring force by rotating the ratchet stop roughly three to five times by hand.
- 3 Clamp the micrometer.
- 4 Remove the gauge block.
- 5 While holding the grip, insert the bore gage between the measuring surfaces of the micrometer and then oscillate the bore gage forward/backward or left/right.
- 6 Set the position where the indicator shows the maximum value (where the contact point is the closest) as zero or the preset value.



Refer to the User's Manual included with the micrometer for details.

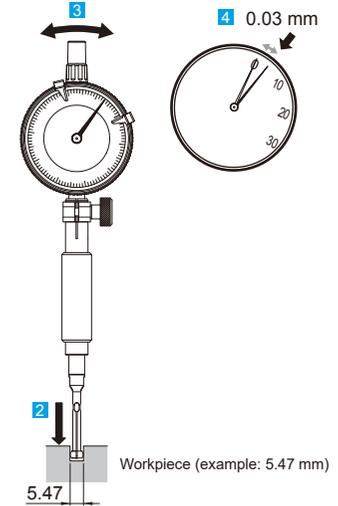
### 4. Measurement Method

Measurement becomes possible once the contact point and indicator have been mounted and reference point setting is complete.

#### Tips

Temperature changes may cause the reference point to deviate. Check the reference point as frequently as possible.

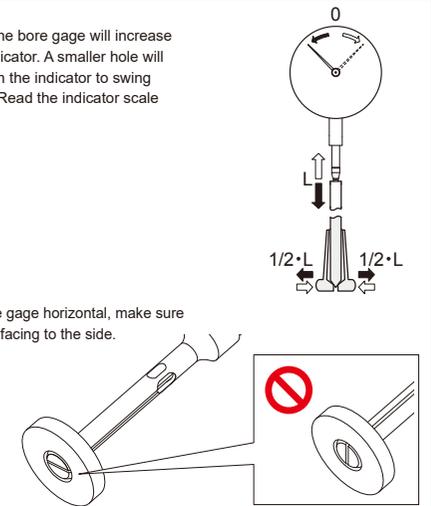
- 1 Clean the workpiece.
- 2 While holding the grip, insert the bore gage into the workpiece.
- 3 Oscillate the bore gage forward/backward or left/right.
- 4 Read the value at the position where the indicator shows the maximum value (where the contact point is the closest).  
 >> The difference between the read value and the dimension of the reference gage will be the measured value.



#### Tips

Closing the contact point on the bore gage will increase the value indicated on the indicator. A smaller hole will therefore cause the pointer on the indicator to swing further to the right (positive). Read the indicator scale with care.

When measuring with the bore gage horizontal, make sure the gap in the contact point is facing to the side.



## 5. Cleaning after Use

Clean the exterior with a soft, dry cloth or a cloth slightly moistened with neutral detergent or alcohol.



Do not use other organic solvents (thinner, benzene, etc.) for resin components. When the product will be out of use for a long period of time, clean and perform anti-rust treatment, and then store it in a place without condensation. When using the product again, verify the accuracy and operation of the bore gage and indicator.

### Tips

- It is recommended to periodically apply low-viscosity lubricant to the tip of the measuring pin in order to extend its service life.
- The performance of the bore gage is strongly influenced by usage and storage conditions. We recommend stipulating a maintenance cycle in-house according to usage frequency, environment, storage method, etc., and inspecting the product periodically.

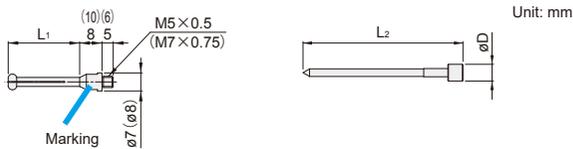
## 6. Specifications

- Operation environment: Temperature 0°C to 40°C, humidity 30% to 70% (no condensation)
- Storage environment: Temperature -10°C to 50°C, humidity 30% to 70% (no condensation)

### ■ CG-MX Contact Point and Measuring Pin List



Contact points and measuring pins are consumables. Replace them if there are any issues with accuracy, operation, or measuring range. After replacement, be sure to calibrate them using a reference gage or the like.



( ): 3.7 - 7.3 mm/0.146 - 0.287 inch range model

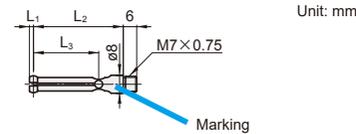
Code No.	Contact point				Measuring pin		
	Marking	Measuring range	L <sub>1</sub>	Part No.	L <sub>2</sub>	øD	Part No.
526-170-10 526-173-20 526-172-20 526-170-11 526-173-21 526-172-21 526-175-10 526-176-20 526-175-11 526-176-21	1.0 1.1 1.2 1.3 1.4	0.95 - 1.15 mm/ 0.037 - 0.045 in 1.07 - 1.25 mm/ 0.042 - 0.049 in 1.17 - 1.35 mm/ 0.046 - 0.053 in 1.27 - 1.45 mm/ 0.050 - 0.057 in 1.37 - 1.55 mm/ 0.054 - 0.061 in	11.5	10AAP247A 10AAP247B 10AAP247C 10AAP247D 10AAP247E	27.5	2.5	201435
526-160-10 526-163-20 526-162-20 526-160-11 526-163-21 526-162-21 526-165-10 526-166-20 526-165-11 526-166-21	1.75 2.00 2.25 2.50 2.75 3.00 3.25 3.50 3.75	1.50 - 1.90 mm/ 0.059 - 0.075 in 1.80 - 2.20 mm/ 0.071 - 0.087 in 2.05 - 2.45 mm/ 0.081 - 0.096 in 2.30 - 2.70 mm/ 0.091 - 0.106 in 2.55 - 2.95 mm/ 0.100 - 0.116 in 2.80 - 3.20 mm/ 0.110 - 0.126 in 3.05 - 3.45 mm/ 0.120 - 0.136 in 3.30 - 3.70 mm/ 0.130 - 0.146 in 3.55 - 3.95 mm/ 0.140 - 0.156 in	17.5 22.5	10AAP248A 10AAP248B 10AAP248C 10AAP248D 10AAP248E 10AAP248F 10AAP248G 10AAP248H 10AAP248J	33.8 39.3	3.5	201436 201437

Code No.	Contact point				Measuring pin		
	Marking	Measuring range	L <sub>1</sub>	Part No.	L <sub>2</sub>	øD	Part No.
526-150-10 526-153-20 526-152-20 526-150-11 526-153-21 526-152-21 526-155-10 526-156-20 526-155-11 526-156-21	4.0 4.5 5.0 5.5 6.0 6.5 7.0	3.7 - 4.3 mm/ 0.146 - 0.169 in 4.2 - 4.8 mm/ 0.165 - 0.189 in 4.7 - 5.3 mm/ 0.185 - 0.209 in 5.2 - 5.8 mm/ 0.205 - 0.228 in 5.7 - 6.3 mm/ 0.224 - 0.248 in 6.2 - 6.8 mm/ 0.244 - 0.268 in 6.7 - 7.3 mm/ 0.264 - 0.287 in	32	10AAP249A 10AAP249B 10AAP249C 10AAP249D 10AAP249E 10AAP249F 10AAP249G	53	5.5	201438

### ■ CG-A Contact Point List



Contact points are consumables. Replace them if there are any issues with accuracy, operation, or measuring range. After replacement, be sure to calibrate them using a reference gage or the like.



Code No.	Marking	Measuring range	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	Part No.
526-102 526-127-20 526-125-20 526-104 526-123-20 526-120-20	1 2 3 4 5 6 7 8	10 - 11 mm/ 0.40 - 0.44 in 11 - 12 mm/ 0.44 - 0.48 in 12 - 13 mm/ 0.48 - 0.52 in 13 - 14 mm/ 0.52 - 0.56 in 14 - 15 mm/ 0.56 - 0.60 in 15 - 16 mm/ 0.60 - 0.64 in 16 - 17 mm/ 0.64 - 0.68 in 17 - 18 mm/ 0.68 - 0.72 in	2.1	46	38	102454 102455 102456 102457 102458 102459 102460 102461

## 7. Off-Site Repairs (Subject to Charge)

Off-site repair (subject to charge) is required in the case of the following malfunctions. Contact your nearest dealer or our sales office.

- Poor accuracy
- Wear on CG-A measuring pin

\*If the product is repaired by a party other than Mitutoyo, its performance cannot be guaranteed.