

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 526 — for Extra Small Holes

- These gages are designed to measure the diameters of very small holes.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- An optional stand (215-120-10) is available for efficient measurement of multiple small holes. (Refer to page C-30 for details)



526-170-11

Note: The dial indicator and the protection cover are optional.

### SPECIFICATIONS

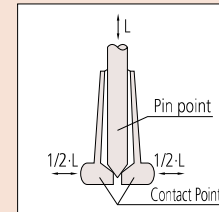
Metric							
Order No.	Range (mm)	Accuracy (μm)	Repeatability (μm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-170-10	0.95 - 1.55	4	1	526-170-10	Not supplied	Not supplied	Not supplied
526-160-10	1.50 - 3.95	4		526-160-10			
526-150-10	3.70 - 7.30	6		526-150-10			
526-172-10	0.95 - 1.55	4		526-170-10	2109SB-10 (Graduation: 0.001 mm)	21DZA000	
526-162-10	1.50 - 3.95	4		526-160-10			
526-152-10	3.70 - 7.30	6		526-150-10			
526-173-10	0.95 - 1.55	4		526-170-10			
526-163-10	1.50 - 3.95	4		526-160-10	2046SB (Graduation: 0.01 mm)	21DZA000	
526-153-10	3.70 - 7.30	6		526-150-10			
526-170-11	0.95 - 1.55	4		526-170-10	Not supplied	Not supplied	
526-160-11	1.50 - 3.95	4		526-160-10			
526-150-11	3.70 - 7.30	6		526-150-10			
526-172-11	0.95 - 1.55	4		526-170-10			
526-162-11	1.50 - 3.95	4		526-160-10	2109SB-10 (Graduation: 0.001 mm)	21DZA000	
526-152-11	3.70 - 7.30	6		526-150-10			
526-173-11	0.95 - 1.55	4		526-170-10	2046SB (Graduation: 0.01 mm)	21DZA000	
526-163-11	1.50 - 3.95	4		526-160-10			
526-153-11	3.70 - 7.30	6		526-150-10			

Inch								
Order No.	Range (in)	Accuracy (in)	Repeatability (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring	
526-175-10	0.037 - 0.061	0.00016	0.00004	526-175-10	Not supplied	Not supplied	Not supplied	
526-165-10	0.059 - 0.156	0.00016		526-165-10				
526-155-10	0.146 - 0.287	0.00024		526-155-10				
526-176-10	0.037 - 0.061	0.00016		526-175-10	2923SB-10 (Graduation: 0.0001 in)	21DZA000		
526-166-10	0.059 - 0.156	0.00016		526-165-10				
526-156-10	0.146 - 0.287	0.00024		526-155-10				
526-175-11	0.037 - 0.061	0.00016		526-175-10				
526-165-11	0.059 - 0.156	0.00016		526-165-10	Not supplied	Not supplied		Supplied
526-155-11	0.146 - 0.287	0.00024		526-155-10				
526-176-11	0.037 - 0.061	0.00016		526-175-10				
526-166-11	0.059 - 0.156	0.00016		526-165-10			2923SB-10 (Graduation: 0.0001 in)	
526-156-11	0.146 - 0.287	0.00024		526-155-10				

Note: Setting rings are not supplied with some models. Please purchase them separately if necessary. For details of setting rings, refer to page C-47.



Measurement Principle



### Setting Rings (Metric models)

Nominal size

- Order No. 526-170-11 etc.

177-220: 1.0 mm  
177-222: 1.1 mm  
177-225: 1.2 mm  
177-227: 1.3 mm  
177-230: 1.4 mm

- Order No. 526-160-11 etc.

177-236: 1.75 mm  
177-239: 2.00 mm  
177-242: 2.25 mm  
177-208: 2.50 mm  
177-246: 2.75 mm  
177-248: 3.00 mm  
177-250: 3.25 mm  
177-252: 3.50 mm  
177-255: 3.75 mm

- Order No. 526-150-11 etc.

177-204: 4.0 mm  
177-257: 4.5 mm  
177-205: 5.0 mm  
177-263: 5.5 mm  
177-267: 6.0 mm  
177-271: 6.5 mm  
177-275: 7.0 mm

### Setting Rings (Inch models)

Nominal size

- Order No. 526-175-11 etc.

177-350: 0.040 in  
177-351: 0.045 in  
177-352: 0.050 in  
177-353: 0.055 in  
177-354: 0.060 in

- Order No. 526-165-11 etc.

177-355: 0.07 in  
177-356: 0.08 in  
177-357: 0.09 in  
177-358: 0.10 in  
177-359: 0.11 in  
177-360: 0.12 in  
177-361: 0.13 in  
177-362: 0.14 in  
177-363: 0.15 in

- Order No. 526-155-11 etc.

177-364: 0.16 in  
177-365: 0.18 in  
177-366: 0.20 in  
177-367: 0.22 in  
177-368: 0.24 in  
177-369: 0.26 in  
177-370: 0.28 in

## DIMENSIONS

### Optional Accessories

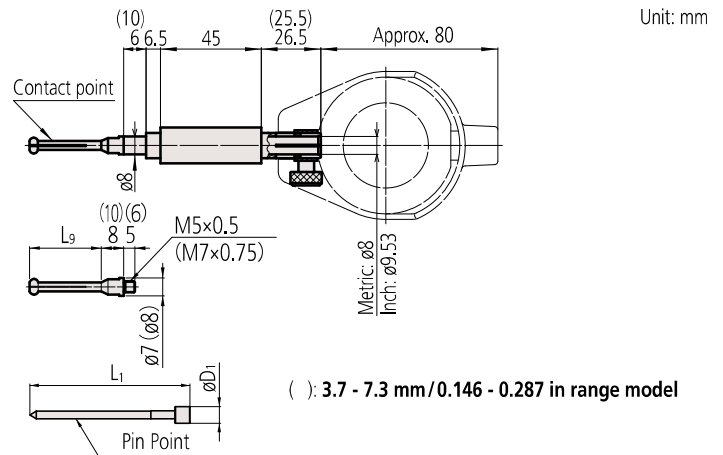
- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000** (See page C-45)
- Setting ring (See page C-47)
- Bore gage stand: **215-120-10** (See page C-30)

### Recommended Dial Indicators (see Chapter F)

- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One-revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

### Recommended Digimatic Indicators (see page F-14)

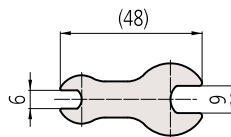
- Metric models: **543-310B** (0.001 mm)
  - Inch models: **543-312B** (0.001 mm/0.0005 in)
- Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.



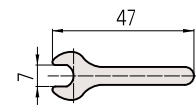
Bore gage (Main body)	Contact point				Pin point		
	Marked No.	Order No.	Range	L <sub>9</sub>	L <sub>1</sub>	øD <sub>1</sub>	Order No.
<b>526-170-10</b> <b>526-175-10</b>	1.0	<b>21DAA601A</b>	0.95 - 1.15 mm/0.037 - 0.045 in	11.5	27.5	2.5	<b>201435</b>
	1.1	<b>21DAA601B</b>	1.07 - 1.25 mm/0.042 - 0.049 in				
	1.2	<b>21DAA601C</b>	1.17 - 1.35 mm/0.046 - 0.053 in				
	1.3	<b>21DAA601D</b>	1.27 - 1.45 mm/0.050 - 0.057 in				
	1.4	<b>21DAA601E</b>	1.37 - 1.55 mm/0.054 - 0.061 in				
<b>526-160-10</b> <b>526-165-10</b>	1.75	<b>21DAA602A</b>	1.50 - 1.90 mm/0.059 - 0.075 in	17.5	33.8	3.5	<b>201436</b>
	2.00	<b>21DAA602B</b>	1.80 - 2.20 mm/0.071 - 0.087 in				
	2.25	<b>21DAA602C</b>	2.05 - 2.45 mm/0.081 - 0.096 in				
	2.50	<b>21DAA602D</b>	2.30 - 2.70 mm/0.091 - 0.106 in				
	2.75	<b>21DAA602E</b>	2.55 - 2.95 mm/0.100 - 0.116 in				
	3.00	<b>21DAA602F</b>	2.80 - 3.20 mm/0.110 - 0.126 in				
	3.25	<b>21DAA602G</b>	3.05 - 3.45 mm/0.120 - 0.136 in				
	3.50	<b>21DAA602H</b>	3.30 - 3.70 mm/0.130 - 0.146 in				
<b>526-150-10</b> <b>526-155-10</b>	3.75	<b>21DAA602J</b>	3.55 - 3.95 mm/0.140 - 0.156 in	22.5	39.3	3.5	<b>201437</b>
	4.0	<b>21DAA603A</b>	3.7 - 4.3 mm/0.146 - 0.169 in				
	4.5	<b>21DAA603B</b>	4.2 - 4.8 mm/0.165 - 0.189 in				
	5.0	<b>21DAA603C</b>	4.7 - 5.3 mm/0.185 - 0.209 in				
	5.5	<b>21DAA603D</b>	5.2 - 5.8 mm/0.205 - 0.228 in				
	6.0	<b>21DAA603E</b>	5.7 - 6.3 mm/0.224 - 0.248 in				
	6.5	<b>21DAA603F</b>	6.2 - 6.8 mm/0.244 - 0.268 in				
7.0	<b>21DAA603G</b>	6.7 - 7.3 mm/0.264 - 0.287 in					

Note: Pin point and contact point are consumable parts. Please replace them with new one when degrading of accuracy, operation, or measuring range.

### Spanner 210188

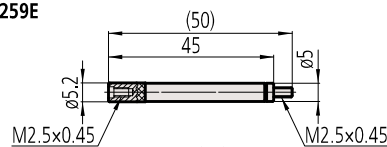


102148

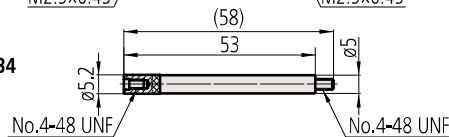


Thickness: 1.5

### Extension rod 21AAA259E



213634



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

Bore gage	Spanner	Extension rod
<b>526-170-10</b>	<b>210188</b>	<b>21AAA259E</b>
<b>526-160-10</b>		
<b>526-150-10</b>	<b>102148</b>	<b>213634</b>
<b>526-175-10</b>	<b>210188</b>	
<b>526-165-10</b>	<b>210188</b>	
<b>526-155-10</b>	<b>102148</b>	

Note: This is not a component for extending the probing depth. (Standard Accessory)

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 526 — for Extra Small Holes

- These gages are designed to measure the diameters of very small holes.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- An optional stand (**215-120-10**) is available for efficient measurement of multiple small holes. (Refer to page C-30 for details)



**526-101**  
Note: The dial indicator and the protection cover are optional.



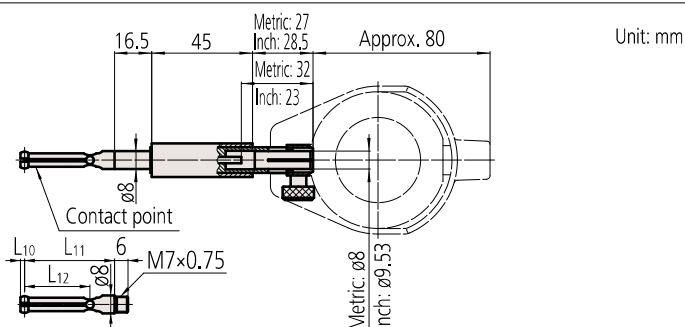
### SPECIFICATIONS

Metric							
Order No.	Range (mm)	Accuracy (μm)	Repeatability (μm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-101	7 - 10	4	2	526-101	Not supplied	Not supplied	Not supplied
526-102	10 - 18	6		526-102			
526-124	7 - 10	4		526-101	2109SB-10 (Graduation: 0.001 mm)	21DZA000	
526-125	10 - 18	6		526-102			
526-126	7 - 10	4		526-101	2046SB (Graduation: 0.01 mm)	21DZA000	
526-127	10 - 18	6		526-102			

Inch							
Order No.	Range (in)	Accuracy (in)	Repeatability (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-103	0.3 - 0.4	0.00016	0.00008	526-103	Not supplied	Not supplied	Not supplied
526-104	0.4 - 0.7	0.00024		526-104			
526-122	0.3 - 0.4	0.00016		526-103	2923SB-10 (Graduation: 0.0001 in)	21DZA000	
526-123	0.4 - 0.7	0.00024		526-104			
526-119	0.3 - 0.4	0.00016		526-103	2922SB (Graduation: 0.0005 in)	21DZA000	
526-120	0.4 - 0.7	0.00024		526-104			

Note: Setting rings are not supplied.  
Please purchase them separately if necessary. For details of the setting rings, refer to page C-47.

### DIMENSIONS

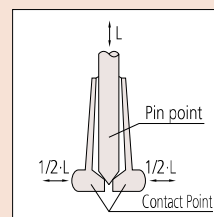


#### STANDARD ACCESSORIES

Bore gage (Main body)	Contact point						Spanner Order No.
	Marked No.	Order No.	Range	L10	L11	L12	
526-101 526-103	1	102469	7.0 - 7.5 mm/0.28 - 0.30 in	1.8	40	29.2	102148
	2	102470	7.5 - 8.0 mm/0.30 - 0.32 in				
	3	102471	8.0 - 8.5 mm/0.32 - 0.34 in				
	4	102472	8.5 - 9.0 mm/0.34 - 0.36 in				
	5	102473	9.0 - 9.5 mm/0.36 - 0.38 in				
	6	102474	9.5 - 10.0 mm/0.38 - 0.40 in				
526-102 526-104	1	102454	10 - 11 mm/0.40 - 0.44 in	2.7	46	38	102148
	2	102455	11 - 12 mm/0.44 - 0.48 in				
	3	102456	12 - 13 mm/0.48 - 0.52 in				
	4	102457	13 - 14 mm/0.52 - 0.56 in				
	5	102458	14 - 15 mm/0.56 - 0.60 in				
	6	102459	15 - 16 mm/0.60 - 0.64 in				
	7	102460	16 - 17 mm/0.64 - 0.68 in				
	8	102461	17 - 18 mm/0.68 - 0.72 in				

Note: Contact point is consumable part. Please replace it with new one when degrading of accuracy, operation, or measuring range.

### Measurement Principle



### Optional Accessories

- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000** (See page C-45)
- Setting ring (See page C-47)
- Bore gage stand: **215-120-10** (See page C-30)

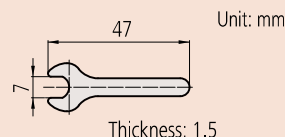
### Recommended Dial Indicators (see Chapter F)

- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One-revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

### Recommended Digimatic Indicators (see Chapter F)

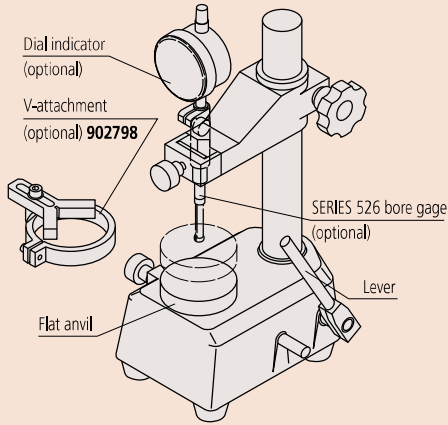
- Metric models: **543-310B (ID-C112GXB)**: 0.001 mm
  - Inch models: **543-312B (ID-C112GEXB)**: 0.001 mm/0.00005 in
- Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

Spanner  
**102148**



### Operating Method

- Pulling the lever forwards moves the platen upwards and the instrument goes into measurement mode.
- The V-attachment (optional) aids positioning the workpiece on the platen and is useful when measuring a large number of the same size of workpiece.



### Optional Accessory

- V-attachment: 902798

## Bore Gage Stand SERIES 215

- Optimal for efficient measurement of multiple small holes with a bore gage. (SERIES 526)

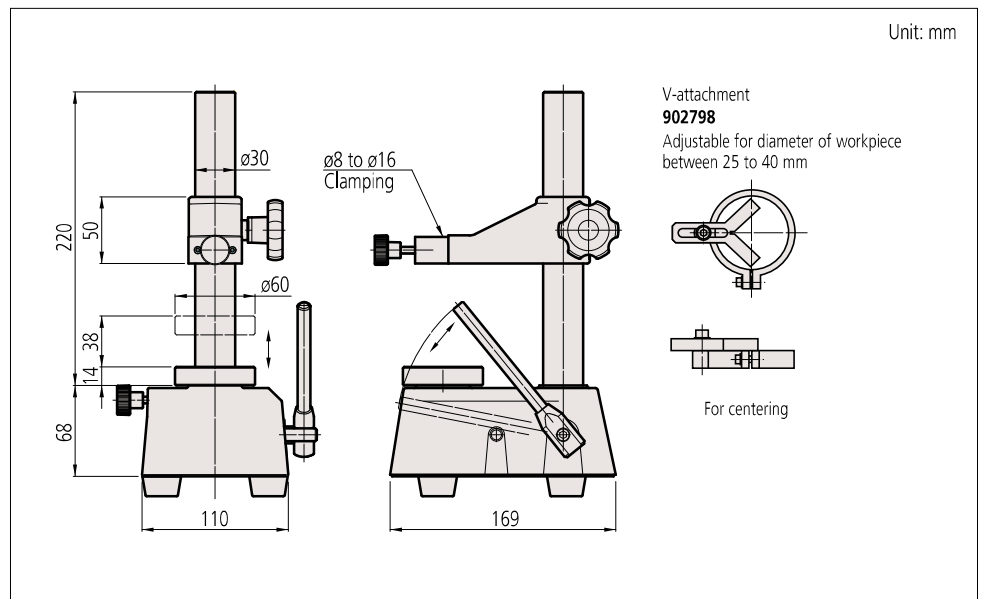


215-120-10

### SPECIFICATIONS

Order No.	Measuring table displacement (mm)	Measuring table
215-120-10	38	Anvil (ø60 mm)

### DIMENSIONS





# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511 — for Small Holes

- These gages are designed to measure the diameters of very small holes.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to page C-47)



511-201

Note: The dial indicator and protection cover are optional.

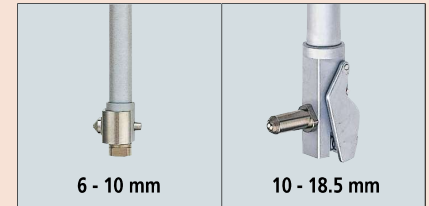
## SPECIFICATIONS

Metric										
Order No.	Range (mm)	Stroke of contact point (mm)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (mm)
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	6 - 10	0.5	2 or less	—	511-209	Not supplied	Not supplied	9 pcs.	Not supplied	50
511-201	10 - 18.5	0.6		6 or less	511-201					1 pc.
511-210	6 - 10	0.5	2 or less	—	511-209	2109SB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	Not supplied	50
511-203	10 - 18.5	0.6		6 or less	511-201					1 pc.
511-211	6 - 10	0.5	2 or less	—	511-209	2046SB (Graduation: 0.01 mm)	21DZA000	9 pcs.	Not supplied	50
511-204	10 - 18.5	0.6		6 or less	511-201					1 pc.

Inch										
Order No.	Range (in)	Stroke of contact point (in)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (in)
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	0.24 - 0.4	0.020	2 or less	—	511-214	Not supplied	Not supplied	9 pcs.	Not supplied	2
511-205	0.4 - 0.74	0.024		6 or less	511-205					1 pc.
511-212	0.24 - 0.4	0.020	2 or less	—	511-214	2923SB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	Not supplied	2
511-206	0.4 - 0.74	0.024		6 or less	511-205					1 pc.
511-213	0.24 - 0.4	0.020	2 or less	—	511-214	2922SB (Graduation: 0.0005 in)	21DZA000	9 pcs.	Not supplied	2
511-207	0.4 - 0.74	0.024		6 or less	511-205					1 pc.

### Contact Points



### Technical Data

- Accuracy: Metric models: 5 μm  
Inch models: 0.0002 in
- Repeatability: Metric models: 2 μm  
Inch models: 0.00008 in
- Adjacent error: Metric models: 2 μm  
Inch models: 0.00008 in

### Optional Accessories

- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000** (See page C-45)

### Recommended Digimatic Indicators (see Chapter F)

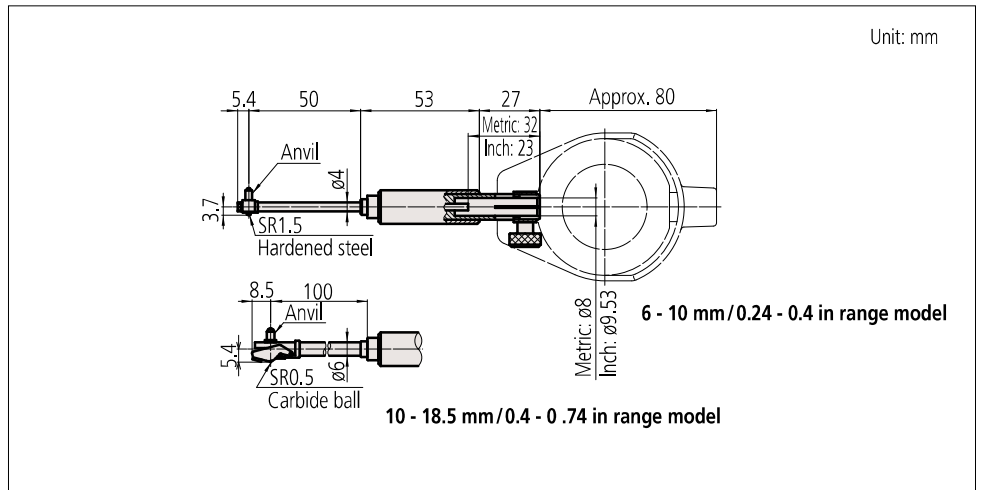
- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One-revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

### Recommended Digimatic Indicators (see Chapter F)

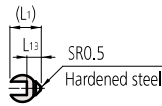
- Metric models: **543-310B (ID-C112GXB)**: 0.001 mm
  - Inch models: **543-312B (ID-C112GEXB)**: 0.001 mm/0.00005 in
- Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.



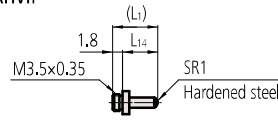
## DIMENSIONS



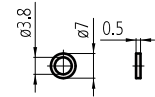
**511-209/511-214**  
Anvil



**511-201/511-205**  
Anvil



**Interchangeable washer**  
(Supplied only with 511-201/511-205)



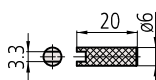
**204355**

## STANDARD ACCESSORIES

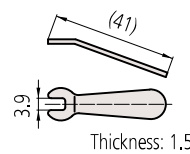
Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub>	L <sub>13</sub>	Order No.	Order No.
<b>511-209</b> <b>511-214</b>	1	<b>952168</b>	6.0 mm/0.24 in	4.7	1.2	Not supplied	<b>206709</b>
	2	<b>952169</b>	6.5 mm/0.26 in	5.3	1.7		
	3	<b>952170</b>	7.0 mm/0.28 in	5.8	2.2		
	4	<b>952414</b>	7.5 mm/0.30 in	6.3	2.7		
	5	<b>952415</b>	8.0 mm/0.32 in	6.8	3.2		
	6	<b>952416</b>	8.5 mm/0.34 in	7.3	3.7		
	7	<b>952417</b>	9.0 mm/0.36 in	7.8	4.2		
	8	<b>952418</b>	9.5 mm/0.38 in	8.3	4.7		
	9	<b>952419</b>	10.0 mm/0.40 in	8.8	5.2		

Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub>	L <sub>14</sub>	Order No.	Order No.
<b>511-201</b> <b>511-205</b>	1	<b>204356</b>	10 mm/0.40 in	3.8	2	<b>204355</b>	<b>204354</b>
	2	<b>204357</b>	11 mm/0.44 in	4.8	3		
	3	<b>204358</b>	12 mm/0.48 in	5.8	4		
	4	<b>204359</b>	13 mm/0.52 in	6.8	5		
	5	<b>204360</b>	14 mm/0.56 in	7.8	6		
	6	<b>204361</b>	15 mm/0.60 in	8.8	7		
	7	<b>204362</b>	16 mm/0.64 in	9.8	8		
	8	<b>204363</b>	17 mm/0.68 in	10.8	9		
	9	<b>204364</b>	18 mm/0.72 in	11.8	10		

**Spanner**  
**206709**



**204354**



Unit: mm

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511

- Longer plunger stroke with no effect on accuracy.
- Carbide is used for the contact point ensuring high durability and wear resistance.
- This model reduces the influence of heat from the operator's hand by 50 % by increasing the grip size and making the grip hollow-structured, thereby retaining high-accuracy measurement.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- Optional Extension Rods can be attached for measuring deep holes. (For details, refer to page C-45)
- A Bore Gage Checker and a range of Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to pages C-46 and C-47)



511-702

511-703

Note: The dial indicator and the protection cover are optional.

## SPECIFICATIONS

Metric												
Order No.	Range (mm)	Stroke of contact point (mm)	Measuring force (N)	Guide force (N)	Bore gage	Content of set					Probing depth (mm)	
						Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil		Spanner
511-701	18 - 35	1.2	4 or less	6 or less	511-701	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-702	35 - 60				511-702			6 pcs.				
511-703	50 - 150				511-703			11 pcs.				
511-704	100 - 160		5 or less	10 or less	511-704			13 pcs.	4 pcs.	1 pc.		
511-705	160 - 250				511-705			6 pcs.				
511-706	250 - 400				511-706			5 pcs.				
511-701	18 - 35	1.6	4 or less	6 or less	511-701	2109SB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	150
511-702	35 - 60				511-702			6 pcs.				
511-703	50 - 150				511-703			11 pcs.				
511-704	100 - 160		5 or less	10 or less	511-704			13 pcs.	4 pcs.	1 pc.		
511-705	160 - 250				511-705			6 pcs.				
511-706	250 - 400				511-706			5 pcs.				
511-701	18 - 35	1.2	4 or less	6 or less	511-701	2046SB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-702	35 - 60				511-702			6 pcs.				
511-703	50 - 150				511-703			11 pcs.				
511-704	100 - 160		5 or less	10 or less	511-704			13 pcs.	4 pcs.	1 pc.		
511-705	160 - 250				511-705			6 pcs.				
511-706	250 - 400				511-706			5 pcs.				
511-921	18 - 150	—	—	—	511-701	2046SB	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-922					511-702			6 pcs.				
511-925-10					511-703			11 pcs.				
Inch												
Order No.	Range (in)	Stroke of contact point (in)	Measuring force (N)	Guide force (N)	Bore gage	Content of set					Probing depth (in)	
						Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil		Spanner
511-731	0.7 - 1.4	0.047	4 or less	6 or less	511-731	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-732	1.4 - 2.5				511-732			6 pcs.				
511-733	2.0 - 6.0				511-733			11 pcs.				
511-734	4.0 - 6.5		5 or less	10 or less	511-734			13 pcs.	4 pcs.	1 pc.		
511-735	6.5 - 10.0				511-735			6 pcs.				
511-736	10.0 - 16.0				511-736			5 pcs.				
511-731	0.7 - 1.4	0.063	4 or less	6 or less	511-731	2923SB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-732	1.4 - 2.5				511-732			6 pcs.				
511-733	2.0 - 6.0				511-733			11 pcs.				
511-734	4.0 - 6.5		5 or less	10 or less	511-734			13 pcs.	4 pcs.	1 pc.		
511-735	6.5 - 10.0				511-735			6 pcs.				
511-736	10.0 - 16.0				511-736			5 pcs.				
511-741	0.7 - 1.4	0.047	4 or less	6 or less	511-731	2922SB (Graduation: 0.0005 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-742	1.4 - 2.5				511-732			6 pcs.				
511-743	2.0 - 6.0				511-733			11 pcs.				
511-744	4.0 - 6.5		5 or less	10 or less	511-734			13 pcs.	4 pcs.	1 pc.		
511-745	6.5 - 10.0				511-735			6 pcs.				
511-746	10.0 - 16.0				511-736			5 pcs.				
511-931	0.7 - 6.0	—	—	—	511-731	2922SB	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-932					511-732			6 pcs.				
511-935-10					511-733			11 pcs.				

Note 1: A 50 mm sub-anvil is supplied with 511-703, and a 75 mm sub-anvil is supplied with 511-706.

Note 2: A 2 in sub-anvil is supplied with 511-733, and a 3 in sub-anvil is supplied with 511-736.

Note 3: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

## Anvil

A carbide ball is used for the contact point. It is more abrasion resistant than a hardened steel ball and, as its surface is smoother than that of a carbide tip, the workpiece is less liable to be marked.

### Comparison of abrasion resistance

Hardened steel ball  
(conventional model)

Carbide ball  
(current model)



Abrasion depth: 0.1 mm  
750 HV or more

Abrasion depth: 0.001 mm  
1350 HV or more

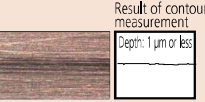
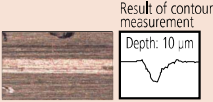
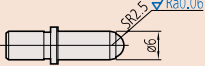
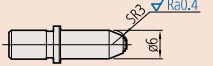
Inspection method

- Load a 0.5 N weight on the anvil, and slide for 1,000 m on abrasive paper of 9 μm (#2000) particle size.

### Comparison of marks on the workpiece

Carbide tip  
(conventional model)

Carbide ball  
(current model)



Inspection method

- Load a 4 N weight on the anvil, and slide on the aluminum plate back and forth for 20 times.



The grip is highly resistant to heat transfer from the operator's hand.

### Technical Data

- Accuracy: Metric models 2 μm  
Inch models 0.00008 in
- Repeatability: Metric models 0.5 μm  
Inch models 0.00002 in
- Adjacent error: Metric models 1 μm  
Inch models 0.00004 in

### Optional Accessories

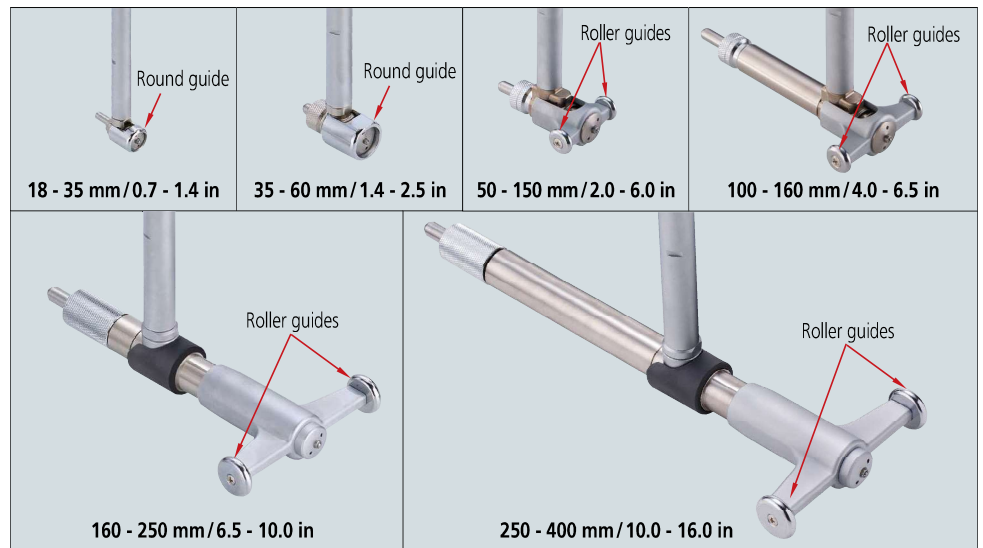
- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000**  
(See page C-45)

### Recommended Dial Indicators (see Chapter F)

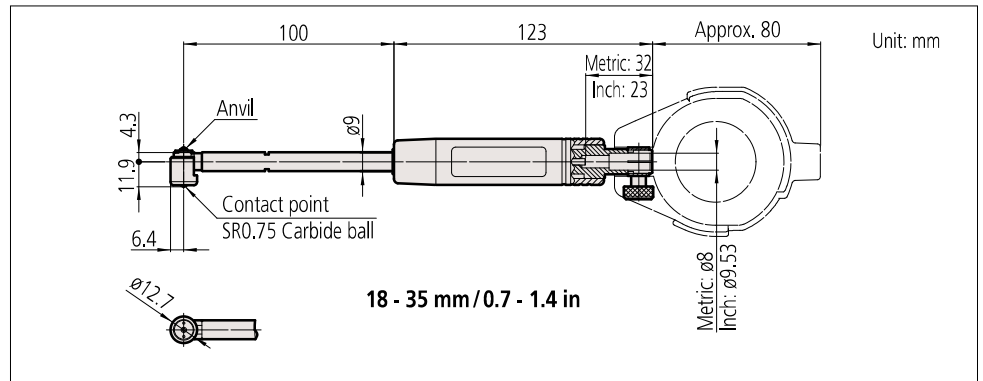
- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

Note: Indicators equipped with rubber bellows, such as waterproof types, cannot be used.

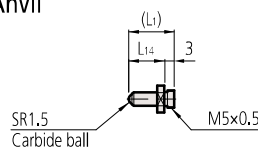
## Contact Points



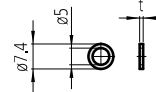
## DIMENSIONS



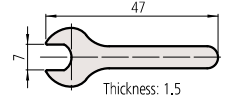
### Anvil



### Interchangeable washer



### Spanner 102148



## STANDARD ACCESSORIES

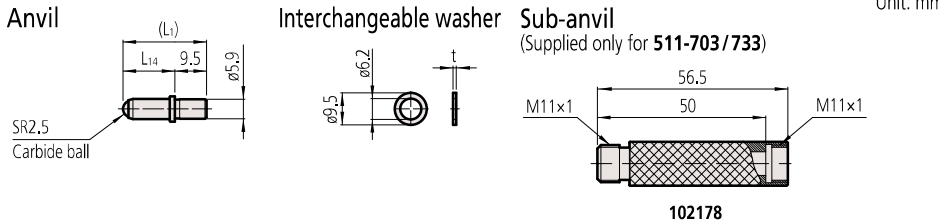
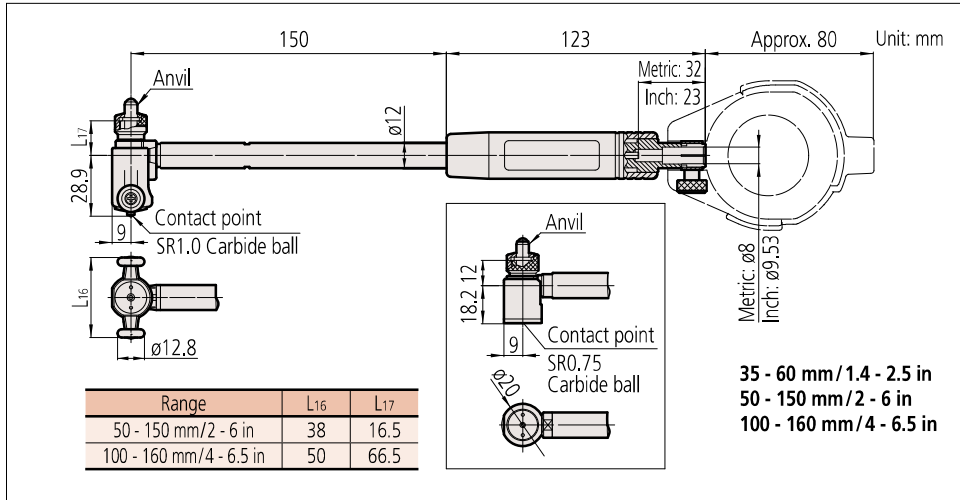
Bore gage (Main body)	Anvil					Interchangeable washer		Spanner
	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub>	L <sub>14</sub>	Order No.	t	Order No.
<b>511-701</b> <b>511-731</b>	1	<b>21DZA213A</b>	18 mm/0.71 in	5.5	2.5	<b>205623</b> <b>205624</b>	0.5 mm/0.02 in 1.0 mm/0.04 in	<b>102148</b>
	2	<b>21DZA213B</b>	20 mm/0.79 in	7.5	4.5			
	3	<b>21DZA213C</b>	22 mm/0.87 in	9.5	6.5			
	4	<b>21DZA213D</b>	24 mm/0.94 in	11.5	8.5			
	5	<b>21DZA213E</b>	26 mm/1.02 in	13.5	10.5			
	6	<b>21DZA213F</b>	28 mm/1.10 in	15.5	12.5			
	7	<b>21DZA213G</b>	30 mm/1.18 in	17.5	14.5			
	8	<b>21DZA213H</b>	32 mm/1.26 in	19.5	16.5			
	9	<b>21DZA213J</b>	34 mm/1.34 in	21.5	18.5			

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511

### DIMENSIONS



Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

### STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Sub-Anvil
	Marked No.	Order No.	Indication of measuring size	L1	L14	Order No.	t	Order No.
511-702 511-732	1	21DZA232A	35 mm / 1.38 in	15	5.5	205457 205458 205459 205460	0.5 mm / 0.02 in 1.0 mm / 0.04 in 2.0 mm / 0.08 in 3.0 mm / 0.12 in	102178 (50 mm / 2 in)
	2	21DZA232B	40 mm / 1.57 in	20	10.5			
	3	21DZA232C	45 mm / 1.77 in	25	15.5			
	4	21DZA232D	50 mm / 1.97 in	30	20.5			
	5	21DZA232E	55 mm / 2.17 in	35	25.5			
	6	21DZA232F	60 mm / 2.36 in	40	30.5			
511-703 511-733 ( ) Using 50 mm / 2 in Sub-Anvil	1	21DZA232A	50 mm (100 mm) / 1.97 in (3.94 in)	15	5.5			
	2	21DZA232B	55 mm (105 mm) / 2.17 in (4.13 in)	20	10.5			
	3	21DZA232C	60 mm (110 mm) / 2.36 in (4.33 in)	25	15.5			
	4	21DZA232D	65 mm (115 mm) / 2.55 in (4.53 in)	30	20.5			
	5	21DZA232E	70 mm (120 mm) / 2.74 in (4.72 in)	35	25.5			
	6	21DZA232F	75 mm (125 mm) / 2.93 in (4.92 in)	40	30.5			
	7	21DZA232G	80 mm (130 mm) / 3.12 in (5.12 in)	45	35.5			
511-704 511-734	8	21DZA232H	85 mm (135 mm) / 3.31 in (5.31 in)	50	40.5			
	9	21DZA232J	90 mm (140 mm) / 3.50 in (5.51 in)	55	45.5			
	10	21DZA232L	95 mm (145 mm) / 3.69 in (5.71 in)	60	50.5			
	11	21DZA232M	100 mm (150 mm) / 3.88 in (5.91 in)	65	55.5			
	12	21DZA232N	155 mm / 6.10 in	70	60.5			
	13	21DZA232P	160 mm / 6.30 in	75	65.5			

### Recommended Digimatic Indicators (see Chapter F)

- Metric models: **543-310B** (ID-C112GXB: 0.001 mm)
- Inch models: **543-312B** (ID-C112GEXB: 0.001 mm/0.00005 in)



- The ID measurement can be performed easily since the minimum value is detected automatically.
- Up to three combinations of master value and tolerance value can be set.
- Nine measurement results (maximum) can be saved and recalled from memory (when no external device is connected). Refer to page F-14 for details.

### Bore Gage Checker 515-590

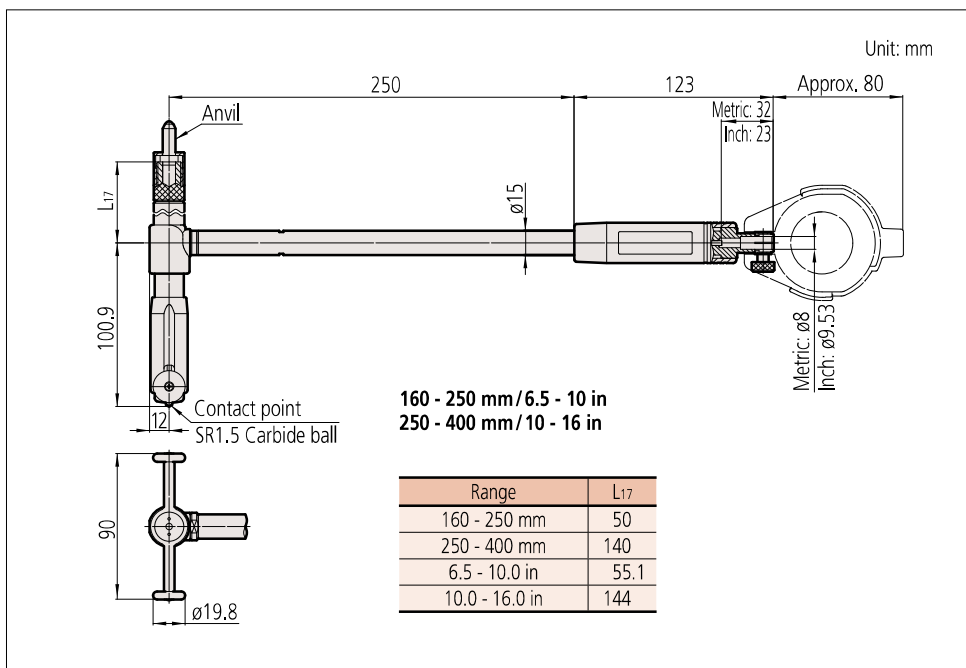
- The Bore Gage Checker allows easy setting of dial bore gages with ranges of 18 mm (0.7 in) through 400 mm (16 in) using gauge blocks.



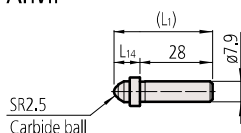
Standard configuration: Stand, Attachment A, B, C 1 pc. for each, Parallel Jaw (2 pcs.)



## DIMENSIONS

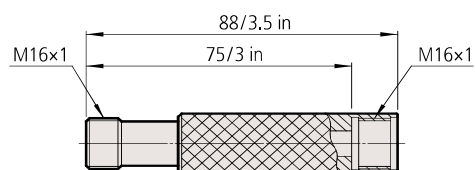
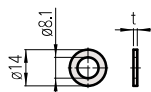


### Anvil



### Interchangeable washer Sub-anvil

Supplied only for **511-706 (202974)** and **511-736 (202975)**



**202974 (511-706)**  
**202975 (511-736)**

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

## STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Sub-Anvil
	Marked No.	Order No.	Indication of measuring size	$L_1$	$L_{14}$	Order No.	$t$	Order No.
<b>511-705</b> <b>511-735</b>	1	<b>21DZA241A</b>	160 mm/6.50 in	38	10	<b>205467</b> <b>205461</b> <b>205462</b> <b>205463</b> <b>205464</b> <b>205465</b> <b>205466</b>	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in 4.0 mm/0.16 in 5.0 mm/0.20 in 6.0 mm/0.24 in	/
	2	<b>21DZA241B</b>	175 mm/7.09 in	53	25			
	3	<b>21DZA241C</b>	190 mm/7.68 in	68	40			
	4	<b>21DZA241D</b>	205 mm/8.27 in	83	55			
	5	<b>21DZA241E</b>	220 mm/8.86 in	98	70			
	6	<b>21DZA241F</b>	235 mm/9.45 in	113	85			
<b>511-706</b> <b>511-736</b> ( ) Using 75 mm/3 in Sub-Anvil	1	<b>21DZA241A</b>	250 mm (325 mm)/10.00 in (13.00 in)	38	10	<b>202974</b> (75 mm) <b>202975</b> (3.0 in)		
	2	<b>21DZA241B</b>	265 mm (340 mm)/10.59 in (13.59 in)	53	25			
	3	<b>21DZA241C</b>	280 mm (355 mm)/11.18 in (14.18 in)	68	40			
	4	<b>21DZA241D</b>	295 mm (370 mm)/11.77 in (14.77 in)	83	55			
	5	<b>21DZA241E</b>	310 mm (385 mm)/12.36 in (15.36 in)	98	70			

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511 — Short Leg Type

- Compact and lightweight due to the short length below the grip.
- Longer plunger stroke with no effect on accuracy.
- Carbide contact point ensures high durability and wear resistance.
- This model reduces the influence of heat from the operator's hand by approx. 50 % by increasing the grip size and making the grip hollow-structured, thereby retaining high-accuracy measurement.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- A Bore Gage Checker and a range of Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to pages C-46 and C-47)



511-761



511-762



511-763



511-761

Note: The dial indicator and the protection cover are optional.



511-763

Note: The dial indicator and the protection cover are optional.



### Technical Data

- Accuracy: Metric models 2  $\mu$ m  
Inch models 0.00008 in
- Repeatability: Metric models 0.5  $\mu$ m  
Inch models 0.00002 in
- Adjacent error: Metric models 1  $\mu$ m  
Inch models 0.00004 in

### Optional Accessories

- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000**  
(See page C-45)

### Recommended Dial Indicators (see Chapter F)

- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One revolution type)  
**2109SB-10** (0.001 mm)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

## SPECIFICATIONS

Metric												
Order No.	Range (mm)	Stroke of contact point (mm)	Measuring force (N)	Guide force (N)	Content of set							Probing depth (mm)
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-761	18 - 35	1.2	4 or less	6 or less	511-761	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-762	35 - 60				511-762			6 pcs.				
511-763	50 - 150	1.6	5 or less	10 or less	511-763	Not supplied	Not supplied	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-764	100 - 160				511-764			13 pcs.				
511-771	18 - 35	1.2	4 or less	6 or less	511-761	2109SB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	
511-772	35 - 60				511-762			6 pcs.				
511-773	50 - 150	1.6	5 or less	10 or less	511-763	2109SB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-774	100 - 160				511-764			13 pcs.				
511-766	18 - 35	1.2	4 or less	6 or less	511-761	2046SB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	
511-767	35 - 60				511-762			6 pcs.				
511-768	50 - 150	1.6	5 or less	10 or less	511-763	2046SB (Graduation: 0.01 mm)	21DZA000	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-769	100 - 160				511-764			13 pcs.				

Inch												
Order No.	Range (in)	Stroke of contact point (in)	Measuring force (N)	Guide force (N)	Content of set							Probing depth (in)
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-781	0.7 - 1.4	0.047	4 or less	6 or less	511-781	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-782	1.4 - 2.5				511-782			6 pcs.				
511-783	2.0 - 6.0	0.063	5 or less	10 or less	511-783	Not supplied	Not supplied	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-784	4.0 - 6.5				511-784			13 pcs.				
511-791	0.7 - 1.4	0.047	4 or less	6 or less	511-781	2923SB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	
511-792	1.4 - 2.5				511-782			6 pcs.				
511-793	2.0 - 6.0	0.063	5 or less	10 or less	511-783	2923SB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-794	4.0 - 6.5				511-784			13 pcs.				
511-786	0.7 - 1.4	0.047	4 or less	6 or less	511-781	2922SB (Graduation: 0.0005 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	
511-787	1.4 - 2.5				511-782			6 pcs.				
511-788	2.0 - 6.0	0.063	5 or less	10 or less	511-783	2922SB (Graduation: 0.0005 in)	21DZA000	11 pcs.	4 pcs.	1 pc.	Not supplied	
511-789	4.0 - 6.5				511-784			13 pcs.				

Note 1: A 50 mm sub-anvil is supplied with **511-763**.

Note 2: A 2 in sub-anvil is supplied with **511-783**.

Note 3: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-avils. (The measurement accuracy in such cases is not guaranteed.)

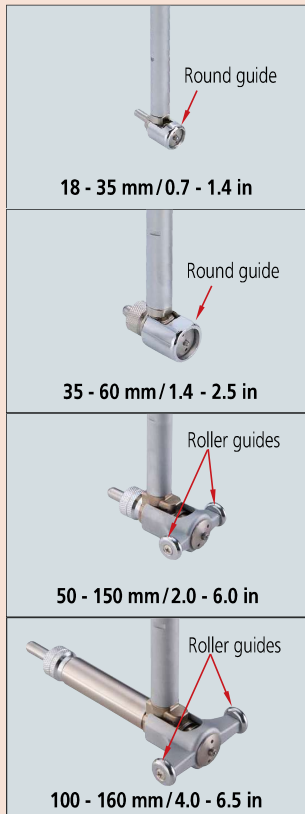
## Recommended Digimatic Indicators (see Chapter F)

- Metric models: **543-310B** (ID-C112GXB: 0.001 mm)
- Inch models: **543-312B** (ID-C112GEXB: 0.001 mm/0.00005 in)

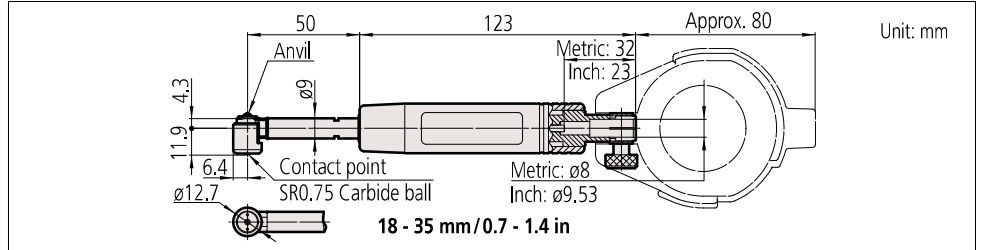


- The ID measurement can be performed easily since the minimum value is detected automatically.
- Up to three combinations of master value and tolerance value can be set.
- Nine measurement results (maximum) can be saved and recalled from memory (when no external device is connected). Refer to page F-14 for details.

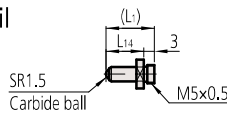
## Contact Points



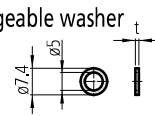
## DIMENSIONS



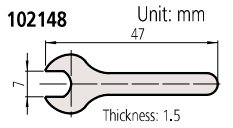
### Anvil



### Interchangeable washer



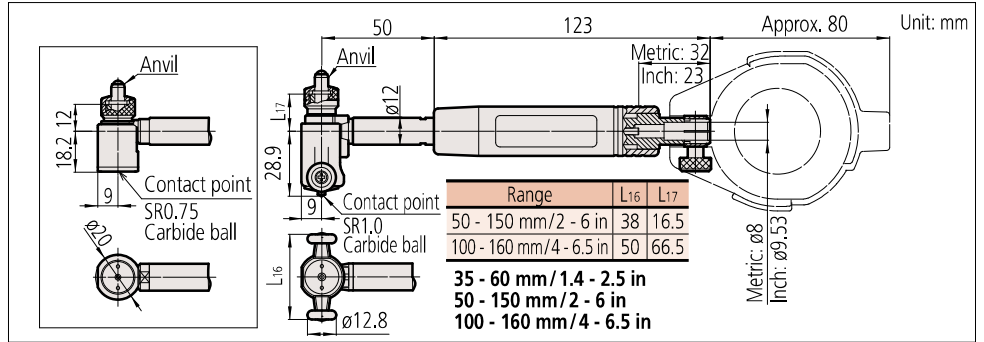
### Spanner 102148



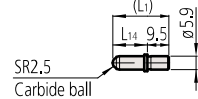
## STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Spanner
	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub>	L <sub>14</sub>	Order No.	t	
<b>511-761</b> <b>511-781</b>	1	21DZA213A	18 mm/0.71 in	5.5 mm/0.22 in	2.5 mm/0.10 in	<b>205623</b> <b>205624</b>	0.5 mm/0.02 in 1.0 mm/0.04 in	<b>102148</b>
	2	21DZA213B	20 mm/0.79 in	7.5 mm/0.30 in	4.5 mm/0.18 in			
	3	21DZA213C	22 mm/0.87 in	9.5 mm/0.37 in	6.5 mm/0.26 in			
	4	21DZA213D	24 mm/0.94 in	11.5 mm/0.45 in	8.5 mm/0.33 in			
	5	21DZA213E	26 mm/1.02 in	13.5 mm/0.53 in	10.5 mm/0.41 in			
	6	21DZA213F	28 mm/1.10 in	15.5 mm/0.61 in	12.5 mm/0.49 in			
	7	21DZA213G	30 mm/1.18 in	17.5 mm/0.69 in	14.5 mm/0.57 in			
	8	21DZA213H	32 mm/1.26 in	19.5 mm/0.77 in	16.5 mm/0.65 in			
	9	21DZA213J	34 mm/1.34 in	21.5 mm/0.85 in	18.5 mm/0.73 in			

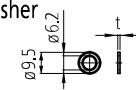
## DIMENSIONS



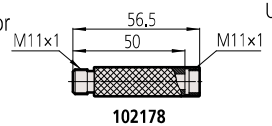
### Anvil



### Interchangeable washer



### Sub-anvil (Supplied only for 511-763 and 511-783.)



Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

## STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Sub-Anvil
	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub>	L <sub>14</sub>	Order No.	t	
<b>511-762</b> <b>511-782</b>	1	21DZA232A	35 mm/1.38 in	15	5.5	<b>205457</b> <b>205458</b> <b>205459</b> <b>205460</b>	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in	<b>102178</b> (50 mm/2 in)
	2	21DZA232B	40 mm/1.57 in	20	10.5			
	3	21DZA232C	45 mm/1.77 in	25	15.5			
	4	21DZA232D	50 mm/1.97 in	30	20.5			
	5	21DZA232E	55 mm/2.17 in	35	25.5			
	6	21DZA232F	60 mm/2.36 in	40	30.5			
<b>511-763</b> <b>511-783</b> ( ) Using 50 mm/2 in Sub-Anvil	1	21DZA232A	50 mm (100 mm)/1.97 in (3.94 in)	15	5.5			
	2	21DZA232B	55 mm (105 mm)/2.17 in (4.13 in)	20	10.5			
	3	21DZA232C	60 mm (110 mm)/2.36 in (4.33 in)	25	15.5			
	4	21DZA232D	65 mm (115 mm)/2.55 in (4.53 in)	30	20.5			
	5	21DZA232E	70 mm (120 mm)/2.74 in (4.72 in)	35	25.5			
	6	21DZA232F	75 mm (125 mm)/2.93 in (4.92 in)	40	30.5			
	7	21DZA232G	80 mm (130 mm)/3.12 in (5.12 in)	45	35.5			
	8	21DZA232H	85 mm (135 mm)/3.31 in (5.31 in)	50	40.5			
	9	21DZA232J	90 mm (140 mm)/3.50 in (5.51 in)	55	45.5			
	10	21DZA232L	95 mm (145 mm)/3.69 in (5.71 in)	60	50.5			
<b>511-764</b> <b>511-784</b>	1	21DZA232A	100 mm/3.94 in	15	5.5			
	2	21DZA232B	105 mm/4.13 in	20	10.5			
	3	21DZA232C	110 mm/4.33 in	25	15.5			
	4	21DZA232D	115 mm/4.53 in	30	20.5			
	5	21DZA232E	120 mm/4.72 in	35	25.5			
	6	21DZA232F	125 mm/4.92 in	40	30.5			
	7	21DZA232G	130 mm/5.12 in	45	35.5			
	8	21DZA232H	135 mm/5.31 in	50	40.5			
	9	21DZA232J	140 mm/5.51 in	55	45.5			
	10	21DZA232L	145 mm/5.71 in	60	50.5			
	11	21DZA232M	150 mm/5.91 in	65	55.5			
	12	21DZA232N	155 mm/6.10 in	70	60.5			
	13	21DZA232P	160 mm/6.30 in	75	65.5			

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511 — with Micrometer Head

- Micrometer head is attached to the anvil for accurate dimensional setting.
- Longer plunger stroke with no effect on accuracy.
- Carbide is used for the contact point ensuring high durability and wear resistance.
- This model reduces the influence of heat from the operator's hand by approx. 50 % by increasing the grip size and making the grip hollow-structured, thereby retaining high-accuracy measurement.
- Wide measuring range with sub-anvils.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- Optional Extension Rods can be attached for measuring deep holes. (For details, refer to page C-45)
- A Bore Gage Checker and a range of Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to pages C-46 and C-47)



**511-804**

Note: The dial indicator and the protection cover are optional.



**511-806**

Note: The dial indicator and the protection cover are optional.

## SPECIFICATIONS

Metric																		
Order No.	Range (mm)	Stroke of contact point (mm)	Measuring force (N)	Guide force (N)	Content of set						Probing depth (mm)							
					Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner								
511-803	60 - 100	1.6	5 or less	10 or less	511-803	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	150							
511-804	100 - 160				3 pcs.													
511-805	150 - 250				4 pcs.													
511-806	250 - 400				3 pcs.													
511-807	400 - 600		6 or less	20 or less	511-807				2 pcs.	250								
511-808	600 - 800				2 pcs.													
511-823	60 - 100				1.6				5 or less			10 or less	511-803	2109SB-10 (Graduation: 0.001 mm)	21DZA000	2 pcs.	3 pcs.	150
511-824	100 - 160												3 pcs.					
511-825	150 - 250	4 pcs.																
511-826	250 - 400	3 pcs.																
511-827	400 - 600	6 or less	20 or less	511-807		2 pcs.	250											
511-828	600 - 800			2 pcs.														
511-813	60 - 100			1.6		5 or less		10 or less	511-803	2046SB (Graduation: 0.01 mm)	21DZA000	2 pcs.	3 pcs.			150		
511-814	100 - 160								3 pcs.									
511-815	150 - 250	4 pcs.																
511-816	250 - 400	3 pcs.																
511-817	400 - 600	6 or less	20 or less		511-807	2 pcs.	250											
511-818	600 - 800				2 pcs.													

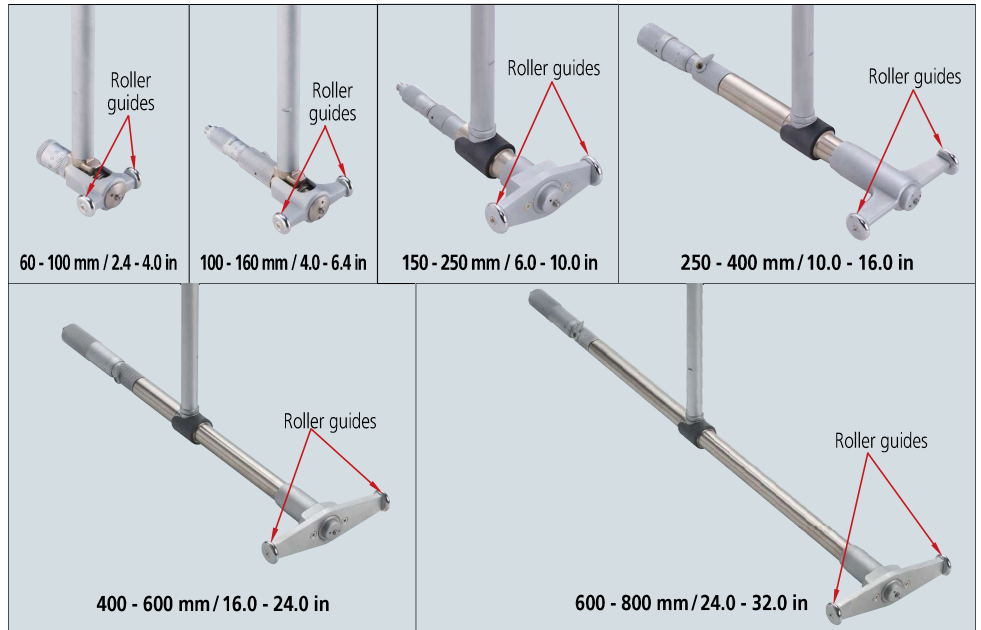
Inch																		
Order No.	Range (in)	Stroke of contact point (in)	Measuring force (N)	Guide force (N)	Content of set						Probing depth (in)							
					Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner								
511-833	2.4 - 4.0	0.063	5 or less	10 or less	511-833	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	6							
511-834	4.0 - 6.4				3 pcs.													
511-835	6.0 - 10.0				4 pcs.													
511-836	10.0 - 16.0				3 pcs.													
511-837	16.0 - 24.0		6 or less	20 or less	511-837				2 pcs.	10								
511-838	24.0 - 32.0				2 pcs.													
511-853	2.4 - 4.0				0.063				5 or less			10 or less	511-833	2923SB-10 (Graduation: 0.0001 in)	21DZA000	2 pcs.	3 pcs.	4
511-854	4.0 - 6.4												3 pcs.					
511-855	6.0 - 10.0	4 pcs.																
511-856	10.0 - 16.0	3 pcs.																
511-857	16.0 - 24.0	6 or less	20 or less	511-837		2 pcs.	10											
511-858	24.0 - 32.0			2 pcs.														
511-843	2.4 - 4.0			0.063		5 or less		10 or less	511-833	2922SB (Graduation: 0.0005 in)	21DZA000	2 pcs.	3 pcs.			4		
511-844	4.0 - 6.4								3 pcs.									
511-845	6.0 - 10.0	4 pcs.																
511-846	10.0 - 16.0	3 pcs.																
511-847	16.0 - 24.0	6 or less	20 or less		511-837	2 pcs.	10											
511-848	24.0 - 32.0				2 pcs.													

Note 1: Storage boxes for 511-807/808/837/838 models are made of wood. The boxes of other models are made of plastic.

Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories. (The measurement accuracy in such cases is not guaranteed.)



## Contact Points



### Technical Data

- Accuracy: Metric models 2  $\mu$ m  
Inch models 0.00008 in
- Repeatability: Metric models 0.5  $\mu$ m  
Inch models 0.00002 in
- Adjacent error: Metric models 1  $\mu$ m  
Inch models 0.00004 in

### Optional Accessories

- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000** (See page C-45)

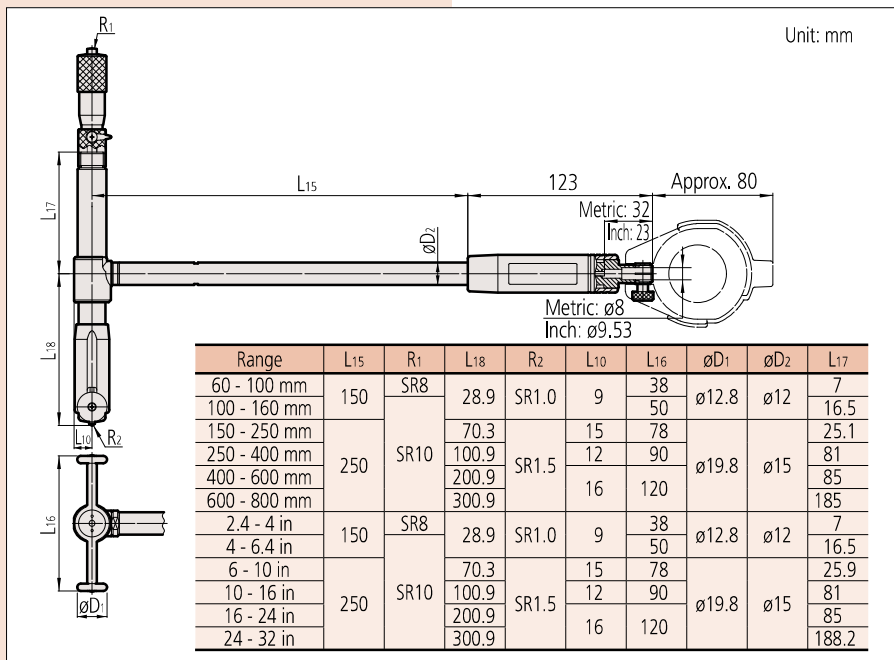
### Recommended Dial Indicators (see Chapter F)

- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One-revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

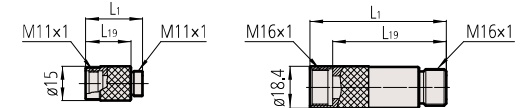
### Recommended Digimatic Indicators (see Chapter F)

- Metric models: **543-310B (ID-C112GXB)**: 0.001 mm
  - Inch models: **543-312B (ID-C112GEXB)**: 0.001 mm/0.00005 in
- Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

## DIMENSIONS



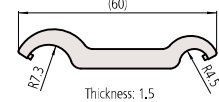
### Sub-anvil



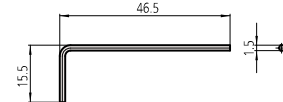
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

### Spanner

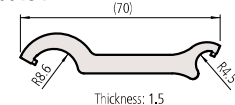
#### 301336



#### 202863



#### 200154



## STANDARD ACCESSORIES

Metric		Micrometer head		Sub-Anvil			Spanner	
Bore gage (Main body)	Order No.	Stroke (mm)	Screw size	Marked No. (mm)	Order No.	L1 (mm)	L19 (mm)	Order No.
511-803	21DZA267	10	M11x1	10	208892	15	10	301336 (2 pcs.)
				20	208894	25	20	202863 (1 pc.)
511-804	21DZA268	13	M11x1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
511-805	21DZA268	13	M11x1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
				50	21DAA492	55	50	
511-806	953118	25	M16x1	25	208926	35	25	200154 (2 pcs.)
				50	208928 (2 pcs.)	60	50	
511-807	953120	50	M16x1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	
511-808	953120	50	M16x1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	

Inch		Micrometer head		Sub-Anvil			Spanner	
Bore gage (Main body)	Order No.	Stroke (in)	Screw size	Marked No. (in)	Order No.	L1 (in)	L19 (in)	Order No.
511-833	21DZA272	0.4	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895	1.0	0.8	202863 (1 pc.)
511-834	21DZA273	0.5	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
511-835	21DZA273	0.5	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
				2	21DAA493	2.2	2	
511-836	21DZA275	1.0	M16x1	1	208927	1.4	1	200154 (2 pcs.)
				2	208929 (2 pcs.)	2.4	2	
511-837	902313	2.0	M16x1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	
511-838	902313	2.0	M16x1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	



# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511 — for Blind Holes

- Capable of ID (inside diameter) measurement close to the bottom of a hole.
- Carbide contact point ensuring high durability and wear resistance.
- Grip is large and hollow to reduce effect of body heat on high-accuracy measurements.
- The indicator (dial indicator, Digimatic indicator) and dial protection cover are optional. Select an indicator from the recommended dial indicators and Digimatic indicators. Please contact us for advice when using an indicator other than the recommended indicators.
- Optional Extension Rods can be attached for measuring deep holes. (For details, refer to page C-45)
- A Bore Gage Checker and a range of Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to pages C-46 and C-47)



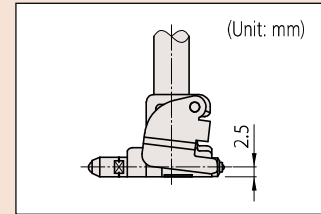
511-416

Note: The dial indicator and protection cover are optional.



511-417

Note: The dial indicator and protection cover are optional.



### Technical Data

- Accuracy: Metric models 4  $\mu$ m  
Inch models 0.00016 in
- Repeatability: Metric models 1  $\mu$ m  
Inch models 0.00004 in
- Adjacent error: Metric models 1  $\mu$ m  
Inch models 0.00004 in

### Optional Accessories

- Dial indicator (See Chapter F)
- Dial protection cover: **21DZA000** (See page C-45)

### Recommended Dial Indicators (see Chapter F)

- Metric models: **2046SB** (0.01 mm)  
**2972TB** (0.01 mm - One-revolution type)  
**2109SB-10** (0.001 mm)  
**2900SB-10** (0.001 mm - One-revolution type)
- Inch models: **2922SB** (0.0005 in)  
**2977TB** (0.0005 in - One-revolution type)  
**2923SB-10** (0.0001 in)  
**2910SB-10** (0.0001 in - One-revolution type)

### Recommended Digimatic Indicators (see Chapter F-14)

- Metric models: **543-310B** (0.001 mm)
  - Inch models: **543-312B** (0.001 mm/0.00005 in)
- Note: Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

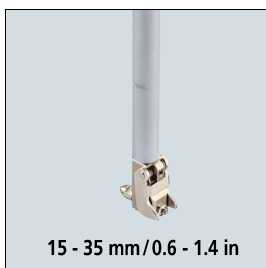
## SPECIFICATIONS

Metric										
Order No.	Range (mm)	Stroke of contact point (mm)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (mm)
					Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-415	15 - 35	1.2	4 or less	6 or less	511-415	Not supplied	Not supplied	11 pcs.	1 pc.	150
511-416	35 - 60		5 or less	10 or less	511-416			6 pcs.	4 pcs.	
511-417	50 - 150	1.2	4 or less	6 or less	511-415	2046SB (Graduation: 0.01 mm)	21DZA000	11 pcs.	1 pc.	150
511-425	15 - 35		5 or less	10 or less	511-416			6 pcs.	4 pcs.	
511-426	35 - 60	1.2	4 or less	6 or less	511-415	2109SB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150
511-427	50 - 150		5 or less	10 or less	511-416			6 pcs.	4 pcs.	
511-435	15 - 35	1.2	4 or less	6 or less	511-415	Not supplied	Not supplied	11 pcs.	1 pc.	150
511-436	35 - 60		5 or less	10 or less	511-416			6 pcs.	4 pcs.	
511-437	50 - 150	1.2	4 or less	6 or less	511-415	Not supplied	Not supplied	11 pcs.	1 pc.	150
511-428	15 - 35		5 or less	10 or less	511-416			6 pcs.	4 pcs.	

Note 1: A 10 mm (0.4 in) sub-anvil is supplied with **511-415/425/435/418/428/438** and a 50 mm (2 in) sub-anvil is supplied with **511-417/427/437/420/430/440**.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

## Contact Points

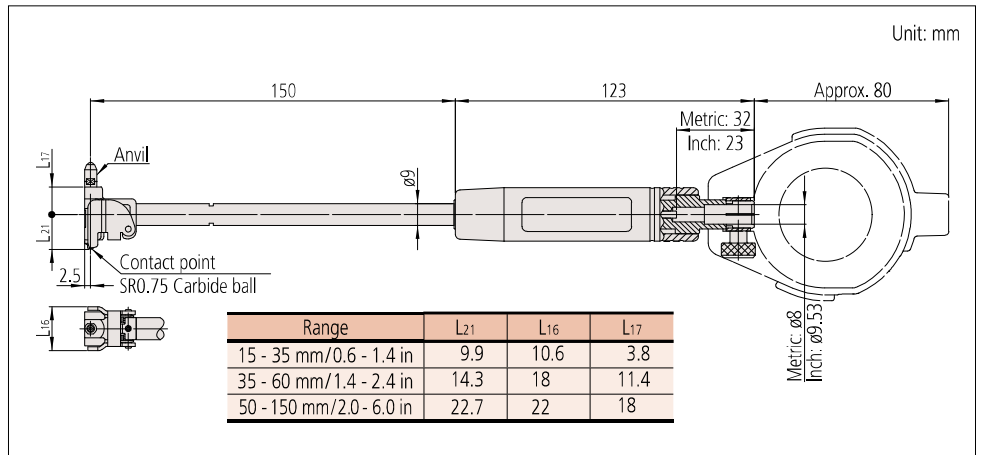


## Recommended Digimatic Indicators (see Chapter F)

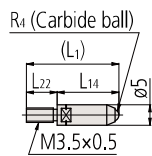
- Metric models: **543-310B (ID-C112GXB)**: 0.001 mm
- Inch models: **543-312B (ID-C112GEXB)**: 0.001 mm/0.00005 in
- The ID measurement can be performed easily since the minimum value is detected automatically.
- Up to three combinations of master value and the tolerance value can be set.
- Nine measurement results (maximum) can be saved and recalled from memory (when no external device is connected).
- Refer to page F-14 for details.



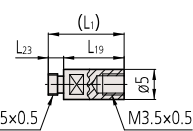
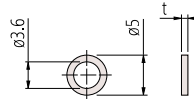
## DIMENSIONS



### Anvil

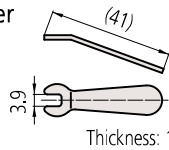


### Interchangeable washer

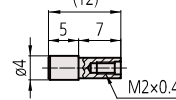


Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

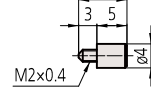
### Spanner 204354



### Washer holder 212202



### Locking screw 212203



## STANDARD ACCESSORIES

Bore gage (Main body)	Anvil							Interchangeable washer		Sub-Anvil		
	Marked No.	Order No.	Indication of measuring size	L1	L22	R4	L14	Order No.	t	Order No.	L23	L19
511-415 511-418 ( ) Using 10 mm/0.4 in Sub-Anvil	1	21DZA376A	15 mm (25 mm)/0.59 in (0.98 in)	4.5	2.5	SR1	2	212127	0.5 mm/0.02 in	21DAA563	2.5	10 mm/0.4 in
	2	21DZA376B	16 mm (26 mm)/0.63 in (1.02 in)	5.5			3					
	3	21DZA376C	17 mm (27 mm)/0.67 in (1.06 in)	6.5			4					
	4	21DZA376D	18 mm (28 mm)/0.71 in (1.10 in)	7.5			5					
	5	21DZA376E	19 mm (29 mm)/0.75 in (1.14 in)	8.5			6					
	6	21DZA376F	20 mm (30 mm)/0.79 in (1.18 in)	9.5			7					
	7	21DZA376G	21 mm (31 mm)/0.83 in (1.22 in)	10.5			8					
	8	21DZA376H	22 mm (32 mm)/0.87 in (1.26 in)	11.5			9					
	9	21DZA376J	23 mm (33 mm)/0.91 in (1.30 in)	12.5			10					
	10	21DZA376L	24 mm (34 mm)/0.94 in (1.34 in)	13.5			11					
	11	21DZA376M	25 mm (35 mm)/0.98 in (1.38 in)	14.5			12					
511-416 511-419	1	21DZA404A	35 mm/1.38 in	17.5			7.5					
	2	21DZA404B	40 mm/1.57 in	22.5	15							
	3	21DZA404C	45 mm/1.77 in	27.5	20							
	4	21DZA404D	50 mm/1.97 in	32.5	25							
	5	21DZA404E	55 mm/2.17 in	37.5	30							
	6	21DZA404F	60 mm/2.36 in	42.5	35							
511-417 511-420 ( ) Using 50 mm/2 in Sub-Anvil	1	21DZA404A	50 mm (100 mm)/1.97 in (3.94 in)	17.5	7.5	SR1.5	10	212127 212128 212129 212130	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in	21DAA596	7.5	50 mm/2 in
	2	21DZA404B	55 mm (105 mm)/2.17 in (4.13 in)	22.5			15					
	3	21DZA404C	60 mm (110 mm)/2.36 in (4.33 in)	27.5			20					
	4	21DZA404D	65 mm (115 mm)/2.56 in (4.53 in)	32.5			25					
	5	21DZA404E	70 mm (120 mm)/2.76 in (4.72 in)	37.5			30					
	6	21DZA404F	75 mm (125 mm)/2.95 in (4.92 in)	42.5			35					
	7	21DZA404G	80 mm (130 mm)/3.15 in (5.12 in)	47.5			40					
	8	21DZA404H	85 mm (135 mm)/3.35 in (5.31 in)	52.5			45					
	9	21DZA404J	90 mm (140 mm)/3.54 in (5.51 in)	57.5			50					
	10	21DZA404L	95 mm (145 mm)/3.74 in (5.71 in)	62.5			55					
	11	21DZA404M	100 mm (150 mm)/3.94 in (5.91 in)	67.5			60					

# Bore Gages

For easy and accurate measurement of inside diameters

## Bore Gages SERIES 511 — ABSOLUTE Digimatic Bore Gages

**MeasurLink<sup>®</sup> ENABLED**  
Data Management Software by Mitutoyo

- These ABSOLUTE Digimatic bore gages are exclusively designed for inside diameter measurement.
- ABS (ABSOLUTE) type bore gages are not subject to overspeed error.
- Up to four Extension Rods (optional) can be connected for measuring at the bottom of a hole 2 m deep.

- The display and grip can be rotated up to 320° and the display can be inclined up to 90°, so that it is easily readable from any direction.
- The minimum value holding function provides easy measurement of hole diameter.
- The gauge block set for master setting allows quick and accurate zero-point setting.
- A Bore Gage Checker and a range of Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to pages C-46 and C-47)



511-501



## SPECIFICATIONS

Metric		
Order No.	511-501	511-502
Range	45 - 100 mm	100 - 160 mm
Stroke of contact point	1.2 mm	
Resolution	0.001 mm	
Accuracy	Overall*1	0.003 mm or less
	Adjacent error	0.002 mm or less
	Repeatability	0.002 mm or less
Measuring force	5 N or less	
Guide force	10 N or less	
Battery	SR44 (2 pcs.), <b>938882</b> For initial operational checks (standard accessory)	
Battery life*2	Approx. 2,000 hours under normal use.	
Scale type	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC60529/JIS D0207, C0920)	
Display	<ul style="list-style-type: none"> <li>• 7 segments 6 digits decimal numeric with minus sign, in/mm</li> <li>• Tolerance judge indication</li> <li>• Analog indication</li> </ul>	
Net weight	500 g	570 g

Inch		
Order No.	511-521	511-522
Range	1.8 - 4.0 in	4.0 - 6.5 in
Stroke of contact point	0.048 in/1.2 mm	
Resolution	0.00005 in/0.001 mm	
Accuracy	Overall*1	0.0001 in/0.003 mm or less
	Adjacent error	0.00008 in/0.002 mm or less
	Repeatability	0.0001 in/0.002 mm or less
Measuring force	5 N or less	
Guide force	10 N or less	
Battery	SR44 (2 pcs.), <b>938882</b> For initial operational checks (standard accessory)	
Battery life*2	Approx. 2,000 hours under normal use.	
Scale type	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC60529/JIS D0207, C0920)	
Display	<ul style="list-style-type: none"> <li>• 7 segments 6 digits decimal numeric with minus sign, in/mm</li> <li>• Tolerance judge indication</li> <li>• Analog indication</li> </ul>	
Net weight	500 g	570 g

\*1 A quantizing error is excluded.

\*2 When the usage time per day is eight hours.

\*3 If the contact point detecting speed is over 50 μm/s, the peak value may not be displayed correctly.

\*4 The level indicated is valid only if the output connector cap is installed.

MeasurLink<sup>®</sup> ENABLED  
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink (refer to page A-5 for details).

**ABSOLUTE™**



### Function

- Preset function
- Master value registration (3 values maximum)
- Tolerance judgment
- Upper/lower limit registration (3 values maximum)
- Minimum value holding
- Data output
- Display rotation (320°)
- Display inclination (90°, 7 steps)
- Low battery alarm display
- Error display

### Optional Accessories

- Extension rod  
250 mm (10 in): **21DZA089**  
500 mm (20 in): **21DZA081**  
Up to four extension rods can be jointed, and a maximum length of 2 m is allowed.
- Example of Connection  
Using four 500 mm extension rods
- SPC Cable:  
1 m: **905338**  
2 m: **905409**  
Refer to pages A-27 to A-29
- USB Input Tool Direct (2 m): **06AFM380F**  
Refer to page A-28
- USB Keyboard Signal Conversion Type  
Communication Conversion Type: **264-016**
- RS-232C Communication Conversion Type: **264-007**  
Refer to page A-14
- Connecting Cables for **U-WAVE-T** (160 mm): **02AZD790F**  
For foot switch: **02AZE140F**  
Refer to page A-20
- Digimatic Mini-Processor **DP-1VA LOGGER: 264-505**

## Gauge Blocks and Block Sets for Setting the Origin or Master Value (optional)

- Typical application



- Rectangular gauge blocks
- Note: Available only for 511-501/521  
**516-118-10**  
**516-118-60** with calibration certificate

Description*	Order No.	Qty	
Nominal length (mm)	1	<b>611611-021</b>	1
	2	<b>611612-021</b>	1
	3	<b>611613-021</b>	1
	5	<b>611615-021</b>	1
	10	<b>611671-021</b>	1
	20	<b>611672-021</b>	1
	30	<b>611673-021</b>	1
40	<b>611674-021</b>	1	
Flat jaw	<b>630030</b>	1 pair (2 pcs.)	
Holder 160 mm	<b>619004</b>	1	
Certificate of inspection		1	

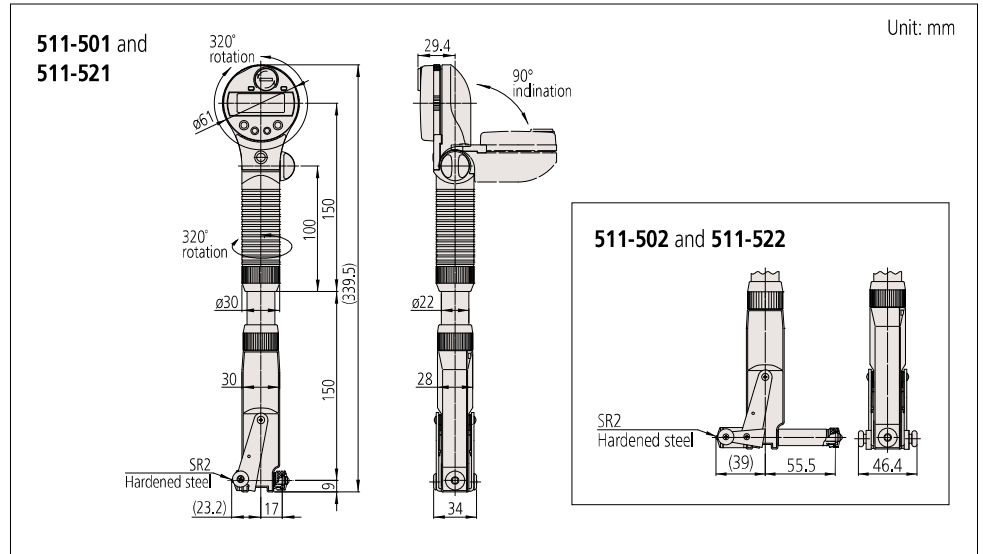
\* Equivalent to JIS B 7506 Grade 0

- Square gauge blocks
- Note: Available only for 511-501/521  
**516-119-10**  
**516-119-60** with calibration certificate

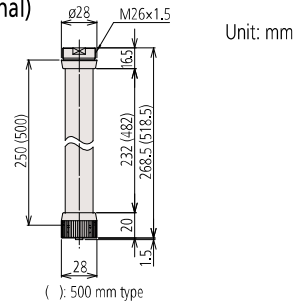
Description*	Order No.	Qty	
Nominal length (mm)	1	<b>614611-021</b>	1
	2	<b>614612-021</b>	1
	3	<b>614613-021</b>	1
	5	<b>614615-021</b>	1
	10	<b>614671-021</b>	1
	20	<b>614672-021</b>	1
	30	<b>614673-021</b>	1
40	<b>614674-021</b>	1	
Flat jaw	<b>619072</b>	1 pair (2 pcs.)	
Tie rod 3 in	<b>619062</b>	1	
Tie rod 2 1/4 in	<b>619063</b>	1	
Tie rod 1 1/2 in	<b>619064</b>	1	
Flat head screw 1 1/4 in	<b>619057</b>	2	
Flat head screw 5/8 in	<b>619058</b>	2	
Certificate of inspection		1	

\* Equivalent to JIS B 7506 Grade 0

## DIMENSIONS

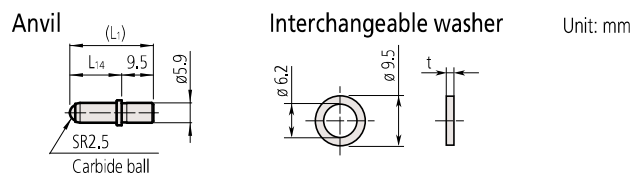


### Extension rod (optional)



## STANDARD ACCESSORIES

Bore gage	Anvil					Interchangeable washer	
(Main body)	Marked No.	Order No.	Indication of measuring size	L <sub>1</sub> (mm)	L <sub>14</sub> (mm)	Order No.	t
<b>511-501</b> <b>511-521</b>	1	<b>21DZA232A</b>	45 mm/1.8 in	15	5.5	<b>205457</b> <b>205458</b> <b>205459</b> <b>205460</b>	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in
	2	<b>21DZA232B</b>	50 mm/2.0 in	20	10.5		
	3	<b>21DZA232C</b>	55 mm/2.2 in	25	15.5		
	4	<b>21DZA232D</b>	60 mm/2.4 in	30	20.5		
	5	<b>21DZA232E</b>	65 mm/2.6 in	35	25.5		
	6	<b>21DZA232F</b>	70 mm/2.8 in	40	30.5		
	7	<b>21DZA232G</b>	75 mm/3.0 in	45	35.5		
	8	<b>21DZA232H</b>	80 mm/3.2 in	50	40.5		
	9	<b>21DZA232J</b>	85 mm/3.4 in	55	45.5		
	10	<b>21DZA232L</b>	90 mm/3.6 in	60	50.5		
	11	<b>21DZA232M</b>	95 mm/3.8 in	65	55.5		
	12	<b>21DZA232N</b>	100 mm/4.0 in	70	60.5		
<b>511-502</b> <b>511-522</b>	1	<b>21DZA232A</b>	100 mm/4.0 in	15	5.5	<b>205457</b> <b>205458</b> <b>205459</b> <b>205460</b>	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in
	2	<b>21DZA232B</b>	105 mm/4.2 in	20	10.5		
	3	<b>21DZA232C</b>	110 mm/4.4 in	25	15.5		
	4	<b>21DZA232D</b>	115 mm/4.6 in	30	20.5		
	5	<b>21DZA232E</b>	120 mm/4.8 in	35	25.5		
	6	<b>21DZA232F</b>	125 mm/5.0 in	40	30.5		
	7	<b>21DZA232G</b>	130 mm/5.2 in	45	35.5		
	8	<b>21DZA232H</b>	135 mm/5.4 in	50	40.5		
	9	<b>21DZA232J</b>	140 mm/5.6 in	55	45.5		
	10	<b>21DZA232L</b>	145 mm/5.8 in	60	50.5		
	11	<b>21DZA232M</b>	150 mm/6.0 in	65	55.5		
	12	<b>21DZA232N</b>	155 mm/6.2 in	70	60.5		
	13	<b>21DZA232P</b>	160 mm/6.4 in	75	65.5		



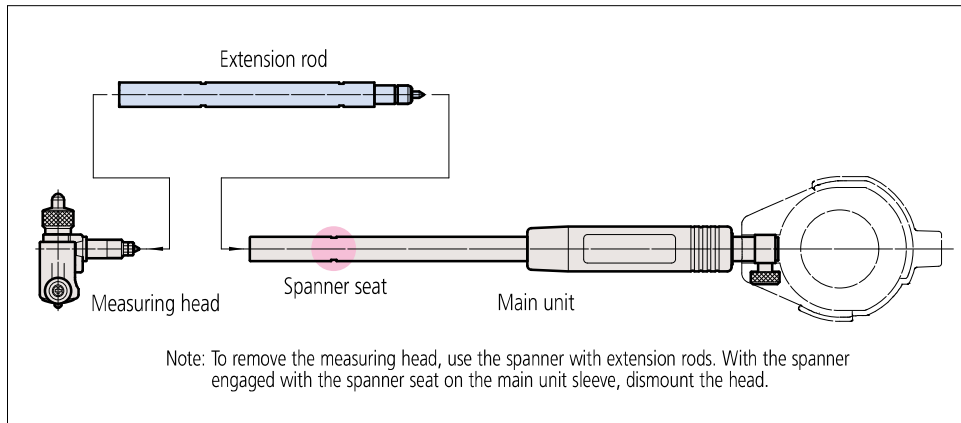


# Bore Gages

For easy and accurate measurement of inside diameters

## Extension Rod SERIES 511 — Accessories for Bore Gages

- Extension Rods (optional) are available to assist in deep-hole measurement.
- If two or more Extension Rods are connected together, measurement errors may occur due to flexure of the rod assembly. Therefore it is best to use no more than a single Extension Rod.
- Extension Rods are available up to 1,000 mm in length.
- Cannot be connected to products with special sizes or special specifications.
- When using a 500 mm (or longer) Extension Rod, use the bore gage in an upright position.
- The accuracy and security of the assembly should be confirmed after connecting an Extension Rod.



## SPECIFICATIONS

Applicable model Order No.	Extension rod length (mm)					Extension rod diameter (mm)	Spanner Order No.
	125	250	500	750	1000		
511-701/511-731 511-415/511-418 511-416/511-419 511-417/511-420	953549	953550	953551	—	—	∅9	102148 (2 pcs.)
511-702/511-732 511-703/511-733 511-704/511-734 511-803/511-833 511-804/511-834	953552	953553	953554	953555	953556	∅12	212556 (2 pcs.)
511-705/511-735 511-706/511-736 511-805/511-835 511-806/511-836 511-807/511-837 511-808/511-838	953557	952361	953558	953559	953560	∅15	212556 (2 pcs.)

Note 1: If an extension rod is attached, the measuring accuracy may degrade due to factors such as rod deflection.  
Note 2: Spanner is supplied as standard.

## Protection cover

- Both the flat backplate of a dial indicator and backplate with a lug can be attached to a protection cover. It can also be attached to Digimatic Indicators (**543-310B**, **543-312B**).

