

Bore Gages

Bore Gages SERIES 526 — for Extra Small Holes

- This series allows for agile and highly accurate comparative measurement of $\varnothing 1$ to 7 mm inside diameters.



526-170-11

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

- We offer an array of indicators. Contact us if you prefer any indicator other than the standard recommended indicator.
- Optional stand (215-120-10) is available for efficient measurement of multiple small holes.

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			
526-172-20	0.95 - 1.55	4		526-170-10	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-162-20	1.50 - 3.95	4		526-160-10			
526-152-20	3.70 - 7.30	6		526-150-10			
526-173-20	0.95 - 1.55	4		526-170-10	2046AB (Graduation: 0.01 mm)	21DZA000	
526-163-20	1.50 - 3.95	4		526-160-10			
526-153-20	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			
526-172-21	0.95 - 1.55	4		526-170-10	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-162-21	1.50 - 3.95	4		526-160-10			
526-152-21	3.70 - 7.30	6		526-150-10			
526-173-21	0.95 - 1.55	4		526-170-10	2046AB (Graduation: 0.01 mm)	21DZA000	
526-163-21	1.50 - 3.95	4		526-160-10			
526-153-21	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				
526-176-20	0.037 - 0.061	0.00016		526-175-10	2923AB-10 (Graduation: 0.0001 in)	21DZA000		
526-166-20	0.059 - 0.156	0.00016		526-165-10				
526-156-20	0.146 - 0.287	0.00024		526-155-10				
526-175-11	0.037 - 0.061	0.00016		526-175-10	Not supplied	Not supplied		Supplied
526-165-11	0.059 - 0.156	0.00016		526-165-10				
526-155-11	0.146 - 0.287	0.00024		526-155-10				
526-176-21	0.037 - 0.061	0.00016		526-175-10	2923AB-10 (Graduation: 0.0001 in)	21DZA000		
526-166-21	0.059 - 0.156	0.00016		526-165-10				
526-156-21	0.146 - 0.287	0.00024		526-155-10				

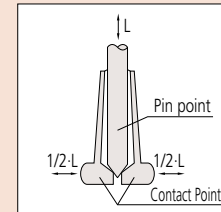
* Accuracy of the bore gage alone.

Note: Setting rings are not supplied with some models. Please purchase them separately if necessary. For details of setting rings, refer to page C-52.

Measurement example



Measurement Principle



Setting Rings (Metric)

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)

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

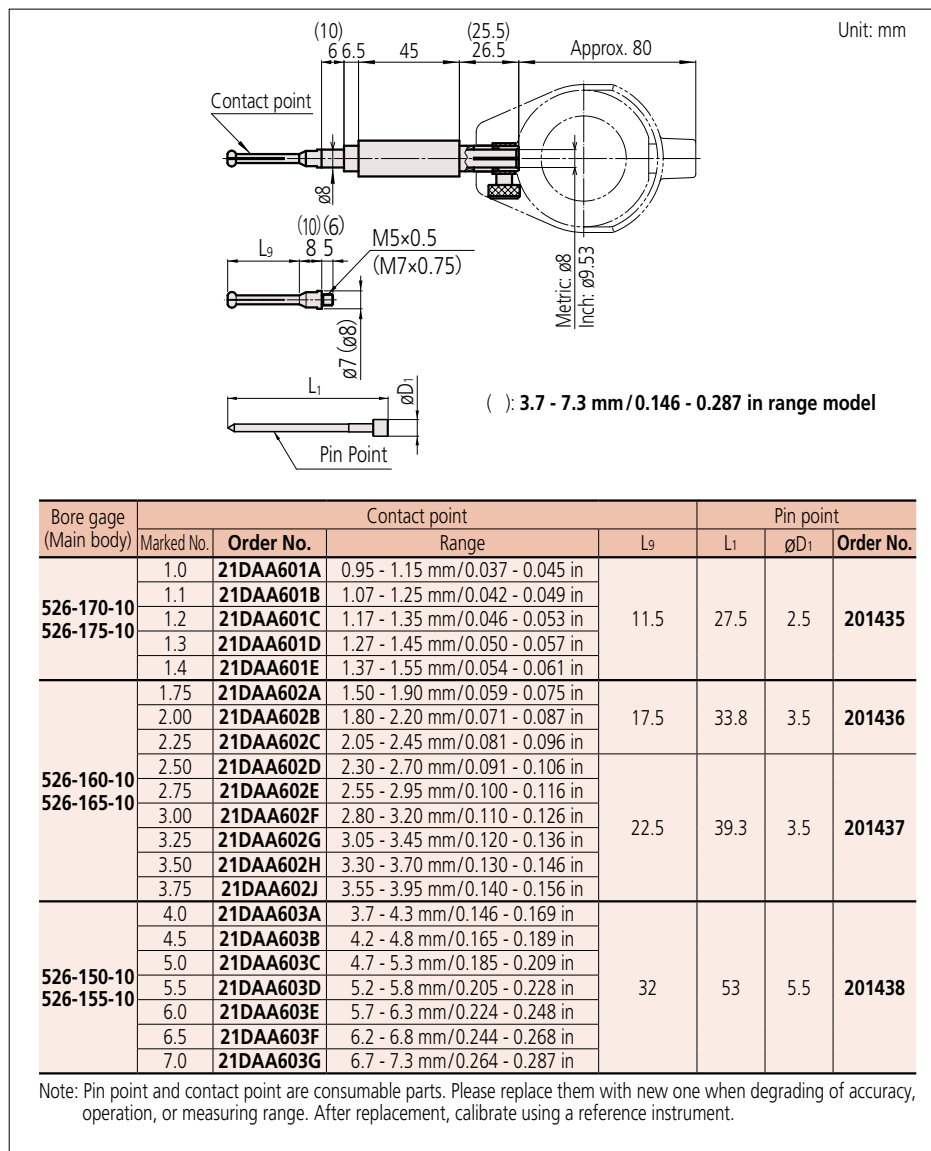
177-369: 0.26 in

177-370: 0.28 in

DIMENSIONS

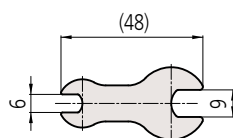
The dial protection cover, recommended indicators

Refer to page C-50.

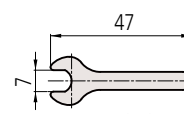


Spanner

210188



102148

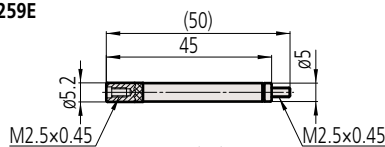


Thickness: 1.5

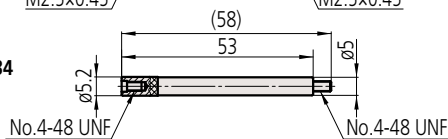
Unit: mm

Extension rod

21AAA259E



213634



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

Bore gage	Spanner	Extension rod
526-170-10	210188	21AAA259E
526-160-10		
526-150-10		
526-175-10	210188	213634
526-165-10		
526-155-10		

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

Bore Gages

Bore Gages SERIES 526 — for Extra Small Holes

- This series allows for agile and highly accurate comparative measurement of $\varnothing 7$ to 18 mm inside diameters.
- We offer an array of indicators. Contact us if you prefer any indicator other than the standard recommended indicator.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.



526-101

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

SPECIFICATIONS

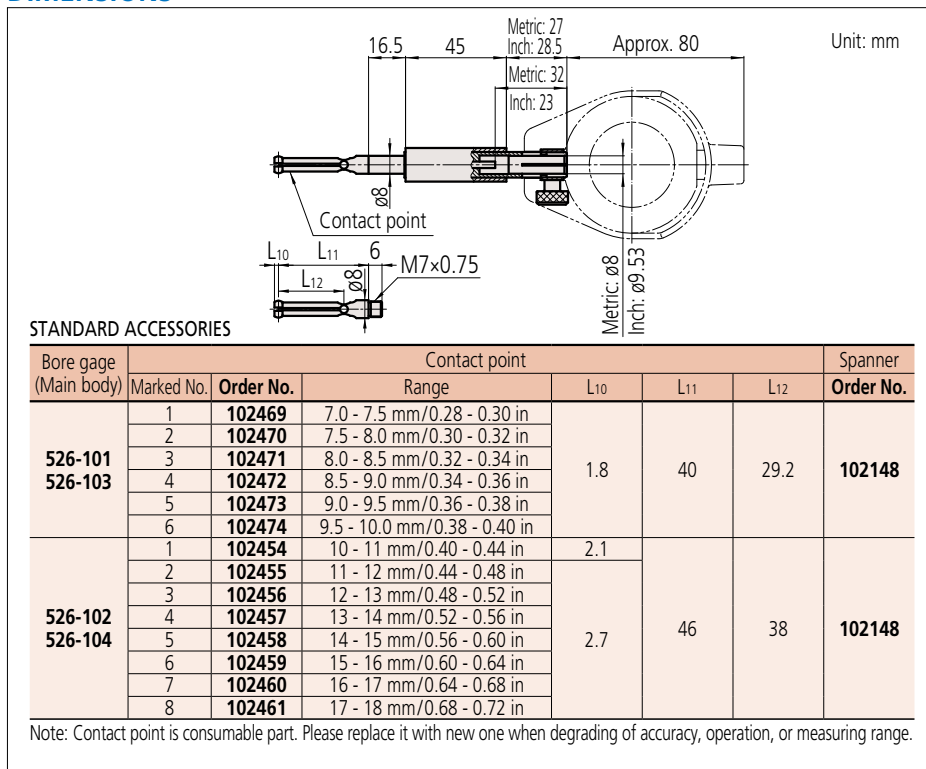
Metric							
Order No.	Range (mm)	Accuracy* (μm)	Repeatability* (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-101	7 - 10	4	2	526-101	Not supplied	Not supplied	Not supplied
526-102	10 - 18	6		526-102			
526-124-20	7 - 10	4		526-101	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-125-20	10 - 18	6		526-102			
526-126-20	7 - 10	4		526-101	2046AB (Graduation: 0.01 mm)	21DZA000	
526-127-20	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			
526-122-20	0.3 - 0.4	0.00016		526-103	2923AB-10 (Graduation: 0.0001 in)	21DZA000	
526-123-20	0.4 - 0.7	0.00024		526-104			
526-119-20	0.3 - 0.4	0.00016		526-103	2922AB (Graduation: 0.0005 in)	21DZA000	
526-120-20	0.4 - 0.7	0.00024		526-104			

* Accuracy of the bore gage alone.

Note: Setting rings are not supplied.

Please purchase them separately if necessary. For details of the setting rings, refer to page C-52.

DIMENSIONS



STANDARD ACCESSORIES

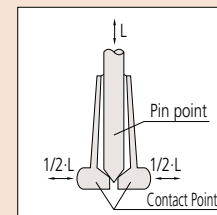
Bore gage (Main body)	Contact point						Spanner Order No.
	Marked No.	Order No.	Range	L ₁₀	L ₁₁	L ₁₂	
526-101 526-103	1	102469	7.0 - 7.5 mm/0.28 - 0.30 in	1.8	40	29.2	102148
	2	102470	7.5 - 8.0 mm/0.30 - 0.32 in				
	3	102471	8.0 - 8.5 mm/0.32 - 0.34 in				
	4	102472	8.5 - 9.0 mm/0.34 - 0.36 in				
	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 example



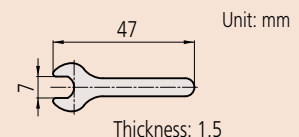
Measurement Principle



The dial protection cover, recommended indicators

Refer to page C-50.

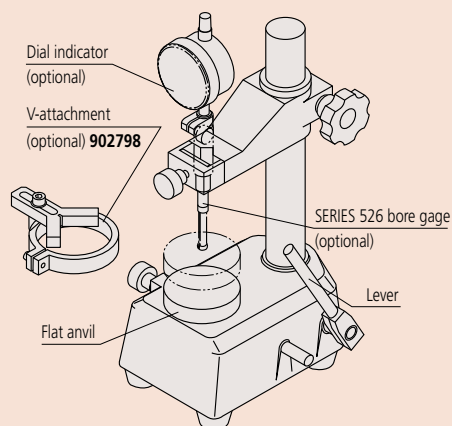
Spanner 102148



Bore Gage Stand SERIES 215

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.



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

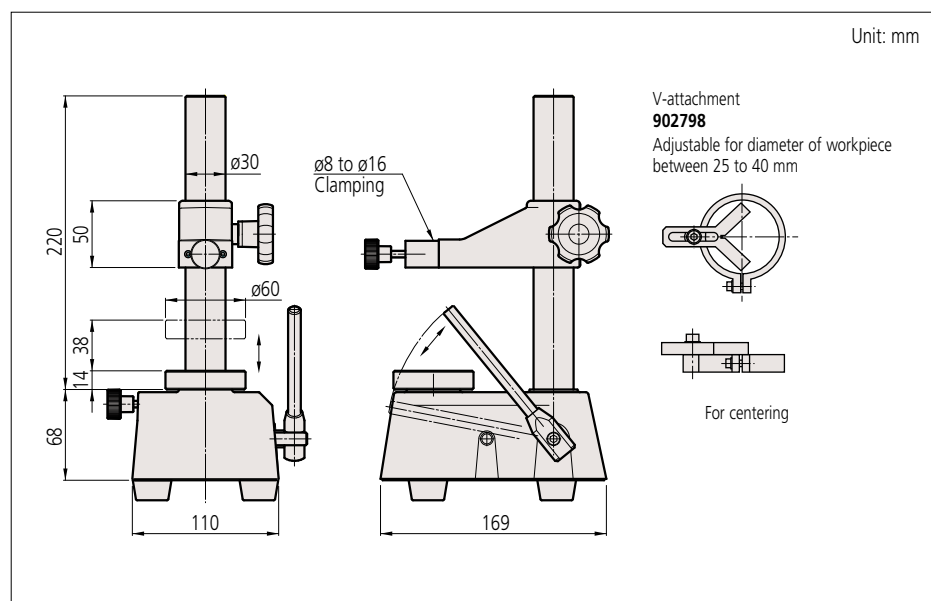


215-120-10

SPECIFICATIONS

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

DIMENSIONS



Bore Gages

Bore Gages SERIES 511 — for Small Holes

- These gages are designed to measure the diameters of very small holes.
- 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.
- Customized products with a longer rod below the grip or with a carbide anvil are available upon request.



511-201

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

SPECIFICATIONS

Metric

Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)
511-209	6 - 10	0.5	5	2	2	2 or less	—
511-201	10 - 18.5	0.6					6 or less
511-210-20	6 - 10	0.5	5	2	2	2 or less	—
511-203-20	10 - 18.5	0.6					6 or less
511-211-20	6 - 10	0.5	5	2	2	2 or less	—
511-204-20	10 - 18.5	0.6					6 or less

Order No.	Content of set					Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	511-209	Not supplied	Not supplied	9 pcs.	Not supplied	50
511-201	511-201				1 pc.	100
511-210-20	511-209	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	Not supplied	50
511-203-20	511-201				1 pc.	100
511-211-20	511-209	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	Not supplied	50
511-204-20	511-201				1 pc.	100

Inch

Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-214	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-205	0.4 - 0.74	0.024					6 or less
511-212-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-206-20	0.4 - 0.74	0.024					6 or less
511-213-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-207-20	0.4 - 0.74	0.024					6 or less

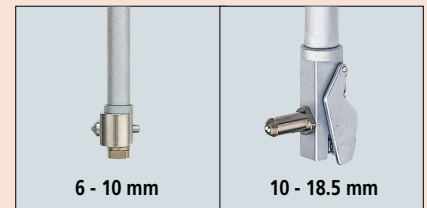
Order No.	Content of set					Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	511-214	Not supplied	Not supplied	9 pcs.	Not supplied	2
511-205	511-205				1 pc.	4
511-212-20	511-214	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	Not supplied	2
511-206-20	511-205				1 pc.	4
511-213-20	511-214	2922AB (Graduation: 0.0005 in)	21DZA000	9 pcs.	Not supplied	2
511-207-20	511-205				1 pc.	4

* Accuracy of the bore gage alone.

Measurement example



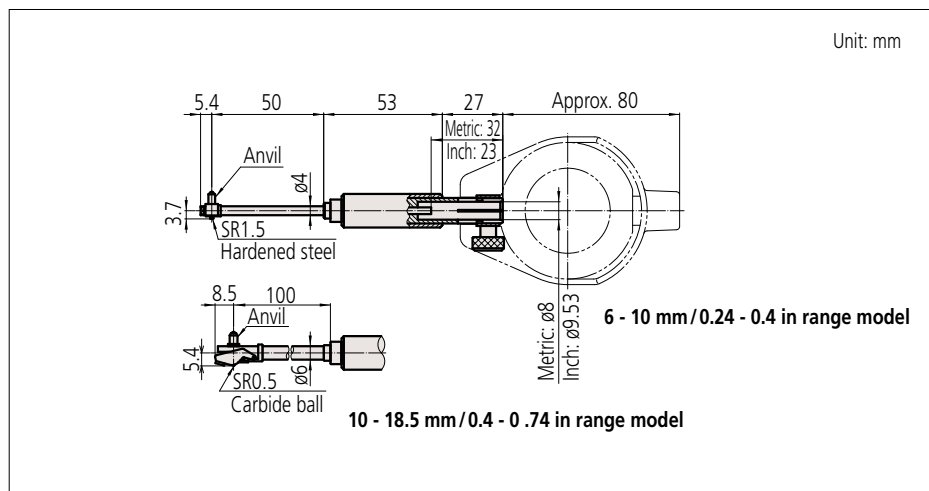
Contact Points



The dial protection cover, recommended indicators

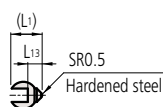
Refer to page C-50.

DIMENSIONS

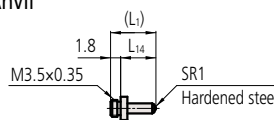


Unit: mm

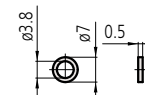
511-209 / 511-214
Anvil



511-201 / 511-205
Anvil



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



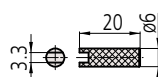
204355

STANDARD ACCESSORIES

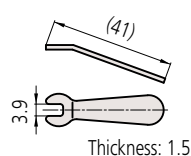
Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Order No.	Indication of measuring size	L ₁	L ₁₃	Order No.	Order No.
511-209 511-214	1	952168	6.0 mm / 0.24 in	4.7	1.2	Not supplied	206709
	2	952169	6.5 mm / 0.26 in	5.3	1.7		
	3	952170	7.0 mm / 0.28 in	5.8	2.2		
	4	952414	7.5 mm / 0.30 in	6.3	2.7		
	5	952415	8.0 mm / 0.32 in	6.8	3.2		
	6	952416	8.5 mm / 0.34 in	7.3	3.7		
	7	952417	9.0 mm / 0.36 in	7.8	4.2		
	8	952418	9.5 mm / 0.38 in	8.3	4.7		
	9	952419	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 ₁	L ₁₄	Order No.	Order No.
511-201 511-205	1	204356	10 mm / 0.40 in	3.8	2	204355	204354
	2	204357	11 mm / 0.44 in	4.8	3		
	3	204358	12 mm / 0.48 in	5.8	4		
	4	204359	13 mm / 0.52 in	6.8	5		
	5	204360	14 mm / 0.56 in	7.8	6		
	6	204361	15 mm / 0.60 in	8.8	7		
	7	204362	16 mm / 0.64 in	9.8	8		
	8	204363	17 mm / 0.68 in	10.8	9		
	9	204364	18 mm / 0.72 in	11.8	10		

Spanner
206709



204354



Unit: mm

Bore Gages

Bore Gages SERIES 511

- This series includes models for highly accurate measurement of $\varnothing 18$ to 400 mm inside diameters.
- The contact point and anvil have a carbide ball tip that is highly durable and abrasion-resistant.
- The grip minimizes the variation of indicator values by reducing heat transfer from the operator's hand.
- Optional extension rods are available for measuring deep holes. Customized products with a longer rod below the grip are also available upon request.



511-702

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

SPECIFICATIONS

Metric								
Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)	
511-701	18 - 35	1.2	2	0.5	1	4 or less	6 or less	
511-702	35 - 60					4 or less	6 or less	
511-703	50 - 150	1.6	2	0.5	1	5 or less	10 or less	
511-704	100 - 160					5 or less	10 or less	
511-705	160 - 250					6 or less	15 or less	
511-706	250 - 400							
511-721-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less	
511-722-20	35 - 60					4 or less	6 or less	
511-723-20	50 - 150	1.6	2	0.5	1	5 or less	10 or less	
511-724-20	100 - 160					5 or less	10 or less	
511-725-20	160 - 250					6 or less	15 or less	
511-726-20	250 - 400							
511-711-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less	
511-712-20	35 - 60					4 or less	6 or less	
511-713-20	50 - 150	1.6	2	0.5	1	5 or less	10 or less	
511-714-20	100 - 160					5 or less	10 or less	
511-715-20	160 - 250					6 or less	15 or less	
511-716-20	250 - 400							
511-921-20	18 - 150	See SPECIFICATIONS of 511-701/702/703						
511-922-20								
511-925-10								

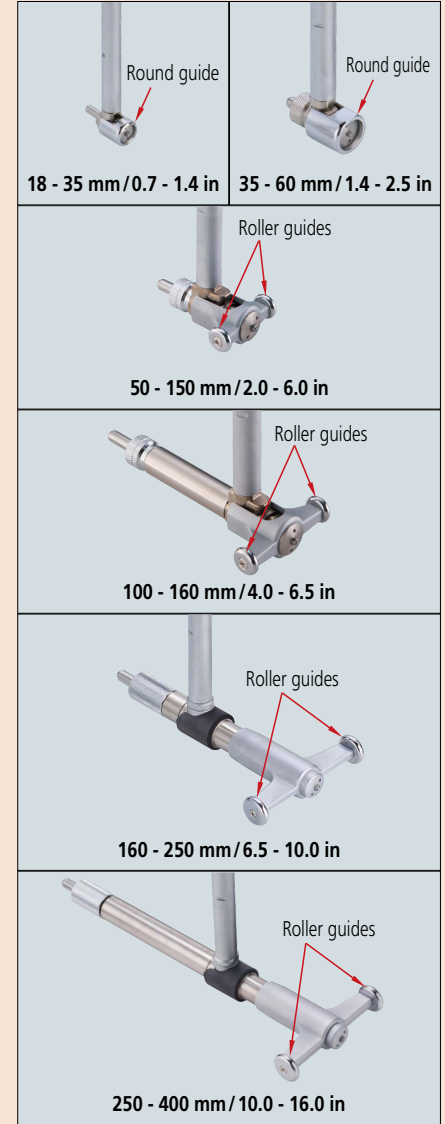
Order No.	Content of set							Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-701	511-701	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-702	511-702			6 pcs.	4 pcs.		1 pc.	
511-703	511-703			11 pcs.		7 pcs.		1 pc.
511-704	511-704			13 pcs.	5 pcs.		1 pc.	
511-705	511-705			6 pcs.		2 pcs.		1 pc.
511-706	511-706			5 pcs.				
511-721-20	511-701	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-722-20	511-702			6 pcs.	4 pcs.		1 pc.	
511-723-20	511-703			11 pcs.		7 pcs.		1 pc.
511-724-20	511-704			13 pcs.	5 pcs.		1 pc.	
511-725-20	511-705			6 pcs.		2 pcs.		1 pc.
511-726-20	511-706			5 pcs.				
511-711-20	511-701	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-712-20	511-702			6 pcs.	4 pcs.		1 pc.	
511-713-20	511-703			11 pcs.		7 pcs.		1 pc.
511-714-20	511-704			13 pcs.	5 pcs.		1 pc.	
511-715-20	511-705			6 pcs.		2 pcs.		1 pc.
511-716-20	511-706			5 pcs.				
511-921-20	Set of	2046AB	21DZA000	See SPECIFICATIONS of 511-701/702/703				
511-922-20	511-701/	2109AB-10						
511-925-10	702/703	543-310B						

* Accuracy of the bore gage alone.

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: 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



Extension Rod

Refer to page C-49.

The dial protection cover, recommended indicators

Refer to page C-50.

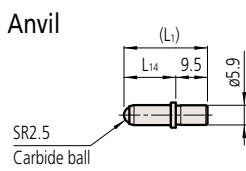
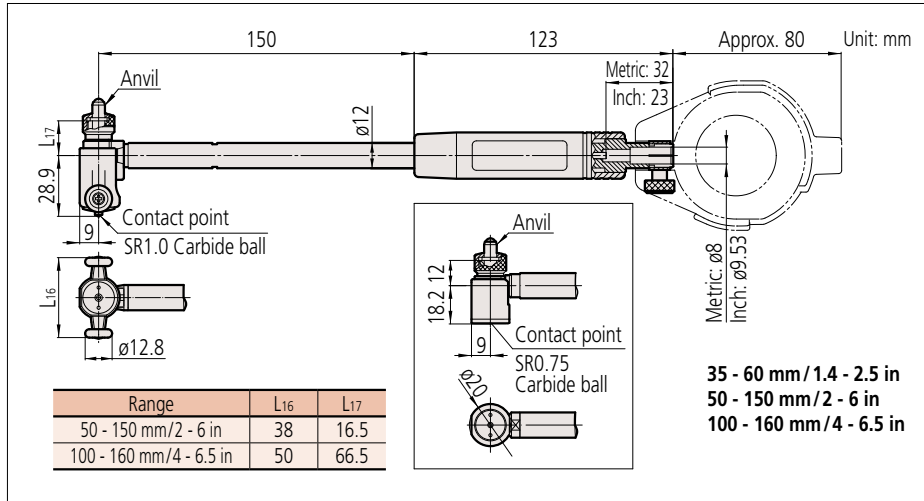
Setting rings

Refer to pages C-52 to C-55.

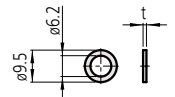
Bore Gages

Bore Gages SERIES 511

DIMENSIONS

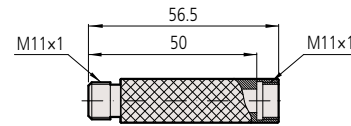


Interchangeable washer



t (mm)	Order No.
0.5	205457
1	205458
2	205459
3	205460

Sub-anvil (Supplied only for 511-703/733)



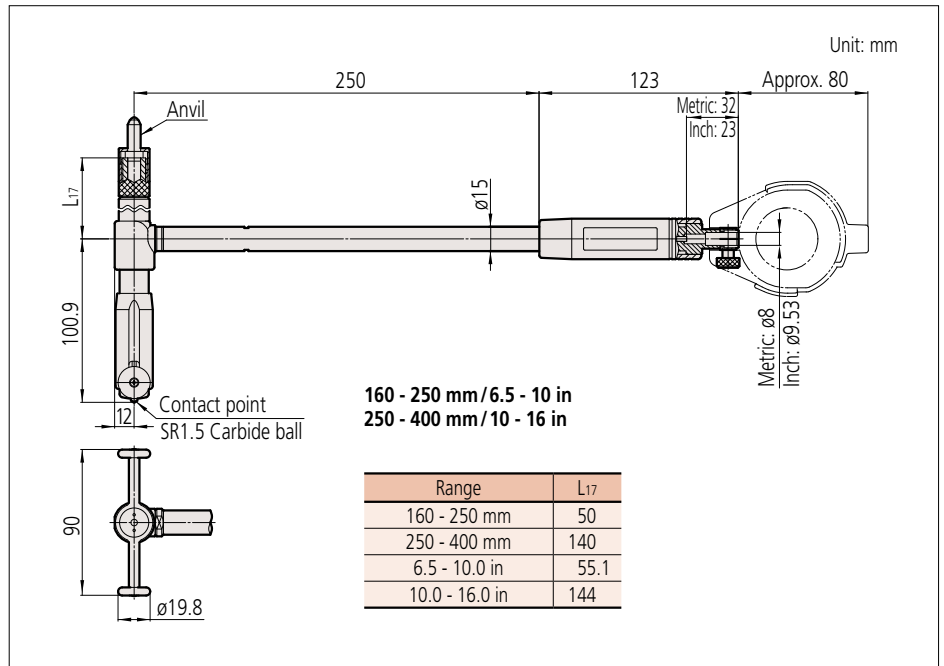
102178

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.)

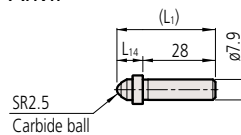
STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Order No.	Indication of measuring size	L ₁	L ₁₄
511-702 511-732	1	21DZA232A	35 mm / 1.38 in	15	5.5
	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
	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
511-704 511-734	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

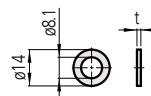
DIMENSIONS



Anvil



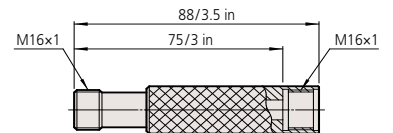
Interchangeable washer



t (mm)	Order No.
0.5	205467
1	205461
2	205462
3	205463
4	205464
5	205465
6	205466

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				
	Marked No.	Order No.	Indication of measuring size	L1	L14
511-705 511-735	1	21DZA241A	160 mm/6.50 in	38	10
	2	21DZA241B	175 mm/7.09 in	53	25
	3	21DZA241C	190 mm/7.68 in	68	40
	4	21DZA241D	205 mm/8.27 in	83	55
	5	21DZA241E	220 mm/8.86 in	98	70
	6	21DZA241F	235 mm/9.45 in	113	85
511-706 511-736 () Using 75 mm/3 in Sub-Anvil	1	21DZA241A	250 mm (325 mm)/10.00 in (13.00 in)	38	10
	2	21DZA241B	265 mm (340 mm)/10.59 in (13.59 in)	53	25
	3	21DZA241C	280 mm (355 mm)/11.18 in (14.18 in)	68	40
	4	21DZA241D	295 mm (370 mm)/11.77 in (14.77 in)	83	55
	5	21DZA241E	310 mm (385 mm)/12.36 in (15.36 in)	98	70

Bore Gages

Bore Gages SERIES 511 — Short Leg Type

- As it is light and easy to handle with a short rod below the grip, the operator can work smoothly when inserting it into a narrow space or measuring an object on the table.
- The contact point and anvil have a carbide ball tip that is highly durable and abrasion-resistant.
- The grip minimizes the variation of indicator values affected by heat transfer from the operator's hand.



511-761 Note: The dial indicator and the dial protection cover are optional.



511-761

SPECIFICATIONS

Metric

Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)
511-761	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-762	35 - 60						
511-763	50 - 150	1.6	2	0.5	1	5 or less	10 or less
511-764	100 - 160						
511-771-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-772-20	35 - 60						
511-773-20	50 - 150	1.6	2	0.5	1	5 or less	10 or less
511-774-20	100 - 160						
511-766-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-767-20	35 - 60						
511-768-20	50 - 150	1.6	2	0.5	1	5 or less	10 or less
511-769-20	100 - 160						

Order No.	Content of set							Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-761	511-761	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-762	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-763	511-763			11 pcs.				
511-764	511-764			13 pcs.				
511-771-20	511-761	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-772-20	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-773-20	511-763			11 pcs.				
511-774-20	511-764			13 pcs.				
511-766-20	511-761	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-767-20	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-768-20	511-763			11 pcs.				
511-769-20	511-764			13 pcs.				

* Accuracy of the bore gage alone.

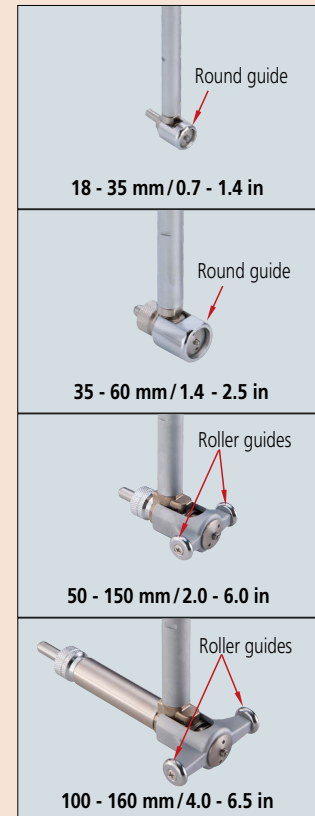
Note 1: A 50 mm sub-anvil is supplied with 511-763.

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.)

Measurement example



Contact Points



The dial protection cover, recommended indicators

Refer to page C-50.

SPECIFICATIONS

Inch							
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-781	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-782	1.4 - 2.5						
511-783	2.0 - 6.0						
511-784	4.0 - 6.5	0.063				5 or less	10 or less
511-791-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-792-20	1.4 - 2.5						
511-793-20	2.0 - 6.0						
511-794-20	4.0 - 6.5	0.063				5 or less	10 or less
511-786-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-787-20	1.4 - 2.5						
511-788-20	2.0 - 6.0						
511-789-20	4.0 - 6.5	0.063				5 or less	10 or less

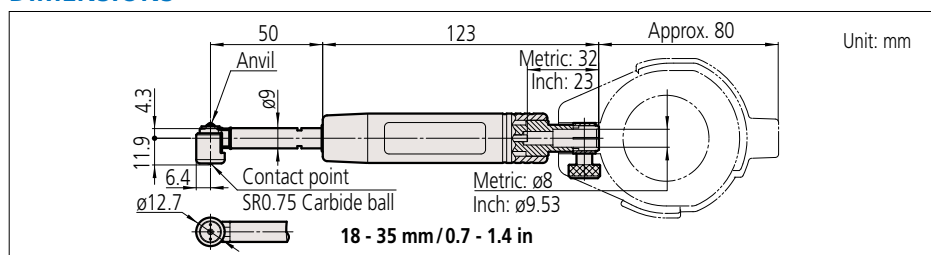
Order No.	Bore gage	Dial indicator	Content of set					Probing depth (in)		
			Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner			
511-781	511-781	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	2		
511-782	511-782			6 pcs.	4 pcs.		Not supplied		Not supplied	
511-783	511-783			11 pcs.						1 pc.
511-784	511-784			13 pcs.						Not supplied
511-791-20	511-781	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2		
511-792-20	511-782			6 pcs.	4 pcs.		1 pc.		Not supplied	
511-793-20	511-783			11 pcs.						Not supplied
511-794-20	511-784			13 pcs.						Not supplied
511-786-20	511-781	2922AB (Graduation: 0.0005 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2		
511-787-20	511-782			6 pcs.	4 pcs.		1 pc.		Not supplied	
511-788-20	511-783			11 pcs.						Not supplied
511-789-20	511-784			13 pcs.						Not supplied

* Accuracy of the bore gage alone.

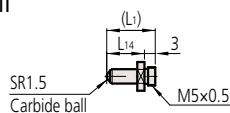
Note 1: A 2 inch sub-anvil is supplied with 511-783.

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.)

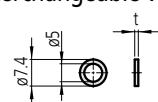
DIMENSIONS



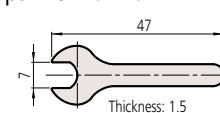
Anvil



Interchangeable washer



Spanner 102148



t (mm)	Order No.
0.5	205623
1	205624

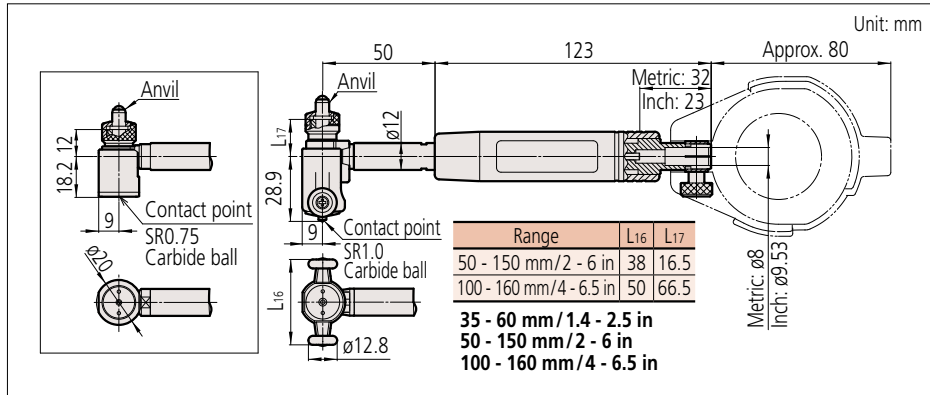
STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Order No.	Anvil		
			Indication of measuring size	L1	L14
511-761 511-781	1	21DZA213A	18 mm/0.71 in	5.5 mm/0.22 in	2.5 mm/0.10 in
	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

Bore Gages

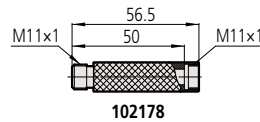
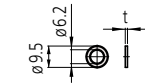
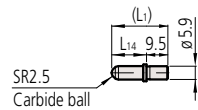
Bore Gages SERIES 511 — Short Leg Type

DIMENSIONS



Unit: mm

Anvil Interchangeable washer Sub-anvil (Supplied only for 511-763 and 511-783.)



t (mm)	Order No.
0.5	205457
1	205458
2	205459
3	205460

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				
	Marked No.	Order No.	Indication of measuring size	L1	L14
511-762 511-782	1	21DZA232A	35 mm / 1.38 in	15	5.5
	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
511-763 511-783 () 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
	11	21DZA232M	100 mm (150 mm) / 3.88 in (5.91 in)	65	55.5
511-764 511-784	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

Recommended Digimatic Indicators

Refer to page C-36.

Bore Gages SERIES 511 — with Micrometer Head

Measurement example



The dial protection cover, recommended indicators

Refer to page C-50.

- This series includes models for measuring $\varnothing 60$ to 800 mm inside diameters.
- The micrometer head is used for dimensional setting. The dimension can be easily changed without replacing the anvil and washer.
- The contact point has a carbide ball tip that is highly durable and abrasion-resistant.
- The grip minimizes the variation of indicator values affected by heat transfer from the operator's hand.



511-803

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

SPECIFICATIONS

Metric							
Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)
511-803	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-804	100 - 160					6 or less	15 or less
511-805	150 - 250						
511-806	250 - 400						
511-807	400 - 600						
511-808	600 - 800	1.6	2	0.5	1	5 or less	10 or less
511-823-20	60 - 100					6 or less	15 or less
511-824-20	100 - 160						
511-825-20	150 - 250						
511-826-20	250 - 400						
511-827-20	400 - 600	1.6	2	0.5	1	5 or less	10 or less
511-828-20	600 - 800					6 or less	15 or less
511-813-20	60 - 100						
511-814-20	100 - 160						
511-815-20	150 - 250						
511-816-20	250 - 400	6 or less	15 or less				
511-817-20	400 - 600						
511-818-20	600 - 800			20 or less			

Order No.	Bore gage	Dial indicator	Content of set				Probing depth (mm)		
			Dial protection cover	Micrometer head	Sub-Anvil	Spanner			
511-803	511-803	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	150		
511-804	511-804				3 pcs.	2 pcs.			
511-805	511-805				4 pcs.				
511-806	511-806				3 pcs.				
511-807	511-807				2 pcs.	2 pcs.	250		
511-808	511-808	2 pcs.							
511-823-20	511-803	2109AB-10 (Graduation: 0.001 mm)	21DZA000	1 pc.	2 pcs.			3 pcs.	150
511-824-20	511-804				3 pcs.			2 pcs.	
511-825-20	511-805				4 pcs.				
511-826-20	511-806				3 pcs.				
511-827-20	511-807				2 pcs.				
511-828-20	511-808	2 pcs.	21DZA000	1 pc.	2 pcs.	3 pcs.	150		
511-813-20	511-803	3 pcs.			2 pcs.				
511-814-20	511-804	4 pcs.							
511-815-20	511-805	3 pcs.							
511-816-20	511-806	2 pcs.			2 pcs.	250			
511-817-20	511-807	2 pcs.							
511-818-20	511-808	2 pcs.							

* Accuracy of the bore gage alone.

Note 1: Storage boxes for 511-807/808 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.)

Bore Gages

Bore Gages SERIES 511 — with Micrometer Head

SPECIFICATIONS

Recommended Digimatic Indicators

Refer to page C-36.

Inch							
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-833	2.4 - 4.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-834	4.0 - 6.4						
511-835	6.0 - 10.0					6 or less	15 or less
511-836	10.0 - 16.0						
511-837	16.0 - 24.0						
511-838	24.0 - 32.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-853-20	2.4 - 4.0						
511-854-20	4.0 - 6.4					6 or less	15 or less
511-855-20	6.0 - 10.0						
511-856-20	10.0 - 16.0						
511-857-20	16.0 - 24.0	20 or less	20 or less				
511-858-20	24.0 - 32.0						
511-843-20	2.4 - 4.0			0.063	0.00008	0.00002	0.00004
511-844-20	4.0 - 6.4						
511-845-20	6.0 - 10.0	6 or less	15 or less				
511-846-20	10.0 - 16.0						
511-847-20	16.0 - 24.0						
511-848-20	24.0 - 32.0	20 or less	20 or less				

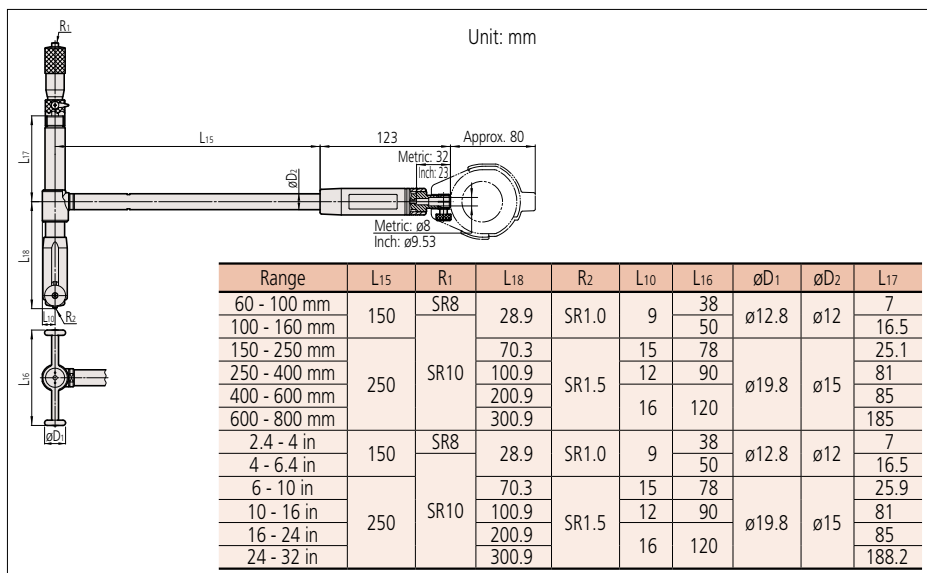
Order No.	Content of set						Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner	
511-833	511-833	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	6
511-834	511-834				3 pcs.	2 pcs.	
511-835	511-835				4 pcs.		
511-836	511-836				3 pcs.		
511-837	511-837				2 pcs.		
511-838	511-838	2 pcs.	3 pcs.	4			
511-853-20	511-833	2923AB-10 (Graduation: 0.0001 in)			21DZA000	1 pc.	2 pcs.
511-854-20	511-834						3 pcs.
511-855-20	511-835						4 pcs.
511-856-20	511-836						3 pcs.
511-857-20	511-837		2 pcs.				
511-858-20	511-838	2 pcs.	2 pcs.	10			
511-843-20	511-833	2922AB (Graduation: 0.0005 in)			21DZA000	1 pc.	2 pcs.
511-844-20	511-834						3 pcs.
511-845-20	511-835						4 pcs.
511-846-20	511-836						3 pcs.
511-847-20	511-837		2 pcs.				
511-848-20	511-838	2 pcs.	3 pcs.	4			

* Accuracy of the bore gage alone.

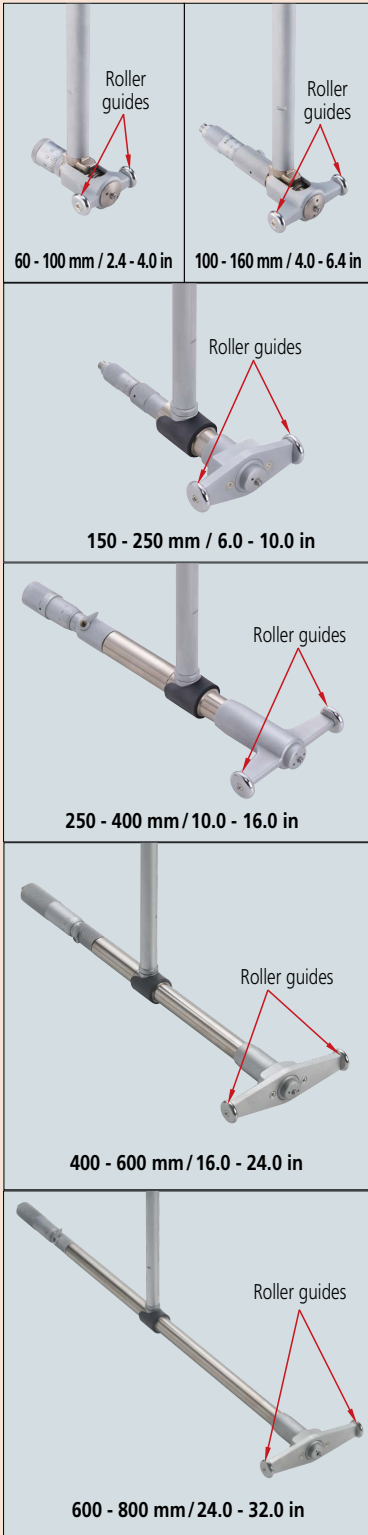
Note 1: Storage boxes for 511-837/838 models are made of wood. The boxes of other models are made of plastic.

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.)

DIMENSIONS

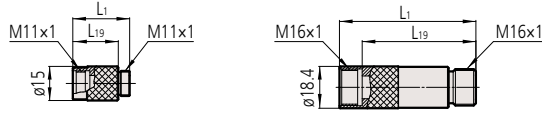


Contact Points



Sub-anvil

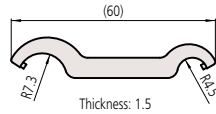
Unit: mm



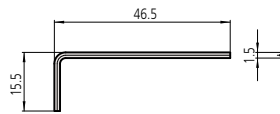
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Spanner

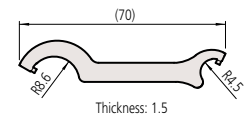
301336



202863



200154



STANDARD ACCESSORIES

Metric								
Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Order No.	Stroke (mm)	Screw size	Marked No. (mm)	Order No.	L ₁ (mm)	L ₁₉ (mm)	Order No.
511-803	21DZA267	10	M11×1	10	208892	15	10	301336 (2 pcs.) 202863 (1 pc.)
				20	208894	25	20	
511-804	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
511-805	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
				50	21DAA492	55	50	
511-806	953118	25	M16×1	25	208926	35	25	200154 (2 pcs.)
				50	208928 (2 pcs.)	60	50	
511-807	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	
511-808	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	

Inch								
Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Order No.	Stroke (in)	Screw size	Marked No. (in)	Order No.	L ₁ (in)	L ₁₉ (in)	Order No.
511-833	21DZA272	0.4	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.) 202863 (1 pc.)
				0.8	208895	1.0	0.8	
511-834	21DZA273	0.5	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
511-835	21DZA273	0.5	M11×1	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	M16×1	1	208927	1.4	1	200154 (2 pcs.)
				2	208929 (2 pcs.)	2.4	2	
511-837	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	
511-838	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	

Bore Gages

Bore Gages SERIES 511 — for Blind Holes

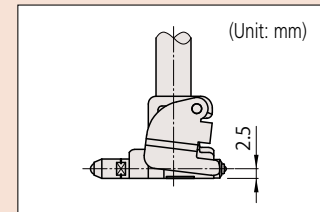
- Capable of ID (inside diameter) measurement close to the bottom of a hole.
- The contact point and anvil have a carbide ball tip that is highly durable and abrasion-resistant.
- Optional Extension Rods can be attached for measuring deep holes. (For details, refer to page C-49)



511-415

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

Measurement example



The dial protection cover, recommended indicators

Refer to page C-50.

SPECIFICATIONS

Metric

Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	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	1	1	4 or less	6 or less	511-415	Not supplied	Not supplied	11 pcs.	1 pc.	150
511-416	35 - 60							511-416			6 pcs.	4 pcs.	
511-417	50 - 150	1.2	4	1	1	5 or less	10 or less	511-417	2046AB (Graduation: 0.01 mm)	21DZA000	11 pcs.	1 pc.	150
511-425-20	15 - 35							511-415			6 pcs.	4 pcs.	
511-426-20	35 - 60	1.2	4	1	1	5 or less	10 or less	511-417	2109AB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150
511-427-20	50 - 150							511-415			6 pcs.	4 pcs.	
511-435-20	15 - 35	1.2	4	1	1	4 or less	6 or less	511-415	2109AB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150
511-436-20	35 - 60							511-416			6 pcs.	4 pcs.	
511-437-20	50 - 150	1.2	4	1	1	5 or less	10 or less	511-417	2109AB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150
511-438-20	15 - 35							511-416			6 pcs.	4 pcs.	

Inch

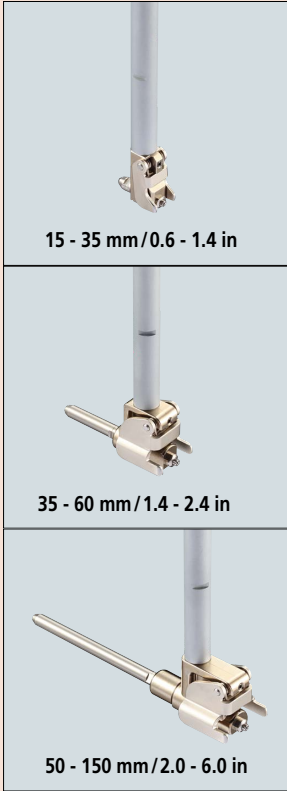
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (in)
								Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-418	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-418	Not supplied	Not supplied	11 pcs.	1 pc.	6
511-419	1.4 - 2.4							511-419			6 pcs.	4 pcs.	
511-420	2.0 - 6.0	0.047	0.00016	0.00004	0.00004	5 or less	10 or less	511-420	2922AB (Graduation: 0.0005 in)	21DZA000	11 pcs.	1 pc.	6
511-428-20	0.6 - 1.4							511-418			6 pcs.	4 pcs.	
511-429-20	1.4 - 2.4	0.047	0.00016	0.00004	0.00004	5 or less	10 or less	511-419	2923AB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	1 pc.	6
511-430-20	2.0 - 6.0							511-420			6 pcs.	4 pcs.	
511-438-20	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-418	2923AB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	1 pc.	6
511-439-20	1.4 - 2.4							511-419			6 pcs.	4 pcs.	
511-440-20	2.0 - 6.0	0.047	0.00016	0.00004	0.00004	5 or less	10 or less	511-420	2923AB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	1 pc.	6
511-441-20	1.4 - 2.4							511-419			6 pcs.	4 pcs.	

* Accuracy of the bore gage alone.

Note 1: A 10 mm (0.4 in) sub-anvil is supplied with 511-415/425-20/435-20/418/428-20/438-20 and a 50 mm (2 in) sub-anvil is supplied with 511-417/427-20/437-20/420/430-20/440-20.

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

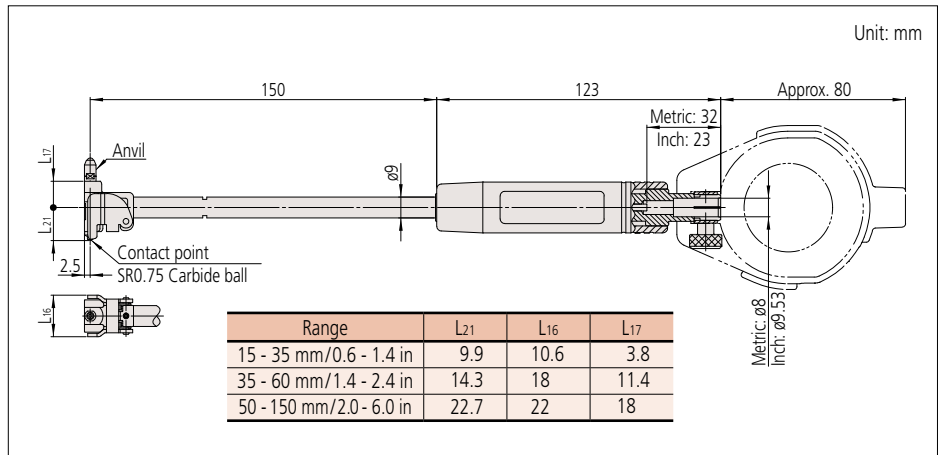


15 - 35 mm / 0.6 - 1.4 in

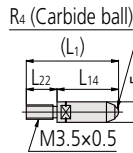
35 - 60 mm / 1.4 - 2.4 in

50 - 150 mm / 2.0 - 6.0 in

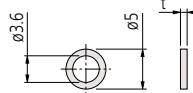
DIMENSIONS



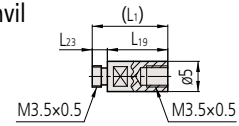
Anvil



Interchangeable washer

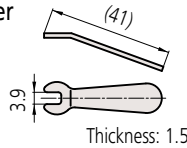


Sub-anvil

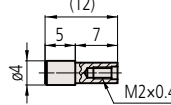


Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

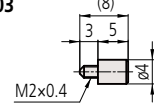
Spanner 204354



Washer holder 212202



Locking screw 212203



Recommended Digimatic Indicators

Refer to page C-36.

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					
	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		SR1	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	2.5		7	212127	0.5 mm / 0.02 in	21DAA563	2.5	10 mm / 0.4 in
	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		SR1.5	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			10				
2		21DZA404B	40 mm / 1.57 in	22.5			15					
3		21DZA404C	45 mm / 1.77 in	27.5			20	212127	0.5 mm / 0.02 in			
4		21DZA404D	50 mm / 1.97 in	32.5	7.5	SR1.5	25	212128	1.0 mm / 0.04 in			
5		21DZA404E	55 mm / 2.17 in	37.5			30	212129	2.0 mm / 0.08 in			
6		21DZA404F	60 mm / 2.36 in	42.5			35	212130	3.0 mm / 0.12 in			
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			10					
	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	212127	0.5 mm / 0.02 in			
	6	21DZA404F	75 mm (125 mm) / 2.95 in (4.92 in)	42.5	7.5	SR1.5	35	212128	1.0 mm / 0.04 in	21DAA596	7.5	50 mm / 2 in
	7	21DZA404G	80 mm (130 mm) / 3.15 in (5.12 in)	47.5			40	212129	2.0 mm / 0.08 in			
	8	21DZA404H	85 mm (135 mm) / 3.35 in (5.31 in)	52.5			45	212130	3.0 mm / 0.12 in			
	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

Bore Gages SERIES 511 — ABSOLUTE Digimatic Bore Gages

- 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.



511-501

SPECIFICATIONS

Metric	511-501	511-502
Order No.	511-501	511-502
Range	45 - 100 mm	100 - 160 mm
Stroke of contact point	1.2 mm	
Resolution	0.001 mm	
Wide range accuracy*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.), 938882 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"> • 7 segments 6 digits decimal numeric with minus sign, in/mm • Tolerance judge indication • Analog indication 	
Net weight	500 g	570 g

Inch	511-521	511-522
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	
Wide range accuracy*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.), 938882 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"> • 7 segments 6 digits decimal numeric with minus sign, in/mm • Tolerance judge indication • Analog indication 	
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.

Measurement example



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

Extension Rod (optional)

250 mm (10 in): **21DZA089**

500 mm (20 in): **21DZA081**

Up to four extension rods can be joined, and a maximum length of 2 m is allowed.

Optional Accessories

Order No.	Type	description
905338	F	Connecting cable (1 m)
905409	F	Connecting cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD790F	F	Connecting cables for U-WAVE-T (160 mm)
02AZE140F	F	Connecting cables for U-WAVE-T For foot switch

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	611611-021	1
	2	611612-021	1
	3	611613-021	1
	5	611615-021	1
	10	611671-021	1
	20	611672-021	1
	30	611673-021	1
40	611674-021	1	
Flat jaw	630030	1 pair (2 pcs.)	
Holder 160 mm	619004	1	
Certificate of inspection		1	

* Equivalent to JIS B 7506 Grade 0

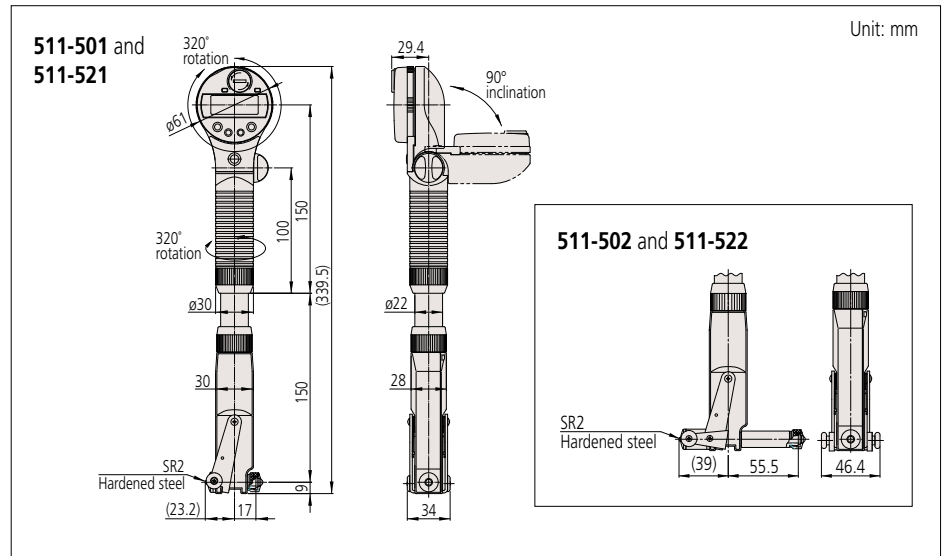
- Square gauge blocks

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

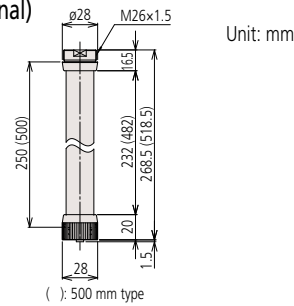
Description*	Order No.	Qty	
Nominal length (mm)	1	614611-021	1
	2	614612-021	1
	3	614613-021	1
	5	614615-021	1
	10	614671-021	1
	20	614672-021	1
	30	614673-021	1
40	614674-021	1	
Flat jaw	619072	1 pair (2 pcs.)	
Tie rod 3 in	619062	1	
Tie rod 2 1/4 in	619063	1	
Tie rod 1 1/2 in	619064	1	
Flat head screw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

* Equivalent to JIS B 7506 Grade 0

DIMENSIONS



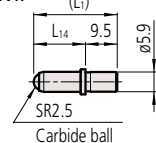
Extension rod (optional)



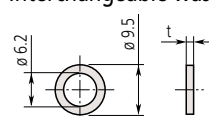
STANDARD ACCESSORIES

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

Anvil



Interchangeable washer



Unit: mm

Bore Gages

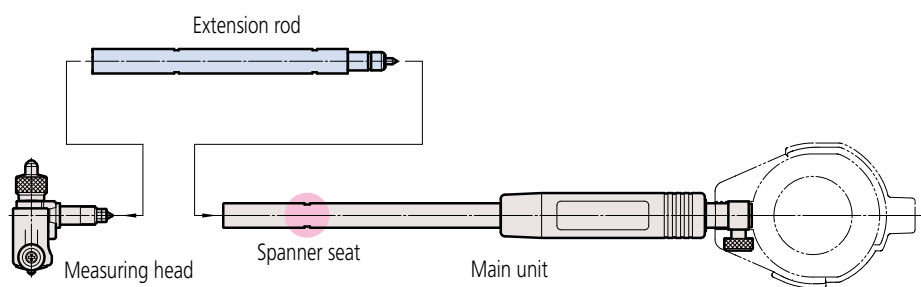
Extension Rod SERIES 511 — Accessories for Bore Gages

- Extension Rods enable measurement of deeper holes when attached to a bore gage. (See the below table for applicable combination with bore gages.)

Note 1: When using an extension rod that is 500 mm or longer, hold the bore gage upright during measurement.

Note 2: Only one extension rod can be attached to a bore gage. It is not possible to use more than one extension rod.

Note 3: The extension rod cannot be used for products with a custom size or custom specifications.



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	—	—	ø9	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	ø12	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	ø15	212556 (2 pcs.)

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

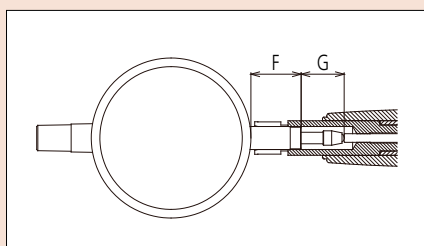
Note 2: Spanner is supplied as standard.

Recommended Indicators Accessories for Bore Gages

Note: Among indicators other than those recommended, the following types of indicator cannot be used.

- Indicators with a total length of F and G of less than 31.8 mm
- Indicators with a measuring range of more than 12.7 mm (ISO/JIS Type)/0.9 in (AMSE/ANSI Type)
- Dust-proof and water-proof indicators with a contact point and spindle covered with rubber

Please contact us if you have any questions about products.



- In addition to bore gages, we offer a wide range of Digimatic indicators and dial indicators.

Some of the products recommended for use with bore gages are shown below.

RECOMMENDED INDICATORS



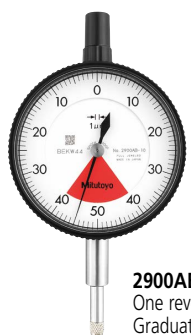
2046AB
Graduation 0.01 mm,
Measuring range 10 mm
Refer to page F-28 for details.



2109AB-10
Graduation 0.001 mm,
Measuring range 1 mm
Refer to page F-30 for details.



2972AB
One revolution type,
Graduation 0.01 mm,
Measuring range 1 mm
Refer to page F-40 for details.



2900AB-10
One revolution type,
Graduation 0.001 mm,
Measuring range 0.08 mm
Refer to page F-36 for details.



543-310B-10
ABSOLUTE Digimatic Indicator
Resolution 0.001 mm
Refer to page F-12 for details.

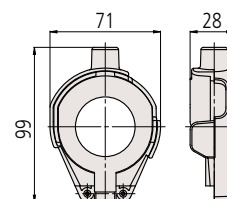
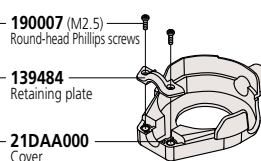
DIAL PROTECTION COVER

- The cover protects the indicator from unexpected impact while handling the bore gage.
- It can offer protection to indicators that are fitted with a lug or flat back.
- It can also be used for **543-310B-10 ID-C112GXB2**, an ABS Digimatic indicator for bore gages.

Note: This protection cover is intended to be attached to a bore gage and cannot be used for a dial indicator or Digimatic indicator alone.



Dial protection cover set
Order No. **21DZA000**



Unit: mm

Bore Gages

Bore Gage Checker SERIES 515

- 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.
- Can be used in both vertical and horizontal positions.



515-590

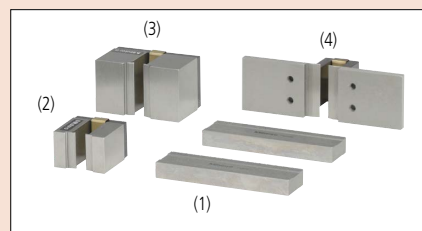
SPECIFICATIONS

Order No.	Applicable range	Flatness of parallel jaw	Parallelism of parallel jaw
515-590	18 - 400 mm (0.7 - 16 in)	0.5 μm	1 μm

Measurement example



Standard Accessories



- (1) Parallel jaw 2 pcs. **630030**
- (2) Attachment A **940088**
- (3) Attachment B **940089**
- (4) Attachment C **940090**

Setting Rings

SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

Made-to-order

- Custom-made setting rings
Mitutoyo can manufacture setting rings to your size and design.
- Nominal size range
1 mm to 305 mm (steel)
4 mm to 50 mm (ceramic)
- Nominal size increment
0.01 mm (up to 45 mm)
0.02 mm (over 45 mm)

- Used for quick and accurate setting of dial bore gages, Holtest, and inside micrometers.

- Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

Steel Setting Rings



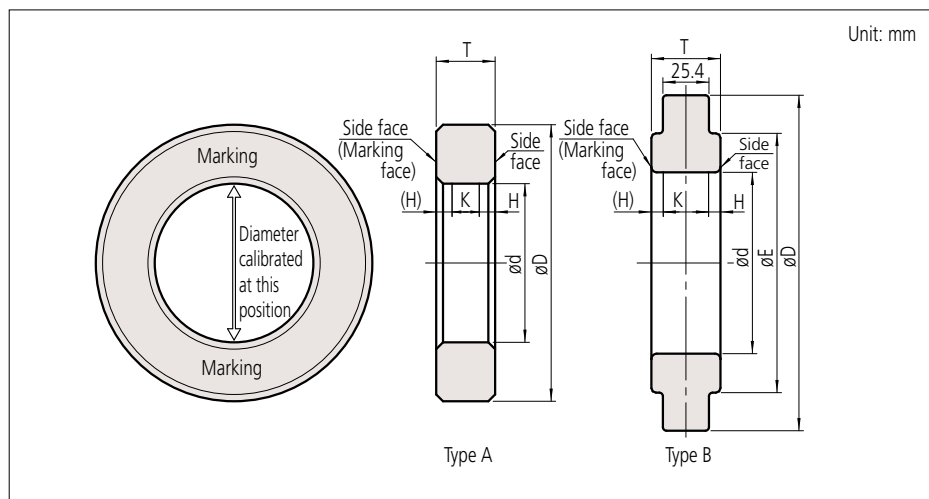
177-300

CERA Setting Rings



177-432

DIMENSIONS



Suffix

177-*-62:** With Inspection Certificate (provides a record of the calibrated diameter) and Calibration Certificate

177-*-82:** With Inspection Certificate (provides a record of the calibrated diameter), Calibration Certificate, and Traceability System Chart

Note 1: The Inspection Certificate is not a substitute for a calibration certificate as it is undated.

Note 2: A more detailed inspection certificate describing roundness and cylindricity is available on request.

Bore Gages

Setting Rings

SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

SPECIFICATIONS

Steel Setting Rings

Metric										
Order No.	Nominal size ϕ D (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual diameter (μ m)	Uncertainty of marked diameter value* ¹ (μ m)	Roundness/Cylindricity* ² (μ m)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-220	1	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-222	1.1	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-225	1.2	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-227	1.3	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-230	1.4	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-236	1.75	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-239	2	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-242	2.25	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-208	2.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-246	2.75	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-248	3	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-250	3.25	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-252	3.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-255	3.75	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-204	4	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-257	4.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-205	5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-263	5.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-267	6	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-271	6.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-275	7	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-125	8	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-279	9	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-126	10	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-284	12	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-132	14	38	—	10	A	± 10	1.5	1.0	2.0	6.0
177-177	16	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-133	17	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-285	18	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-286	20	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-139	25	53	—	15	A	± 10	1.5	1.0	3.2	8.6
177-288	30	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-140	35	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-290	40	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-178	45	85	—	15	A	± 10	1.5	1.0	3.7	7.6
177-146	50	85	—	20	A	± 20	1.5	1.0	3.7	12.6
177-292	60	112	—	20	A	± 20	1.5	1.0	3.7	12.6
177-314	62	112	—	20	A	± 20	1.5	1.5	3.7	12.6
177-147	70	112	—	20	A	± 20	1.5	1.5	3.7	12.6
177-316	75	125	—	25	A	± 20	1.5	1.5	4.2	16.6
177-294	80	125	—	25	A	± 20	1.5	1.5	4.2	16.6
177-318	87	140	—	25	A	± 20	1.5	1.5	4.2	16.6
177-148	90	140	—	25	A	± 20	1.5	1.5	4.2	16.6
177-296	100	160	—	25	A	± 20	1.5	2.0	4.2	16.6
177-298	125	210	168	38.1 (25.4)	B	± 20	2.5	2.0	5.3	27.5
177-300	150	235	187		B	± 20	2.5	2.0	5.3	27.5
177-302	175	260	215		B	± 20	2.5	2.5	5.3	27.5
177-304	200	311	244		B	± 20	2.5	2.5	5.3	27.5
177-306	225	337	264		B	± 20	2.5	2.5	5.3	27.5
177-308	250	362	290		B	± 20	2.5	3.0	5.3	27.5
177-310	275	413	321		B	± 20	2.5	3.0	5.3	27.5
177-312	300	438	340	B	± 20	2.5	3.0	5.3	27.5	

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity."

Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

Inch

Order No.	Nominal size ϕD (in)	Dimensions (mm)			Type	Accuracy				
		ϕD	ϕE	T		Tolerance between the nominal size and the actual diameter (in)	Uncertainty of marked diameter value*1 (in)	Roundness/Cylindricity*2 (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-209	0.1	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-206	0.16	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-207	0.24	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-281	0.275	25	—	7	A	± 0.0004	0.00006	0.00004	2.0	3.0
177-179	0.35	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-283	0.425	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-180	0.5	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-181	0.6	38	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-182	0.65	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-183	0.7	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-287	0.8	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-184	1	53	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-289	1.2	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-185	1.4	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-291	1.6	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-186	1.8	85	—	15	A	± 0.0004	0.00006	0.00004	3.7	7.6
177-187	2	85	—	20	A	± 0.0008	0.00006	0.00004	3.7	12.6
177-293	2.4	112	—	20	A	± 0.0008	0.00006	0.00004	3.7	12.6
177-315	2.5	112	—	20	A	± 0.0008	0.00006	0.00006	4.2	11.6
177-188	2.8	112	—	20	A	± 0.0008	0.00006	0.00006	4.2	11.6
177-317	3	125	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-295	3.2	125	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-319	3.5	140	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-189	3.6	140	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-297	4	160	—	25	A	± 0.0008	0.00006	0.00008	4.2	16.6
177-299	5	210	168	38.1	B	± 0.0008	0.00010	0.00008	5.3	27.5
177-301	6	235	187	38.1	B	± 0.0008	0.00010	0.00008	5.3	27.5
177-303	7	260	215	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-305	8	311	244	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-307	9	337	264	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-309	10	362	290	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5
177-311	11	413	321	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5
177-313	12	438	340	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

Bore Gages

Setting Rings

SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

SPECIFICATIONS

CERA Setting Rings

Metric										
Order No.	Nominal size ϕ d (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual diameter (μ m)	Uncertainty of marked diameter value* ¹ (μ m)	Roundness/Cylindricity* ² (μ m)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-418	4	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-420	6	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-423	8	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-424	10	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-425	12	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-427	16	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-429	20	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-430	25	53	—	15	A	± 10	1.5	1.0	3.2	8.6
177-431	30	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-432	35	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-433	40	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-434	45	85	—	15	A	± 10	1.5	1.0	3.7	7.6

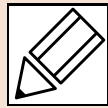
Inch										
Order No.	Nominal size ϕ d (in)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual diameter (in)	Uncertainty of marked diameter value* ¹ (in)	Roundness/Cylindricity* ² (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-518	0.16	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-520	0.24	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-522	0.275	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-523	0.35	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-524	0.425	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-525	0.5	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-527	0.65	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-529	0.8	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-530	1	53	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-531	1.2	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-532	1.4	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-533	1.6	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-534	1.8	85	—	15	A	± 0.0004	0.00006	0.00004	3.7	7.6

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity."

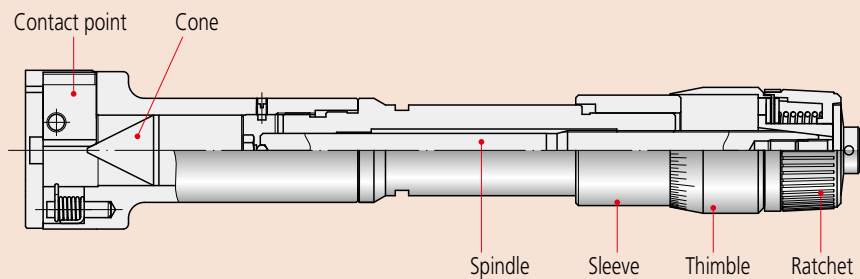
Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

Quick Guide to Precision Measuring Instruments



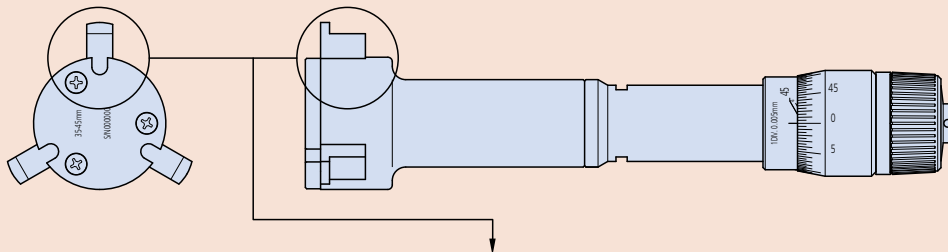
Inside Micrometers

Nomenclature (Holtest)



Custom-ordered Products (Holtest / Borematic)

Mitutoyo can custom-build an inside micrometer best suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required. Please note that, depending on circumstances, such a micrometer will usually need to be used with a master setting ring for accuracy assurance. (A custom-ordered micrometer can be made compatible with a master ring supplied by the customer. Please consult Mitutoyo.)

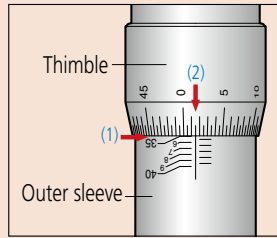


Type of feature	Workpiece profile (example)	Contact point tip profile (example)	Remarks
Square groove		<p>Tip radius R that can measure the minimum diameter (different for each size)</p> <p>W=1 or more</p>	<ul style="list-style-type: none"> Allows measurement of the diameter of variously shaped inside grooves and splines. Minimum measurable groove diameter is approximately 16 mm (differs depending on the workpiece profile.) Dimension l should be as follows: For W=less than 2 mm: l=less than 2 mm For W=2 mm or more: l=2 mm as the standard value which can be modified according to circumstances. The number of splines or serrations is limited to a multiple of 3. Details of the workpiece profile should be provided at the time of placing a custom-order. If your application needs a measuring range different from that of the standard inside micrometer an additional initial cost for the master ring gauge will be required.
Round groove		<p>Tip radius R that can measure the minimum diameter (different for each size)</p> <p>W=1 or more R=0.5 or more</p>	
Spline		<p>W=0.5 or more</p> <p>Tip radius R that can measure the minimum diameter (different for each size)</p>	
Serration		<p>45° or more</p> <p>R=0.3 or more</p>	
Threaded hole			

How to Read the Scale

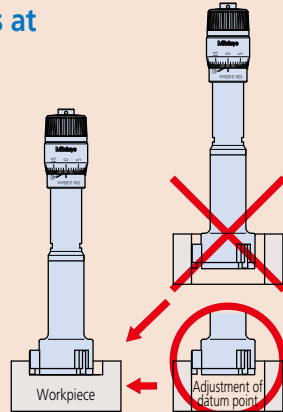
Graduation 0.005 mm

(1) Outer sleeve	35 mm
(2) Thimble	0.015 mm
Reading	35.015 mm



Changes in measured values at different measuring points

The accuracy of a Holtest is maximized if the same part of the anvils is used for measurement as was used for standardizing the instrument with a setting ring.

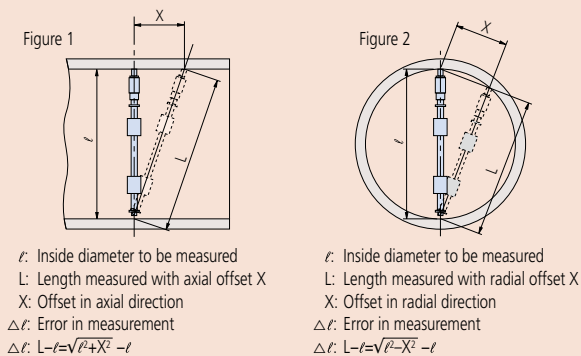


When you use the tip of the anvil for measurement, adjust the datum point using the tip of the anvil.

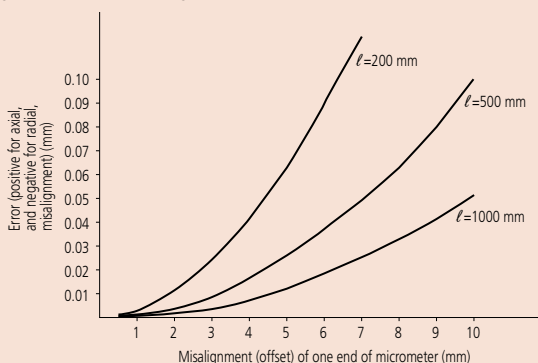
Measurement error due to temperature effects on an inside micrometer

The accuracy of an inside micrometer is degraded if its temperature is significantly different from. To help prevent this situation occurring wear gloves and only hold the micrometer by the heat insulators to reduce the transfer of heat from the operator's hands.

Effect of misalignment on accuracy (Inside Micrometer)

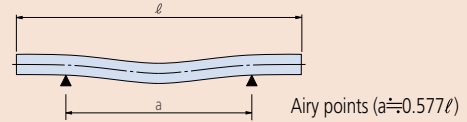


If the Inside Micrometer is misaligned in the axial or radial direction by an offset distance X when a measurement is taken, as in Figures 1 and 2, then that measurement will be in error as shown in the graph below (constructed from the formulae given above). The error is positive for axial misalignment and negative for radial misalignment.

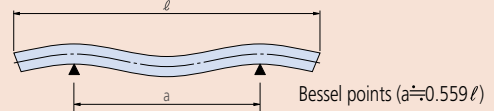


Airy and Bessel Points

When a length standard bar or inside micrometer lies horizontally, supported as simply as possible at two points, it bends under its own weight into a shape that depends on the spacing of those points. There are two distances between the points that control this deformation in useful ways, as shown below.



The ends of a bar (or micrometer) can be made exactly horizontal by spacing the two supports symmetrically as shown above. These points are known as the 'Airy Points' and are commonly used to ensure that the ends of a length bar are parallel to one another, so that the length is well defined.



The change in length of a bar (or micrometer) due to bending can be minimized by spacing the two supports symmetrically as shown above. These points are known as the 'Bessel Points' and may be useful when using a long inside micrometer.

Reference point setting (2-point gages)

- Reference point setting with a ring gage or cylinder master gage
 Insert the bore gage into the ring gage, vertically or horizontally swing the bore gage, and set the zero point to the point where the indicator reads the maximum value. (Rotate the dial face for a dial gage and perform presetting or zero setting for a Digimatic indicator.)
- Reference point setting with outside micrometer and gauge block
 Hold a gauge block (of the reference dimension) between a micrometer's measuring faces as if measuring the block. Clamp the micrometer's spindle and then pull out the gauge block. Insert the bore gage between the micrometer's measuring faces. Maneuver the bore gage to the position where the indicator reads a minimum and then set the pointer to read zero (or a preset value required) by rotating the bezel.
- Reference point setting with outside micrometer only
 Fix the micrometer in a vertical attitude with its head side (spindle side) downward (see illustration below), and then adjust the distance between the measuring faces to the reference dimension. At this time, do not clamp the micrometer spindle. Insert the bore gage between the micrometer's measuring faces. Maneuver the bore gage to the position where the indicator reads a minimum and then set the pointer to read zero (or a preset value required) by rotating the bezel. Zero-setting with a micrometer requires a certain degree of dexterity because no self-centering action is available, as is the case when using a setting gage.
 Zero-setting is also possible by performing the same procedure using the gauge block, height master, or bore gage zero checker in addition to the outside micrometer.

