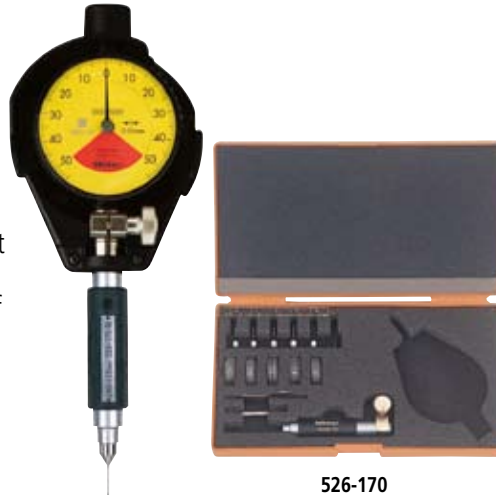


Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 526 — for Extra Small Holes

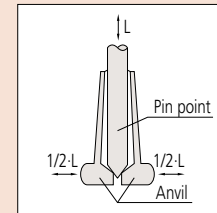
- These gages are designed to measure the diameters of very small holes. The radial displacement of the split-ball anvil is converted to axial displacement of the measuring rod, which is shown on the dial indicator.
- Dial indicators and protection covers are optionally available. Some indicators and protection covers cannot be used with these bore gages. Contact a Mitutoyo sales office if considering the use of dial indicators or Digimatic indicators other than recommended models.
- An optional stand (215-120-10) is available for efficient measurement of multiple small holes. Refer to page C-48 for details.



526-170

* The dial indicator and the protection cover are optional.

Measurement principle



Technical Data

Accuracy
Metric models: 4µm
Inch models: .00016"
Repeatability
Metric models: 2µm
Inch models: .00008"

Optional Accessories

- Dial indicator (See Chapter F)
- 21DZA000**: Dial protection cover
- Setting ring (See page C-45)
- 215-120-10**: Stand for small holes

Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972 (0.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GB: 0.001mm/.00005")

SPECIFICATIONS

Metric								
Order No.	Range	Bore gage	Content of set					Probing depth
			Dial indicator	Dial protection cover	Anvil	Pin point	Setting ring	
526-170	0.95-1.55mm	526-170	Not supplied	Not supplied	5 pcs.	1 pc.	5 pcs.	11.5mm
526-160	1.50-4.00mm	526-160			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-150	3.70-7.30mm	526-150			7 pcs.	1 pc.	7 pcs.	32.0mm
526-172	0.95-1.55mm	526-170	2109SB-10 (Graduation 0.001mm)	21DZA000	5 pcs.	1 pc.	5 pcs.	11.5mm
526-162	1.50-4.00mm	526-160			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-152	3.70-7.30mm	526-150			7 pcs.	1 pc.	7 pcs.	32.0mm
526-173	0.95-1.55mm	526-170	2046SB (Graduation: 0.01mm)	21DZA000	5 pcs.	1 pc.	5 pcs.	11.5mm
526-163	1.50-4.00mm	526-160			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-153	3.70-7.30mm	526-150			7 pcs.	1 pc.	7 pcs.	32.0mm

Inch								
Order No.	Range	Bore gage	Content of set					Probing depth
			Dial indicator	Dial protection cover	Anvil	Pin point	Setting ring	
526-175	.037-.061"	526-175	Not supplied	Not supplied	5 pcs.	1 pc.	5 pcs.	.45"
526-165	.60-.155"	526-165			9 pcs.	2 pcs.	9 pcs.	.68,.88"
526-155	.145-.29"	526-155			7 pcs.	1 pc.	7 pcs.	1.25"
526-176	.037-.061"	526-175	2923SB-10 (Graduation: .0001")	21DZA000	5 pcs.	1 pc.	5 pcs.	.45"
526-166	.60-.155"	526-165			9 pcs.	2 pcs.	9 pcs.	.68,.88"
526-156	.145-.29"	526-155			7 pcs.	1 pc.	7 pcs.	1.25"

DIMENSIONS

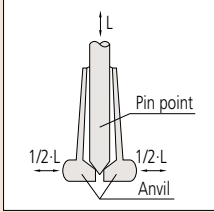
Unit: mm

() : 3.7 - 7.3mm / .145 - .29 range model

STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Parts No.	Anvil		Pin point	Setting ring mm/inch
			Measuring range	A		
526-170 526-175	1.0	201414	0.95-1.15mm	.037-.045"	11.5mm/.45"	1.0mm/.04"
	1.1	201415	1.07-1.25mm	.042-.049"		1.1mm/.045"
	1.2	201416	1.17-1.35mm	.046-.053"		1.2mm/.05"
	1.3	201417	1.27-1.45mm	.050-.057"		1.3mm/.055"
526-160 526-165	1.4	201418	1.37-1.55mm	.054-.061"	17.5mm/.68"	1.4mm/.06"
	1.75	201419	1.50-1.90mm	.060-.075"		1.75mm/.07"
	2.00	201420	1.80-2.20mm	.070-.085"		2.00mm/.08"
	2.25	201421	2.05-2.45mm	.080-.095"		2.25mm/.09"
	2.50	201422	2.25-2.75mm	.090-.105"		2.50mm/.10"
	2.75	201423	2.50-3.00mm	.100-.115"		2.75mm/.11"
	3.00	201424	2.75-3.25mm	.110-.125"		3.00mm/.12"
	3.25	201425	3.00-3.50mm	.120-.135"		3.25mm/.13"
3.50	201426	3.25-3.75mm	.130-.145"	3.50mm/.14"		
3.75	201427	3.50-4.00mm	.140-.155"	3.75mm/.15"		
526-150 526-155	4.0	201428	3.70-4.30mm	.145-.170"	32.0mm/1.25"	4.0mm/.16"
	4.5	201429	4.20-4.80mm	.165-.190"		4.5mm/.18"
	5.0	201430	4.70-5.30mm	.185-.210"		5.0mm/.20"
	5.5	201431	5.20-5.80mm	.205-.230"		5.5mm/.22"
	6.0	201432	5.70-6.30mm	.225-.250"		6.0mm/.24"
	6.5	201433	6.20-6.80mm	.245-.270"		6.5mm/.26"
	7.0	201434	6.70-7.30mm	.265-.290"		7.0mm/.28"

Measurement principle



Technical Data

Accuracy

Metric models: 7-10mm, 4 μ m / 10-18mm, 6 μ m
 Inch models: .3-.4", .00016" / .4-.7", .00024"

Repeatability

Metric models: 2 μ m
 Inch models: .00008"

Optional accessories

- : Dial indicator (See Chapter F)
- 21DZA000**: Dial protection cover
- : Setting ring (See page C-45)
- 215-120-10**: Stand for small holes

Recommended dial indicators

- Metric models: **2046SB** (0.01mm)
2972 (0.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
 Inch models: **2922SB** (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

- Metric models: **543-264B** (ID-C112GB, 0.001mm)
 Inch models: **543-266B** (ID-C112GEB, 0.001mm/.00005")

Bore Gages SERIES 526 — for Extra Small Holes



526-101

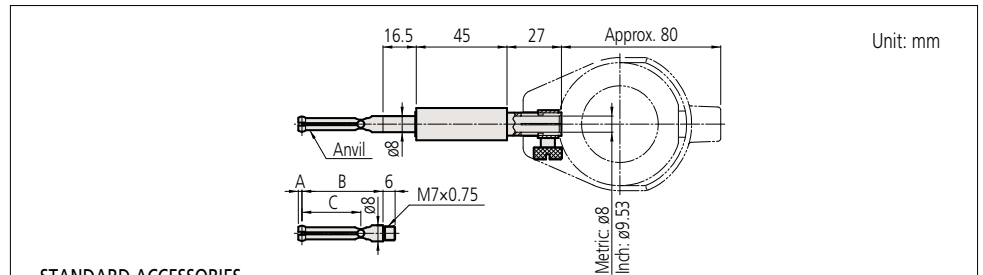
* The dial indicator and the protection cover are optional.

SPECIFICATIONS

Order No.	Range	Bore gage	Content of set			Probing depth
			Dial indicator	Dial protection cover	Anvil	
526-101	7-10mm	526-101	Not supplied	Not supplied	6 pcs.	32mm
526-102	10-18mm	526-102			8 pcs.	62mm
526-124	7-10mm	526-101	2109SB-10 (Graduation: 0.001mm)	21DZA000	6 pcs.	32mm
526-125	10-18mm	526-102			8 pcs.	62mm
526-126	7-10mm	526-101	2046SB (Graduation: 0.01mm)	21DZA000	6 pcs.	32mm
526-127	10-18mm	526-102			8 pcs.	62mm

Order No.	Range	Bore gage	Content of set			Probing depth
			Dial indicator	Dial protection cover	Anvil	
526-103	.3-.4"	526-103	Not supplied	Not supplied	6 pcs.	1.25"
526-104	.4-.7"	526-104			8 pcs.	2.42"
526-122	.3-.4"	526-101	2923SB-10 (Graduation: .0001")	21DZA000	6 pcs.	1.25"
526-123	.4-.7"	526-102			8 pcs.	2.42"
526-119	.3-.4"	526-101	2922SB (Graduation: .0005")	21DZA000	6 pcs.	1.25"
526-120	.4-.7"	526-102			8 pcs.	2.42"

DIMENSIONS



STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Parts No.	Measuring range	Anvil		
				A	B	C
526-101 526-103	1	102469	7.0 - 7.5mm	1.8mm/.07"	40mm/1.57"	29.2mm/1.15"
	2	102470	7.5 - 8.0mm			
	3	102471	8.0 - 8.5mm			
	4	102472	8.5 - 9.0mm			
	5	102473	9.0 - 9.5mm			
	6	102474	9.5 - 10.0mm			
526-102 526-104	1	102454	10 - 11mm	2.7mm/.11"	46mm/1.81"	38mm/1.50"
	2	102455	11 - 12mm			
	3	102456	12 - 13mm			
	4	102457	13 - 14mm			
	5	102458	14 - 15mm			
	6	102459	15 - 16mm			
	7	102460	16 - 17mm			
	8	102461	17 - 18mm			

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511 — for Small Holes

- The interchangeable anvils used on this gage are made of high-grade tool steel.
- The dial indicator is fully protected by a rugged cover.
- Dial indicators and protection covers are optionally available. Some indicators and protection covers cannot be used with these bore gages. Contact a Mitutoyo sales office if considering the use of dial indicators or Digimatic indicators other than recommended models.
- 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-44 and C-45.)



The dial indicator and protection cover are optional.

Close-up view of anvils and contact points



Technical Data

Accuracy: Metric models: 5µm
Inch models: .0002"
Repeatability: Metric models: 2µm
Inch models: .00008"
Adjacent error: Metric models: 2µm
Inch models: .00008"

Optional Accessories

– : Dial indicator (See Chapter F)
21DZA000: Dial protection cover

Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972 (0.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

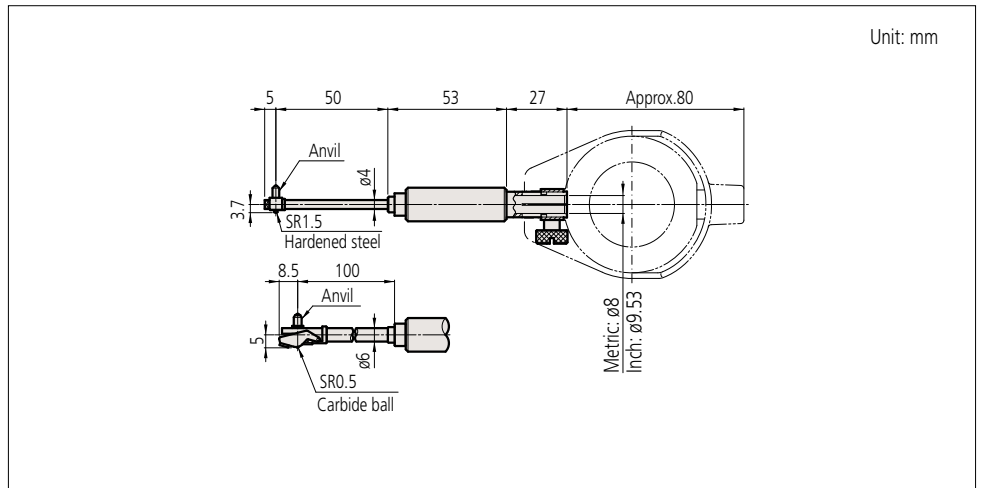
Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")

SPECIFICATIONS

Metric										
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	6-10mm	0.5mm	2N or less	—	511-209	Not supplied	Not supplied	9 pcs.	Not supplied	50mm
511-201	10-18.5mm	0.6mm		6N or less	511-201				1 pc.	100mm
511-210	6-10mm	0.5mm	2N or less	—	511-209	2109SB-10 (Graduation: 0.001mm)	21DZA000	9 pcs.	Not supplied	50mm
511-203	10-18.5mm	0.6mm		6N or less	511-201				1 pc.	100mm
511-211	6-10mm	0.5mm	2N or less	—	511-209	2046SB (Graduation: 0.01mm)	21DZA000	9 pcs.	Not supplied	50mm
511-204	10-18.5mm	0.6mm		6N or less	511-201				1 pcs.	100mm

Inch										
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	.24-.4"	.020"	2N or less	—	511-214	Not supplied	Not supplied	9 pcs.	Not supplied	2"
511-205	.4-.74"	.024"		6N or less	511-205				1 pc.	4"
511-212	.24-.4"	.020"	2N or less	—	511-214	2923SB-10 (Graduation: .0001")	21DZA000	9 pcs.	Not supplied	2"
511-206	.4-.74"	.024"		6N or less	511-205				1 pc.	4"
511-213	.24-.4"	.020"	2N or less	—	511-214	2922SB (Graduation: .0005")	21DZA000	9 pcs.	Not supplied	2"
511-207	.4-.74"	.024"		6N or less	511-205				1 pc.	4"

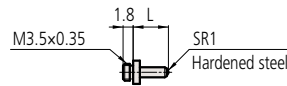
DIMENSIONS



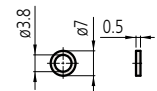
511-209
Anvil



511-201
Anvil



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



No.204355

STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Parts No.	Anvil			Interchangeable Washer Parts No.
			Size	L		
511-209 511-214	1	952168	6.0mm	.24"	1.2mm/.05"	Not supplied
	2	952169	6.5mm	.26"	1.7mm/.07"	
	3	952170	7.0mm	.28"	2.2mm/.09"	
	4	952414	7.5mm	.30"	2.7mm/.11"	
	5	952415	8.0mm	.32"	3.2mm/.13"	
	6	952416	8.5mm	.34"	3.7mm/.15"	
	7	952417	9.0mm	.36"	4.2mm/.17"	
	8	952418	9.5mm	.38"	4.7mm/.19"	
	9	952419	10.0mm	.40"	5.2mm/.21"	
511-201 511-205	1	204356	10.0mm	.40"	2mm/.08"	204355
	2	204357	11.0mm	.44"	3mm/.12"	
	3	204358	12.0mm	.48"	4mm/.16"	
	4	204359	13.0mm	.52"	5mm/.20"	
	5	204360	14.0mm	.56"	6mm/.24"	
	6	204361	15.0mm	.60"	7mm/.28"	
	7	204362	16.0mm	.64"	8mm/.32"	
	8	204363	17.0mm	.68"	9mm/.36"	
	9	204364	18.0mm	.72"	10mm/.40"	

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511

- Now offers a longer plunger stroke while maintaining original 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.
- Optional extension rods can be attached for measuring deep holes. (For details, refer to page C-43.)
- Dial indicators and protection covers are optionally available.
Some dial indicators are not usable with bore gages or protection covers.
- 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-44 and C-45.)



Dial indicators and protection covers are optional.

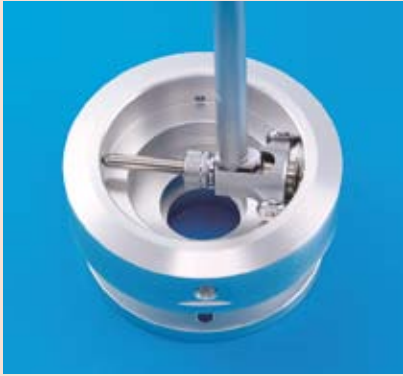
SPECIFICATIONS

Metric												
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set							Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Wrench	
511-701	18-35mm	1.2mm	4N or less	6N or less	511-701	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	100mm
511-702	35-60mm				511-702			6 pcs.				
511-703	50-150mm				511-703			11 pcs.				
511-704	100-160mm				511-704			13 pcs.				
511-705	160-250mm				511-705			6 pcs.				
511-706	250-300mm				511-706			5 pcs.				
511-721	18-35mm	1.2mm	4N or less	6N or less	511-701	2109SB-10 (Graduation: 0.001mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100mm
511-722	35-60mm				511-702			6 pcs.				
511-723	50-150mm				511-703			11 pcs.				
511-724	100-160mm				511-704			13 pcs.				
511-725	160-250mm				511-705			6 pcs.				
511-726	250-300mm				511-706			5 pcs.				
511-711	18-35mm	1.2mm	4N or less	6N or less	511-701	2046SB (Graduation: 0.01mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100mm
511-712	35-60mm				511-702			6 pcs.				
511-713	50-150mm				511-703			11 pcs.				
511-714	100-160mm				511-704			13 pcs.				
511-715	160-250mm				511-705			6 pcs.				
511-716	250-300mm				511-706			5 pcs.				
511-921	18-150mm	—	—	—	511-701	2046SB	21DZA000	—	—	—	—	—
511-922					511-702	2109SB-10						
511-925					511-703	543-264B						

Inch												
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set							Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Wrench	
511-731	.7-1.4"	.047"	4N or less	6N 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"				511-734			13 pcs.				
511-735	6.5-10.0"				511-735			6 pcs.				
511-736	10.0-16.0"				511-736			5 pcs.				
511-751	.7-1.4"	.063"	5N or less	10N or less	511-731	2923SB-10 (Graduation: .0001")	21DZA000	9 pcs.	4 pcs.	Not supplied	1 pc.	6"
511-752	1.4-2.5"				511-732			6 pcs.				
511-753	2.0-6.0"				511-733			11 pcs.				
511-754	4.0-6.5"				511-734			13 pcs.				
511-755	6.5-10.0"				511-735			6 pcs.				
511-756	10.0-16.0"				511-736			5 pcs.				
511-741	.7-1.4"	.063"	5N or less	10N or less	511-731	2922SB (Graduation: .0005")	21DZA000	9 pcs.	4 pcs.	Not supplied	1 pc.	6"
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"				511-734			13 pcs.				
511-745	6.5-10.0"				511-735			6 pcs.				
511-746	10.0-16.0"				511-736			5 pcs.				
511-931	.7-6.0"	—	—	—	511-731	2922SB	21DZA000	—	—	—	—	—
511-932					511-732	2923SB-10						
511-935					511-733	543-266B						

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

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.)



New grip improves accuracy during prolonged use

Technical Data

Accuracy: Metric models 2µm
Inch models .00008"
Repeatability: Metric models 0.5µm
Inch models .00002"
Adjacent error: Metric models 1µm
Inch models .00004"

Optional Accessories

--: Dial indicator (See Chapter F)
21DZA000: Dial protection cover

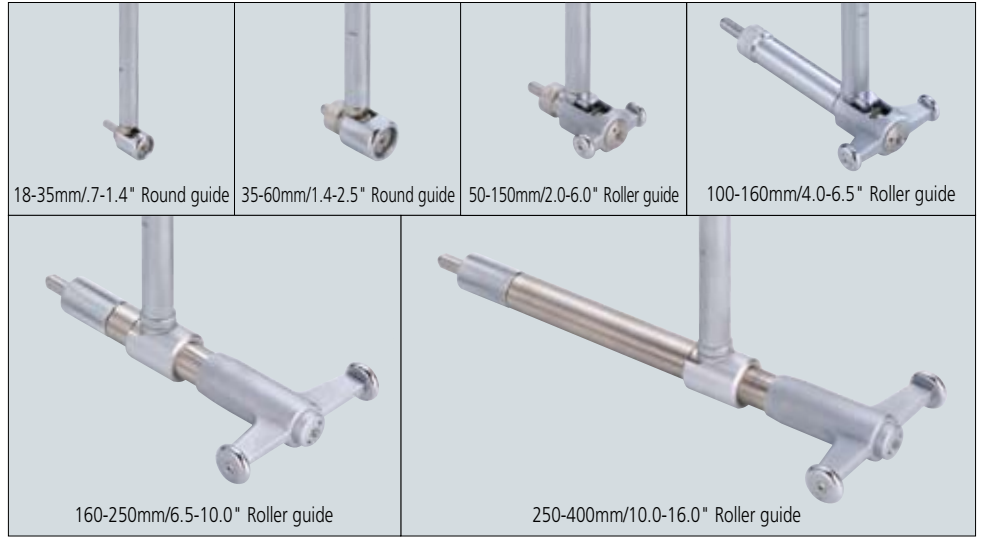
Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972 (0.001mm - One revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (0.0001" - One-revolution type)

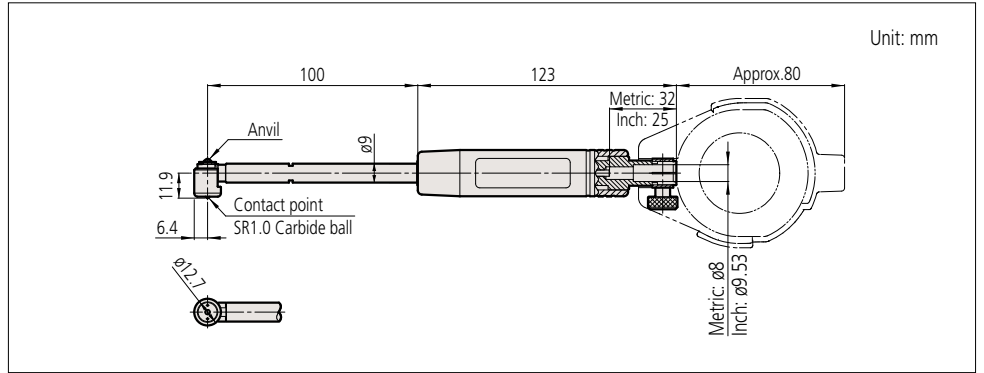
Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")

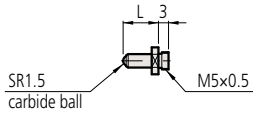
Contact Points



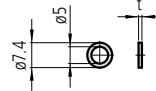
DIMENSIONS



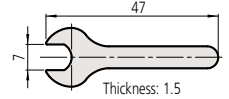
Anvil



Interchangeable washer



Wrench
102148



STANDARD ACCESSORIES

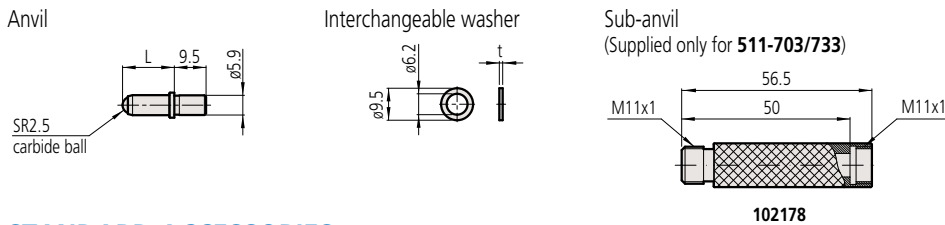
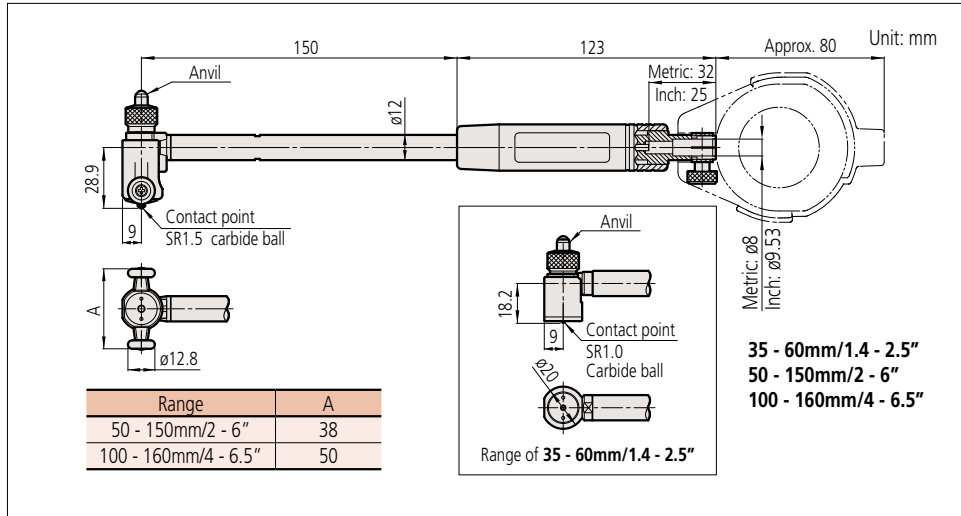
Bore gage (Main body)	Anvil						Interchangeable washer		Wrench
	Marked No.	Parts No.	Size	L		Parts No.	t	Parts No.	
511-701 511-731	1	21DZA213A	18mm	.71"	2.5mm	.10"	205623 205624	0.5mm/.02" 1.0mm/.04"	102148
	2	21DZA213B	20mm	.79"	4.5mm	.18"			
	3	21DZA213C	22mm	.87"	6.5mm	.26"			
	4	21DZA213D	24mm	.94"	8.5mm	.33"			
	5	21DZA213E	26mm	1.02"	10.5mm	.41"			
	6	21DZA213F	28mm	1.10"	12.5mm	.49"			
	7	21DZA213G	30mm	1.18"	14.5mm	.57"			
	8	21DZA213H	32mm	1.26"	16.5mm	.65"			
	9	21DZA213J	34mm	1.34"	18.5mm	.73"			

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511

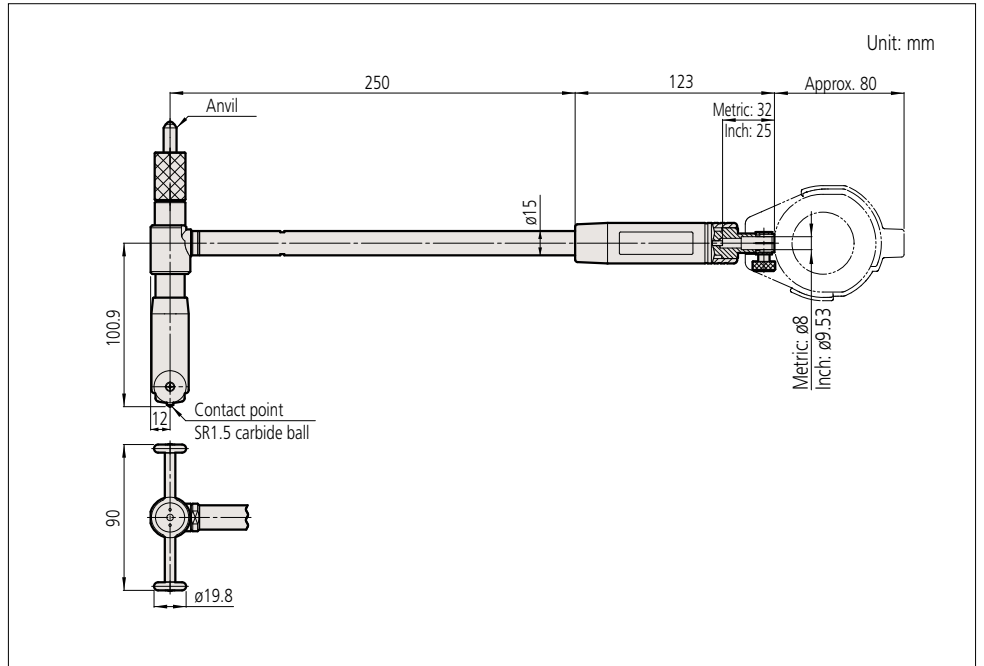
DIMENSIONS



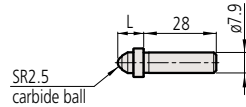
STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Sub-Anvil	
	Marked No.	Parts No.	Size	L	L	Parts No.	t	Parts No.	
511-702 511-732	1	21DZA232A	35mm	1.38"	5.5mm .22"	205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"	102178 (50mm/2")	
	2	21DZA232B	40mm	1.57"	10.5mm .41"				
	3	21DZA232C	45mm	1.77"	15.5mm .61"				
	4	21DZA232D	50mm	1.97"	20.5mm .81"				
	5	21DZA232E	55mm	2.17"	25.5mm 1.00"				
	6	21DZA232F	60mm	2.36"	30.5mm 1.20"				
511-703 511-733 () Used 50mm/2" Sub-Anvil	7	21DZA232G	80mm (130mm)	3.12" (5.12")	35.5mm 1.40"				
	8	21DZA232H	85mm (135mm)	3.31" (5.31")	40.5mm 1.59"				
	9	21DZA232J	90mm (140mm)	3.50" (5.51")	45.5mm 1.79"				
	10	21DZA232L	95mm (145mm)	3.69" (5.71")	50.5mm 1.99"				
	11	21DZA232M	100mm (150mm)	3.88" (5.91")	55.5mm 2.19"				
	511-704 511-734	1	21DZA232A	100mm	3.94"				5.5mm .22"
		2	21DZA232B	105mm	4.13"				10.5mm .41"
		3	21DZA232C	110mm	4.33"	15.5mm .61"			
		4	21DZA232D	115mm	4.53"	20.5mm .81"			
		5	21DZA232E	120mm	4.72"	25.5mm 1.00"			
		6	21DZA232F	125mm	4.92"	30.5mm 1.20"			
7		21DZA232G	130mm	5.12"	35.5mm 1.40"				
8		21DZA232H	135mm	5.31"	40.5mm 1.59"				
9		21DZA232J	140mm	5.51"	45.5mm 1.79"				
10		21DZA232L	145mm	5.71"	50.5mm 1.99"				
11		21DZA232M	150mm	5.91"	55.5mm 2.19"				
12		21DZA232N	155mm	6.10"	60.5mm 2.38"				
13		21DZA232P	160mm	6.30"	65.5mm 2.58"				

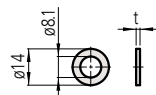
DIMENSIONS



Anvil

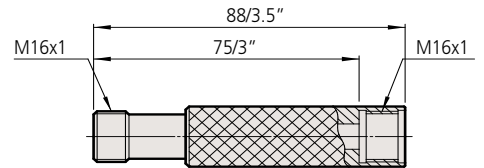


Interchangeable washer



Sub-anvil

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



No. 202974 (511-706)
No. 202975 (511-736)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable washer		Sub-Anvil	
	Marked No.	Parts No.	Size		L		Parts No.	t	Parts No
511-705 511-735	1	212142	160mm	6.30"	10.0mm	.39"	205467 205461 205462 205463 205464 205465 205466	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12" 4.0mm/.16" 5.0mm/.20" 6.0mm/.24"	Metric: 202974 (75mm) Inch: 202975 (3.0")
	2	212143	175mm	6.89"	25.0mm	.98"			
	3	212144	190mm	7.48"	40.0mm	1.57"			
	4	212145	205mm	8.07"	55.0mm	2.17"			
	5	212146	220mm	8.66"	70.0mm	2.76"			
	6	212152	235mm	9.25"	85.0mm	3.35"			
511-706 511-736 () Used 75mm/3" Sub-Anvil	1	212142	250mm (325mm)	9.84" (12.80")	10.0mm	.39"	205467 205461 205462 205463 205464 205465 205466	Metric: 202974 (75mm) Inch: 202975 (3.0")	
	2	212143	265mm (340mm)	10.43" (13.39")	25.0mm	.98"			
	3	212144	280mm (355mm)	11.02" (13.98")	40.0mm	1.57"			
	4	212145	295mm (370mm)	11.61" (14.57")	55.0mm	2.17"			
	5	212146	310mm (385mm)	12.20" (15.16")	70.0mm	2.76"			
	6	212152	310mm (385mm)	12.20" (15.16")	70.0mm	2.76"			

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.
- Now offers a longer plunger stroke while maintaining original accuracy.
- Carbide is used for the contact point ensuring high durability and wear resistance.
- High-accuracy measurement is aided by a large grip with a sponge-like structure that reduces heat transfer from the operator's hand by 50%.
- Optional extension rods can be attached for measuring deep holes. (For details, refer to page C-43.)
- Dial indicators and protection covers are optionally available.
Some dial indicators are not usable with bore gages or protection covers.
- 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-44 and C-45.)



Dial indicators and protection covers are optional.

SPECIFICATIONS

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

Inch												
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set							Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-781	.7-1.4"	.047"	4N or less	6N 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.	Not supplied	4 pcs.	Not supplied	
511-783	2.0-6.0"	.063"	5N or less	10N 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.		Not supplied		
511-791	.7-1.4"	.047"	4N or less	6N or less	511-781	2923SB-10 (Graduation: .0001")	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2"
511-792	1.4-2.5"				511-782			6 pcs.	Not supplied	4 pcs.	Not supplied	
511-793	2.0-6.0"	.063"	5N or less	10N or less	511-783	Not supplied	Not supplied	11 pcs.	4 pcs.		1 pc.	Not supplied
511-794	4.0-6.5"				511-784			13 pcs.		Not supplied		
511-786	.7-1.4"	.047"	4N or less	6N or less	511-781	2922SB (Graduation: .0005")	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2"
511-787	1.4-2.5"				511-782			6 pcs.	Not supplied	4 pcs.	Not supplied	
511-788	2.0-6.0"	.063"	5N or less	10N or less	511-783	Not supplied	Not supplied	11 pcs.	4 pcs.		1 pc.	Not supplied
511-789	4.0-6.5"				511-784			13 pcs.		Not supplied		

Notes: 1) A 10mm sub-anvil is supplied with 511-761, and a 50mm sub-anvil is supplied with 511-764.

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.)

Technical Data

Accuracy: Metric models 2µm
Inch models .0008"
Repeatability: Metric models 0.5µm
Inch models .0002"
Adjacent error: Metric models 1µm
Inch models .0004"

Optional Accessories

-: Dial indicator (See Chapter F)
21DZA000: Dial protection cover

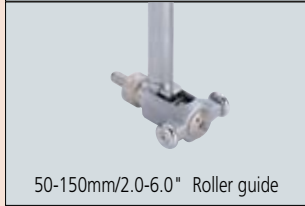
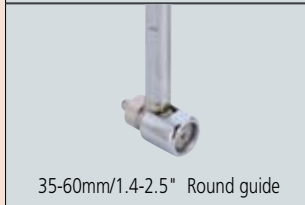
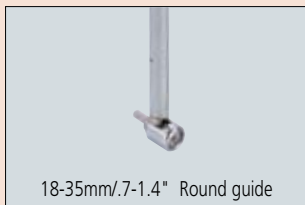
Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972 (.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

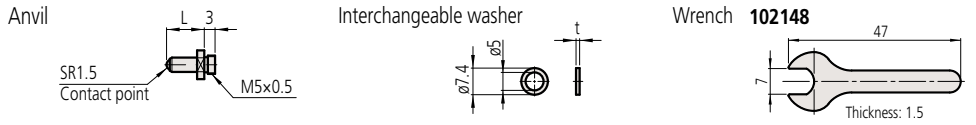
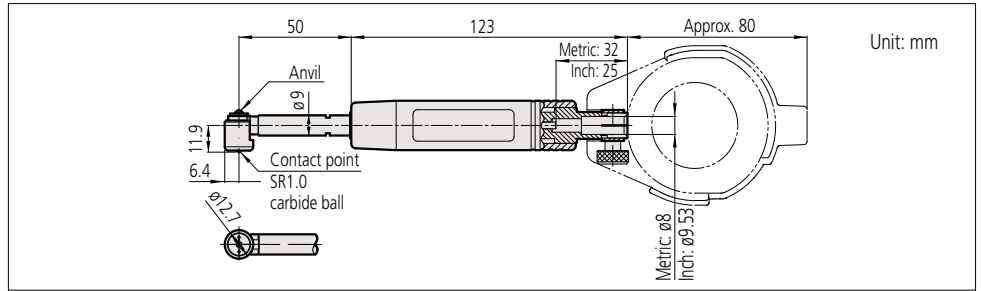
Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB, 0.001mm)
Inch models: **543-266B** (ID-C112GEB, 0.001mm/.00005")

Contact Points



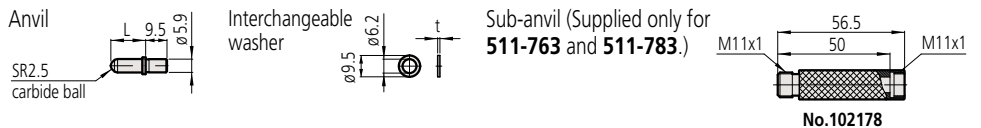
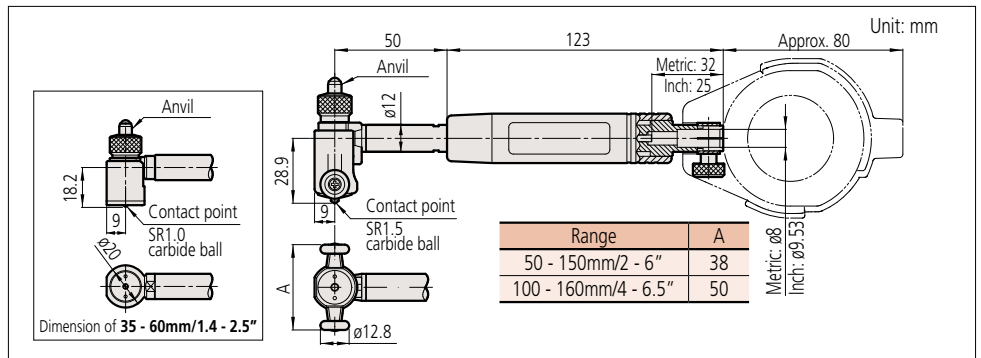
DIMENSIONS



STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Parts No.	Anvil			Interchangeable washer		Wrench Parts No.	
			Size	L	t	Parts No.	t		
511-761 511-781	1	21DZA213A	18mm	.71"	2.5mm	.10"	205623 205624	0.5mm/.02" 1.0mm/.04"	102148
	2	21DZA213B	20mm	.79"	4.5mm	.18"			
	3	21DZA213C	22mm	.87"	6.5mm	.26"			
	4	21DZA213D	24mm	.94"	8.5mm	.33"			
	5	21DZA213E	26mm	1.02"	10.5mm	.41"			
	6	21DZA213F	28mm	1.10"	12.5mm	.49"			
	7	21DZA213G	30mm	1.18"	14.5mm	.57"			
	8	21DZA213H	32mm	1.26"	16.5mm	.65"			
	9	21DZA213J	34mm	1.34"	18.5mm	.73"			

DIMENSIONS



STANDARD ACCESSORIES

Bore gage (Main body)	Marked No.	Parts No.	Anvil			Interchangeable washer		Sub-Anvil Parts No.				
			Size	L	t	Parts No.	t					
511-762 511-782	1	21DZA232A	35mm	1.38"	5.5mm	.22"	205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"	102178 (50mm/2")			
	2	21DZA232B	40mm	1.57"	10.5mm	.41"						
	3	21DZA232C	45mm	1.77"	15.5mm	.61"						
	4	21DZA232D	50mm	1.97"	20.5mm	.81"						
	5	21DZA232E	55mm	2.17"	25.5mm	1.00"						
	6	21DZA232F	60mm	2.36"	30.5mm	1.20"						
511-763 511-783 () Used 50mm/2" Sub-Anvil	1	21DZA232A	50mm (100mm)	1.97" (3.94")	5.5mm	.22"				205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"	102178 (50mm/2")
	2	21DZA232B	55mm (105mm)	2.17" (4.13")	10.5mm	.41"						
	3	21DZA232C	60mm (110mm)	2.36" (4.33")	15.5mm	.61"						
	4	21DZA232D	65mm (115mm)	2.55" (4.53")	20.5mm	.81"						
	5	21DZA232E	70mm (120mm)	2.74" (4.72")	25.5mm	1.00"						
	6	21DZA232F	75mm (125mm)	2.93" (4.92")	30.5mm	1.20"						
	7	21DZA232G	80mm (130mm)	3.12" (5.12")	35.5mm	1.40"						
	8	21DZA232H	85mm (135mm)	3.31" (5.31")	40.5mm	1.59"						
	9	21DZA232J	90mm (140mm)	3.50" (5.51")	45.5mm	1.79"						
	10	21DZA232L	95mm (145mm)	3.69" (5.71")	50.5mm	1.99"						
	11	21DZA232M	100mm (150mm)	3.88" (5.91")	55.5mm	2.19"						
511-764 511-784	1	21DZA232A	100mm	3.94"	5.5mm	.22"	205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"	102178 (50mm/2")			
	2	21DZA232B	105mm	4.13"	10.5mm	.41"						
	3	21DZA232C	110mm	4.33"	15.5mm	.61"						
	4	21DZA232D	115mm	4.53"	20.5mm	.81"						
	5	21DZA232E	120mm	4.72"	25.5mm	1.00"						
	6	21DZA232F	125mm	4.92"	30.5mm	1.20"						
	7	21DZA232G	130mm	5.12"	35.5mm	1.40"						
8	21DZA232H	135mm	5.31"	40.5mm	1.59"							
9	21DZA232J	140mm	5.51"	45.5mm	1.79"							
10	21DZA232L	145mm	5.71"	50.5mm	1.99"							
11	21DZA232M	150mm	5.91"	55.5mm	2.19"							
12	21DZA232N	155mm	6.10"	60.5mm	2.38"							
13	21DZA232P	160mm	6.30"	65.5mm	2.58"							

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.
 - Now offers a longer plunger stroke while maintaining original accuracy.
 - Carbide is used for the contact point ensuring high durability and wear resistance.
 - High-accuracy measurement is aided by a large grip with a sponge-like structure that reduces heat transfer from the operator's hand by 50%.
 - Wide measuring range with sub-anvils.
 - Optional extension rods can be attached for measuring deep holes. (For details, refer to page C-43.)
 - Dial indicators and protection covers are optionally available.
- Some dial indicators are not usable with bore gages or protection covers.
- 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-44 and C-45.)



511-804



511-806

Dial indicators and protection covers are optional.

SPECIFICATIONS

Metric													
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set						Probing depth		
					Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Wrench			
511-803	60-100mm	1.6mm	5N or less	10N or less	511-803	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	150mm		
511-804	100-160mm				511-804								
511-805	150-250mm		6N or less	15N or less	511-805							2 pcs.	250mm
511-806	250-400mm				511-806								
511-807	400-600mm				511-807								
511-808	600-800mm	511-808											
511-823	60-100mm	1.6mm	5N or less	10N or less	511-803	2109SB-10 (Graduation: 0.001mm)	21DZA000	1 pc.	2 pcs.	3 pcs.	150mm		
511-824	100-160mm				511-804								
511-825	150-250mm		6N or less	15N or less	511-805							2 pcs.	250mm
511-826	250-400mm				511-806								
511-827	400-600mm				511-807								
511-828	600-800mm	511-808											
511-813	60-100mm	1.6mm	5N or less	10N or less	511-803	2046SB (Graduation: 0.01mm)	21DZA000	1 pc.	2 pcs.	3 pcs.	150mm		
511-814	100-160mm				511-804								
511-815	150-250mm		6N or less	15N or less	511-805							2 pcs.	250mm
511-816	250-400mm				511-806								
511-817	400-600mm				511-807								
511-818	600-800mm	511-808											

Inch													
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set						Probing depth		
					Bore gage	Dial indicator	Dial protection cover	Micro meter head	Sub-Anvil	Wrench			
511-833	2.4-4.0"	.063"	5N or less	10N or less	511-833	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	6"		
511-834	4.0-6.4"				511-834								
511-835	6.0-10.0"		6N or less	15N or less	511-835							2 pcs.	10"
511-836	10.0-16.0"				511-836								
511-837	16.0-24.0"				511-837								
511-838	24.0-32.0"	511-838											
511-853	2.4-4.0"	.063"	5N or less	10N or less	511-833	2923SB-10 (Graduation: .0001")	21DZA000	1 pc.	2 pcs.	3 pcs.	4"		
511-854	4.0-6.4"				511-834								
511-855	6.0-10.0"		6N or less	15N or less	511-835							2 pcs.	6"
511-856	10.0-16.0"				511-836								
511-857	16.0-24.0"				511-837								
511-858	24.0-32.0"	511-838											
511-843	2.4-4.0"	.063"	5N or less	10N or less	511-833	2922SB (Graduation: .0005")	21DZA000	1 pc.	2 pcs.	3 pcs.	4"		
511-844	4.0-6.4"				511-834								
511-845	6.0-10.0"		6N or less	15N or less	511-835							2 pcs.	6"
511-846	10.0-16.0"				511-836								
511-847	16.0-24.0"				511-837								
511-848	24.0-32.0"	511-838											

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

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 2µm
Inch models .00008"
Repeatability: Metric models 0.5µm
Inch models .00002"
Adjacent error: Metric models 1µm
Inch models .00004"

Optional Accessories

-: Dial indicator (See Chapter F)
21DZA000: Dial protection cover

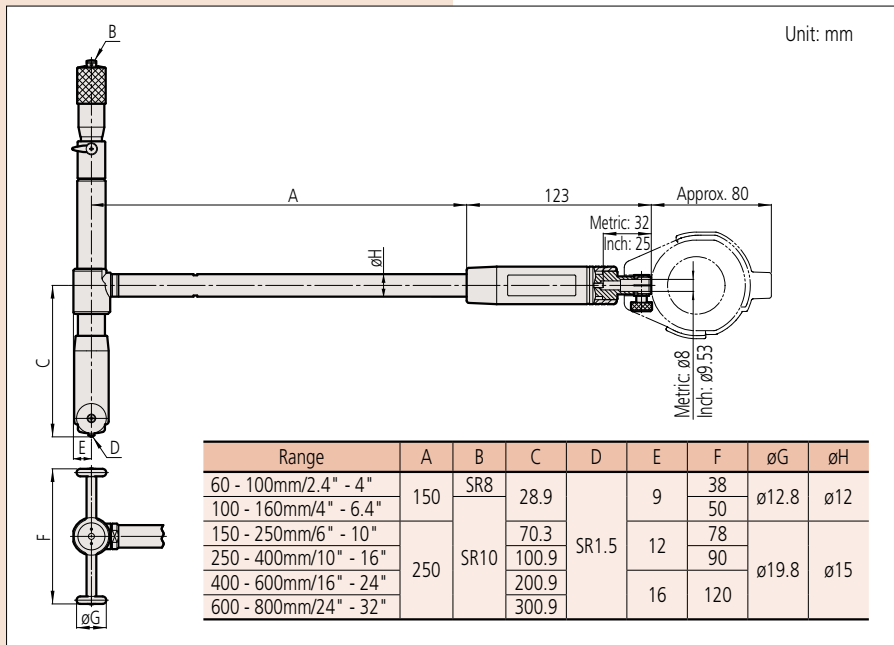
Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972 (0.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
2922SB (.0005")
Inch models: **2977** (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

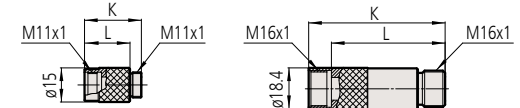
Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")

DIMENSIONS

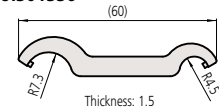


Sub-anvil

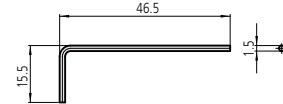


Wrench

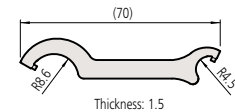
No.301336



No.202863



No.200154



STANDARD ACCESSORIES

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

Inch				Sub-Anvil				Wrench
Bore gage (Main body)	Micrometer head		Screw size	Marked No.	Parts No.	K	L	Parts No.
511-833	21DZA272	.4"	M11x1	.4"	208893	.6"	.4"	301336 (2 pcs.)
				.8"	208895	1.0"	.8"	
511-834	21DZA273	.5"	M11x1	.4"	208893	.6"	.4"	301336 (2 pcs.)
				.8"	208895 (2 pcs.)	1.0"	.8"	
511-835	21DZA273	.5"	M11x1	.4"	208892	.6"	.4"	301336 (2 pcs.)
				.8"	208894 (2 pcs.)	1.0"	.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

- Micrometer head attached for accurate dimensional setting.
- Carbide-tipped contact point for durability.
- Wide measuring range with sub-anvils.



- Dial indicators and protection covers are optionally available. Some indicators and protection covers cannot be equipped with these bore gages. Contact a Mitutoyo sales office if considering the use of dial indicators or Digimatic indicators other than recommended models.
- Extension rods (optional) can be attached for measuring deep holes.
- Optional Setting Rings offer the best method of setting Bore Gages.
- 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-44 and C-45.)



511-402

The dial indicator and protection cover are optional.

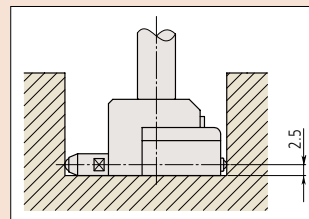
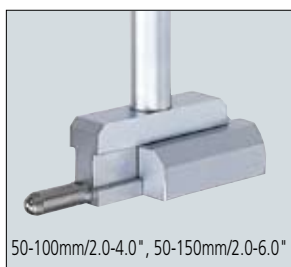
SPECIFICATIONS

Metric		Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
Order No.	Range				Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-401	15-35mm	1.2mm	4N or less	6N or less	511-401	Not supplied	Not supplied	11 pcs.	1 pc.	150mm
511-402	35-60mm				6 pcs.			4 pcs.		
511-403	50-100mm		5N or less	10N or less	511-403				11 pcs.	
511-404	50-150mm				511-404			11 pcs.		
511-421	15-35mm	1.2mm	4N or less	6N or less	511-401	2109SB-10 (Graduation: 0.001mm)	21DZA000	11 pcs.	1 pc.	150mm
511-422	35-60mm				6 pcs.			4 pcs.		
511-423	50-100mm		5N or less	10N or less	511-403				11 pcs.	
511-424	50-150mm				511-404			11 pcs.		
511-411	15-35mm	1.2mm	4N or less	6N or less	511-401	2046SB (Graduation: 0.01mm)	21DZA000	11 pcs.	1 pc.	150mm
511-412	35-60mm				6 pcs.			4 pcs.		
511-413	50-100mm		5N or less	10N or less	511-403				11 pcs.	
511-414	50-150mm				511-404			11 pcs.		

Inch		Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
Order No.	Range				Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-406	.6-1.4"	.047"	4N or less	6N or less	511-406	Not supplied	Not supplied	11 pcs.	1 pc.	6"
511-407	1.4-2.4"				6 pcs.			4 pcs.		
511-408	2.0-4.0"		5N or less	10N or less	511-408				11 pcs.	
511-409	2.0-6.0"				511-409			11 pcs.		
511-441	.6-1.4"	.047"	4N or less	6N or less	511-406	2923SB-10 (Graduation: .0001")	21DZA000	11 pcs.	1 pc.	6"
511-442	1.4-2.4"				6 pcs.			4 pcs.		
511-443	2.0-4.0"		5N or less	10N or less	511-408				11 pcs.	
511-444	2.0-6.0"				511-409			11 pcs.		
511-431	.6-1.4"	.047"	4N or less	6N or less	511-406	2922SB (Graduation: .0005")	21DZA000 (Graduation: .0005")	11 pcs.	1 pc.	6"
511-432	1.4-2.4"				6 pcs.			4 pcs.		
511-433	2.0-4.0"		5N or less	10N or less	511-407				11 pcs.	
511-434	2.0-6.0"				511-409			11 pcs.		

Notes: 1) A 10mm sub-anvil is supplied with 511-401, and a 50mm sub-anvil is supplied with 511-404.

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.)



Technical Data

Accuracy: Metric models 5µm
Inch models .0002"
Repeatability: Metric models 2µm
Inch models .00008"
Adjacent error: Metric models 2µm
Inch models .00008"

Optional Accessories

-: Dial indicator (See Chapter F)
21DZA000: Dial protection cover

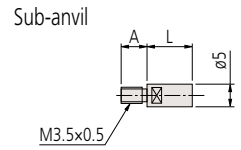
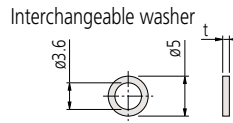
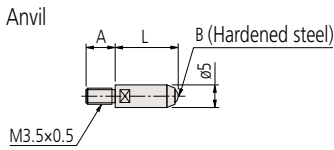
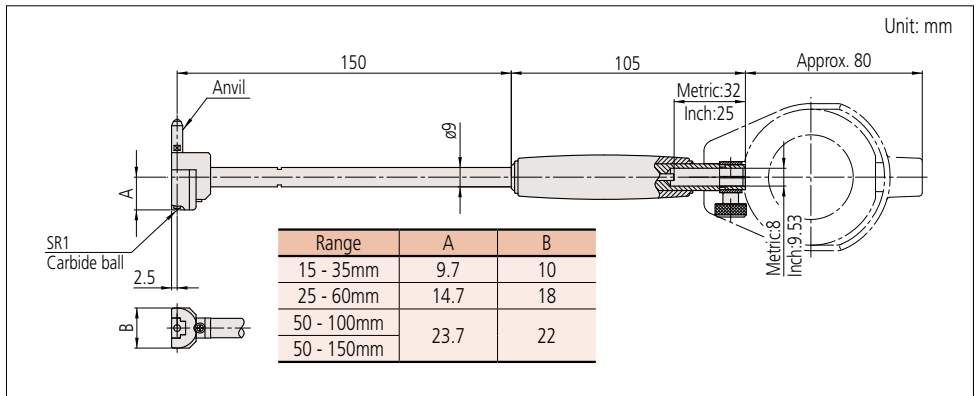
Recommended dial indicators

Metric models: 2046SB (0.01mm)
2972 (0.001mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: 2922SB (.0005")
2977 (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

Metric models: 543-264B (ID-C112GB: 0.001mm)
Inch models: 543-266B (ID-C112GEB: 0.001mm/.00005")

DIMENSIONS



STANDERD ACCESSORIES

Metric												
Bore gage (Main body)	Anvil						Interchangeable washer		Sub-Anvil			
	Marked No.	Parts No.	Size	A	B	L	Parts No.	t	Parts No.	A	L	
511-401 () Used 2.5mm Sub-Anvil	1	212131	15mm (25mm)	2.5 mm	SR1 mm	2mm	212127	0.5mm	212175	2.5mm	10mm	
	2	212132	16mm (26mm)			3mm						
	3	212133	17mm (27mm)			4mm						
	4	212134	18mm (28mm)			5mm						
	5	212135	19mm (29mm)			6mm						
	6	212136	20mm (30mm)			7mm						
	7	212137	21mm (31mm)			8mm						
	8	212138	22mm (32mm)			9mm						
	9	212139	23mm (33mm)			10mm						
	10	212140	24mm (34mm)			11mm						
	11	212141	25mm (35mm)			12mm						
511-402	1	212142	35mm	7.5 mm	SR1.5 mm	10mm	212127	0.5mm	212128	1.0mm	212129	2.0mm
	2	212143	40mm			15mm						
	3	212144	45mm			20mm						
	4	212145	50mm			25mm						
	5	212146	55mm			30mm						
	6	212147	60mm			35mm						
511-403	1	212142	50mm	7.5 mm	SR1.5 mm	10mm	212127	0.5mm	212128	1.0mm	212129	2.0mm
	2	212143	55mm			15mm						
	3	212144	60mm			20mm						
	4	212145	65mm			25mm						
	5	212146	70mm			30mm						
	6	212147	75mm			35mm						
	7	212148	80mm			40mm						
	8	212149	85mm			45mm						
	9	212150	90mm			50mm						
	10	212151	95mm			55mm						
	11	212152	100mm			60mm						
511-404 () Used 2.5mm Sub-Anvil	1	212142	50mm (100mm)	7.5 mm	SR1.5 mm	10mm	212127	0.5mm	212128	1.0mm	212129	2.0mm
	2	212143	55mm (105mm)			15mm						
	3	212144	60mm (110mm)			20mm						
	4	212145	65mm (115mm)			25mm						
	5	212146	70mm (120mm)			30mm						
	6	212147	75mm (125mm)			35mm						
	7	212148	80mm (130mm)			40mm						
	8	212149	85mm (135mm)			45mm						
	9	212150	90mm (140mm)			50mm						
	10	212151	95mm (145mm)			55mm						
	11	212152	100mm (150mm)			60mm						

Inch												
Bore gage (Main body)	Anvil						Interchangeable washer		Sub-Anvil			
	Marked No.	Parts No.	Size	A	B	L	Parts No.	t	Parts No.	A	L	
511-406 () Used .4" Sub- Anvil	1	212153	.60" (1.00")	.1	SR.04"	.09"	212127	.02"	212176	.1"	.4"	
	2	212154	.64" (1.04")			.13"						
	3	212155	.68" (1.08")			.17"						
	4	212156	.72" (1.12")			.21"						
	5	212157	.76" (1.16")			.25"						
	6	212158	.80" (1.20")			.29"						
	7	212159	.84" (1.24")			.33"						
	8	212160	.88" (1.28")			.37"						
	9	212161	.92" (1.32")			.41"						
	10	212162	.96" (1.36")			.45"						
	11	212163	1.00" (1.40")			.49"						
511-407	1	212164	1.4"	.3	SR.06"	.42"	212127	.02"	212128	.04"	212129	.06"
	2	212165	1.6"			.62"						
	3	212166	1.8"			.82"						
	4	212167	2.0"			1.02"						
	5	212168	2.2"			1.22"						
	6	212169	2.4"			1.42"						
511-408	1	212164	2.0"	.3	SR.06"	.42"	212127	.02"	212128	.04"	212129	.06"
	2	212165	2.2"			.62"						
	3	212166	2.4"			.82"						
	4	212167	2.6"			1.02"						
	5	212168	2.8"			1.22"						
	6	212169	3.0"			1.42"						
	7	212170	3.2"			1.62"						
	8	212171	3.4"			1.82"						
	9	212172	3.6"			2.02"						
	10	212173	3.8"			2.22"						
	11	212174	4.0"			2.42"						
511-409 () Used 2.5mm Sub-Anvil	1	212164	2.0" (4.0")	.3	SR.06"	.42"	212127	.02"	212128	.04"	212129	.06"
	2	212165	2.2" (4.2")			.62"						
	3	212166	2.4" (4.4")			.82"						
	4	212167	2.6" (4.6")			1.02"						
	5	212168	2.8" (4.8")			1.22"						
	6	212169	3.0" (5.0")			1.42"						
	7	212170	3.2" (5.2")			1.62"						
	8	212171	3.4" (5.4")			1.82"						
	9	212172	3.6" (5.6")			2.02"						
	10	212173	3.8" (5.8")			2.22"						
	11	212174	4.0" (6.0")			2.42"						

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages

SERIES 511 — Absolute Digimatic Bore Gages

- These ABSOLUTE Digimatic bore gages are exclusively designed for inside diameter measurement.
- Up to four extension rods (250mm or 500mm) can be used for measuring at the bottom of a hole 2m deep.
- The display and grip can be rotated up to 320 degrees and the display can be inclined up to 90 degrees, so that it is easily readable from any direction.
- The minimum value holding function provides easy measurement of hole diameter.
- Setting the Bore Gage to a master value using a gauge block set allows quick and accurate 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-44 and C-45.)



SPECIFICATIONS

Metric									
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Resolution	Content of set			Probing depth
						Anvil	Interchangeable washer	Battery (SR44)	
511-501	45-100mm	1.2mm	5N or less	10N or less	0.001mm	12 pcs.	4 pcs.	2 pcs.	150mm
511-502	100-160mm					13 pcs.	4 pcs.	2 pcs.	

Inch									
Order No.	Range	Stroke of contact point	Measuring force	Guide force	Resolution	Content of set			Probing depth
						Anvil	Interchangeable washer	Battery (SR44)	
511-521	1.8-4.0"	.047"	5N or less	6N or less	.0005"/ 0.001mm	12 pcs.	4 pcs.	2 pcs.	6"
511-522	4.0-6.5"					13 pcs.	4 pcs.	2 pcs.	

- Notes: 1) Normal use is assumed to be 8 hours per day.
 2) The correct peak value may not be displayed if the anvil's speed exceeds 50 µm/s.
 3) IP53 indicates resistance to dust and dripping water, but only applies when the connector cap is in place.

ABSOLUTE

Absolute Encoder

Technical Data

- Accuracy: Metric models 3µm
 Inch models .00012"
 Excluding quantizing error
- Excluding quantizing error
- Repeatability: Metric models 2µm
 Inch models .00008"
- Adjacent error: Metric models 2µm
 Inch models .00008"
- Battery life: Approx. 2000 hours under normal use.
 Display: LCD character height 8.5mm
 Scale type: ABSOLUTE electrostatic linear encoder
 Max. response speed: Unlimited

Function

- Presetting, Preset, Power on/off, inch/mm conversion (inch/mm type only), Data output, GO/±NG tolerance judgment Min value holding, Data hold
- Alarm:
 Low battery voltage, scale contamination, over-flow error, tolerance limit setting error

Optional Accessories

- 21DZA089:** Extension rod 250 mm (10")
21DZA081: Extension rod 500 mm (20")
516-118-10: Setup metric rectangular gauge block set
516-119-10: Setup metric square gauge block set
905338: SPC cable (1m)
905409: SPC cable (2m)
02AZD790F: SPC cable for U-WAVE (160mm)
 _____ : Setting ring (See page C-45.)



Gauge blocks and block sets for setting the origin or master value (optional)

Usage example



Rectangular gauge blocks

516-118
516-118-30 with calibration certificate

Description	Order No.	Qty	
Nominal length (mm)	1	611611-02	1
	2	611612-02	1
	3	611613-02	1
	5	611615-02	1
	10	611671-02	1
	20	611672-02	1
	30	611673-02	1
40	611674-02	1	
Flat jaw	630030	1 pair (2 pcs)	
Holder 160 mm	619004	1	
Position detecting system		1	

* Equivalent to JIS B 7506 Grade 0

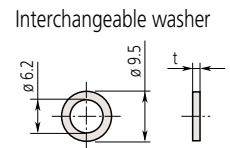
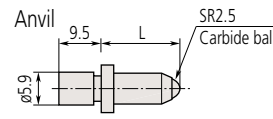
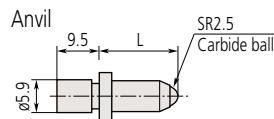
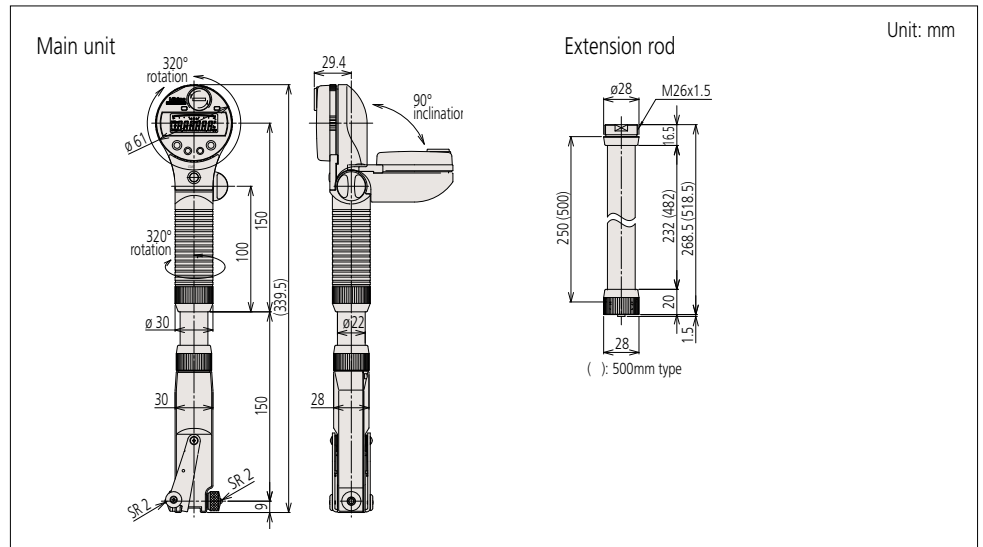
Square gauge blocks

516-119
516-119-30 with calibration certificate

Description	Order No.	Qty	
Nominal length (mm)	1	611611-02	1
	2	611612-02	1
	3	611613-02	1
	5	611615-02	1
	10	611671-02	1
	20	611672-02	1
	30	611673-02	1
40	611674-02	1	
Flat jaw	619072	1 pair (2 pcs)	
Tie rod 3"	619062	1	
Tie rod 2 1/4"	619064	1	
Tie rod 1 1/2"	619057	1	
Flat head screw 1 1/4"	619058	2	
Flat head screw 5/8"		2	
Position detecting system		1	

* Equivalent to JIS B 7506 Grade 0

DIMENSIONS



STANDARD ACCESSORIES

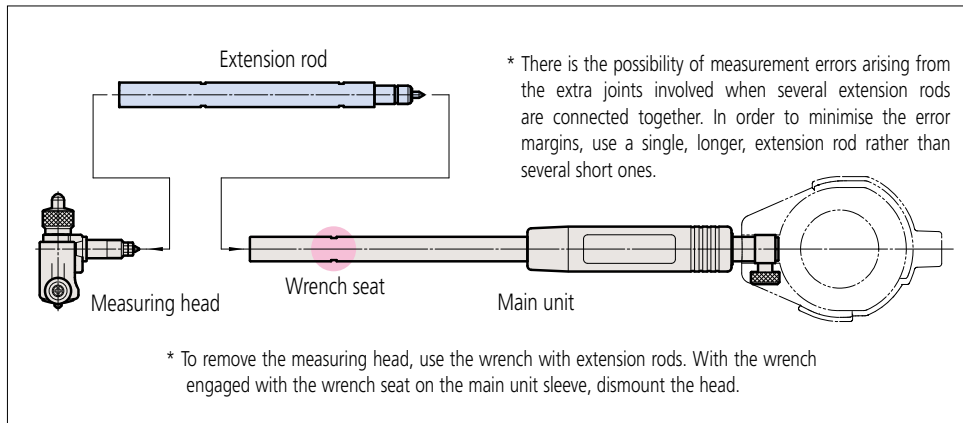
Bore gage (Main body)	Anvil					Interchangeable washer	
	Marked No.	Parts No.	Size		L	Parts No.	t
511-501 511-521	1	21DZA232A	45mm	1.8"	5.5mm/.22"	205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"
	2	21DZA232B	50mm	2.0"	10.5mm/.42"		
	3	21DZA232C	55mm	2.2"	15.5mm/.61"		
	4	21DZA232D	60mm	2.4"	20.5mm/.81"		
	5	21DZA232E	65mm	2.6"	25.5mm/1.00"		
	6	21DZA232F	70mm	2.8"	30.5mm/1.20"		
	7	21DZA232G	75mm	3.0"	35.5mm/1.40"		
	8	21DZA232H	80mm	3.2"	40.5mm/1.59"		
	9	21DZA232J	85mm	3.4"	45.5mm/1.79"		
	10	21DZA232L	90mm	3.6"	50.5mm/1.99"		
	11	21DZA232M	95mm	3.8"	55.5mm/2.19"		
	12	21DZA232N	100mm	4.0"	60.5mm/2.38"		
511-502 511-522	1	21DZA232A	100mm	4.0"	5.5mm/.22"	205457 205458 205459 205460	0.5mm/.02" 1.0mm/.04" 2.0mm/.08" 3.0mm/.12"
	2	21DZA232B	105mm	4.2"	10.5mm/.42"		
	3	21DZA232C	110mm	4.4"	15.5mm/.61"		
	4	21DZA232D	115mm	4.6"	20.5mm/.81"		
	5	21DZA232E	120mm	4.8"	25.5mm/1.00"		
	6	21DZA232F	125mm	5.0"	30.5mm/1.20"		
	7	21DZA232G	130mm	5.2"	35.5mm/1.40"		
	8	21DZA232H	135mm	5.4"	40.5mm/1.59"		
	9	21DZA232J	140mm	5.6"	45.5mm/1.79"		
	10	21DZA232L	145mm	5.8"	50.5mm/1.99"		
	11	21DZA232M	150mm	6.0"	55.5mm/2.19"		
	12	21DZA232N	155mm	6.2"	60.5mm/2.38"		
	13	21DZA232P	160mm	6.4"	65.5mm/2.58"		

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.
- The extension rod length is available up to 1000mm.
- When using a 500mm (or longer) extension rod, use the bore gage in an upright position.
- The accuracy and security of the assembly should be confirmed after connecting a rod.

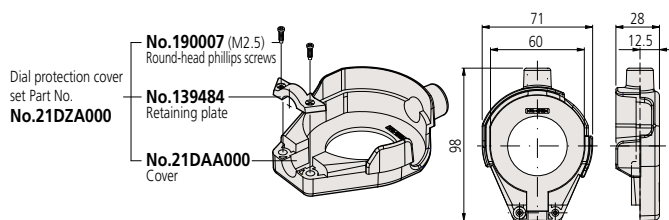


SPECIFICATIONS

Applicable model Order No.	Extension rod length					Extension rod diameter	Wrench part No.
	125m	250m	500m	750m	1000m		
511-701	953549	953550	953551	—	—	ø9mm	102148
511-702	953552	953553	953554	953555	953556	ø12mm	212556
511-703							
511-704							
511-803							
511-804	953557	952361	953558	953559	953560	ø15mm	212556
511-705							
511-706							
511-805							
511-806							
511-807							
511-808							

Protection cover

- Both the flat backplate of a dial indicator and backplate with a lug can be attached to a protection cover.



Usage example



Technical Data

Flatness of parallel jaw
0.5 μ m (Parallelism 1 μ m)

Bore Gage Checker SERIES 515

- The Bore Gage Checker allows easy setting of dial bore gages with ranges of 18mm (.7") through 400mm (16") using gauge blocks.



515-590

Standard configuration: Stand
Attachment A, B, C (1 pc each)
parallel jaw (2 pcs)

SPECIFICATIONS

Order No.	Applicable range
515-590	18 - 400mm (.7"-16")

Bore Gages

For easy and accurate measurement of inside diameters

Setting Rings

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

- Used for quick and accurate setting of dial bore gages, Holtest, and inside micrometers.
- If a setting ring of an optimal size is prepared, it can be used for calibration.

Steel Setting Rings

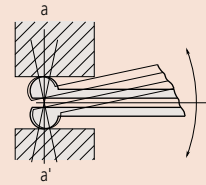


Ceramic Setting Rings



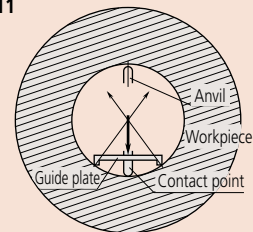
How to read the indicated value

Series 526



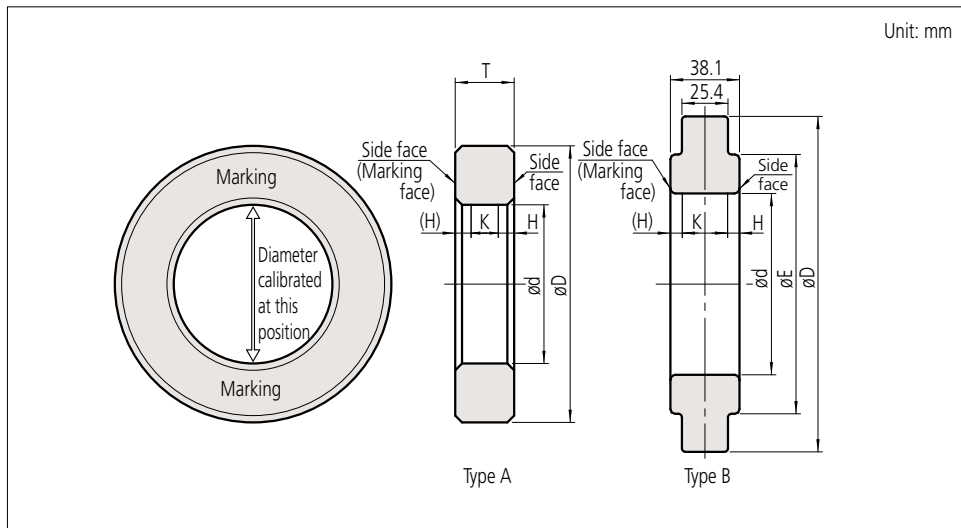
The 526 series has a gage head with high curvature. Alignment with the diameter (a-a') is achieved by rotating the gage head in the direction indicated by the arrow, and the reading is the maximum value read from the dial indicator.

Series 511



The 511 series provides a guide plate to align the setting ring diameter with the measurement axis of the bore gage.

DIMENSIONS



Bore Gages

For easy and accurate measurement of inside diameters

Bore Gage Measuring Machine

- Ring gages can be measured efficiently with high accuracy for inside diameters from 6 to 120mm and thicknesses up to 40mm.



565-201

The dedicated stand is optional.

Optional Accessories

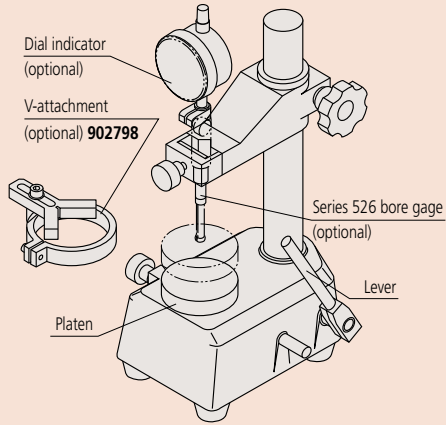
- Vibration isolation stand (air spring type)
- Dedicated stand
- Master gage 6mm
- Master gage 12.5mm
- Master gage 75mm
- Master gage 120mm

SPECIFICATIONS

Range	ID: 6mm - 120mm
Resolution	0.0001mm (0.1 μ m)
Accuracy (20°C)	$\pm(0.3+5D/1000)\mu$ m D=Difference in the nominal dimensions between a master gage and a ring gage (mm)
Repeatability ($\pm 2\sigma$)	$\pm 0.2\mu$ m
Measuring unit	Laser Hologscale
Measuring force	Approx. 0.2N
Workpiece size	OD: 20mm to 200mm Thickness: Up to 40mm
Ambient temperature	20°C $\pm 0.5^\circ$ C
Air requirement	400KPa
Air consumption	Approx. 30 liters per minute
Dimensions (W x D x H)	720 x 494 x 875mm

Operating method

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



Bore Gage Stand SERIES 215

- Optimal for efficient measurement of multiple small holes with a bore gage (series 526).
- V-attachment (**902798**) is available for centering a large number of workpieces quickly (option).
- With platen (60mm).

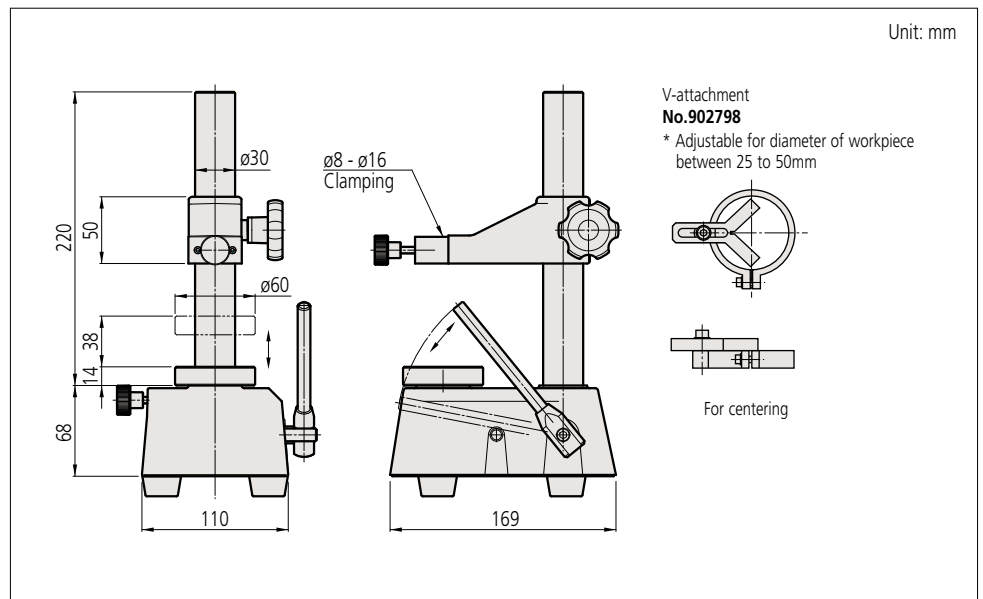


215-120-10

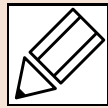
SPECIFICATIONS

Order No.	Measuring table displacement	Measuring table
215-120-10	38 mm	Flat measuring table (ø60mm)

DIMENSIONS

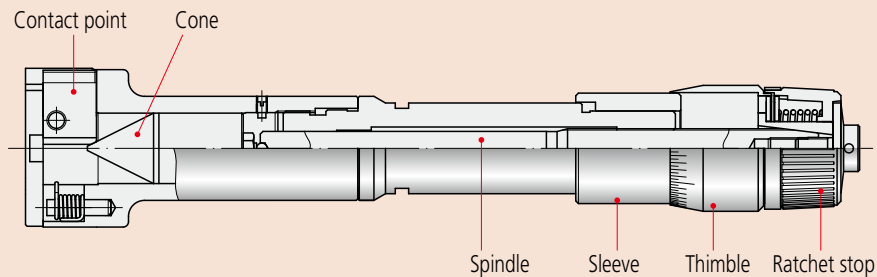


Quick Guide to Precision Measuring Instruments



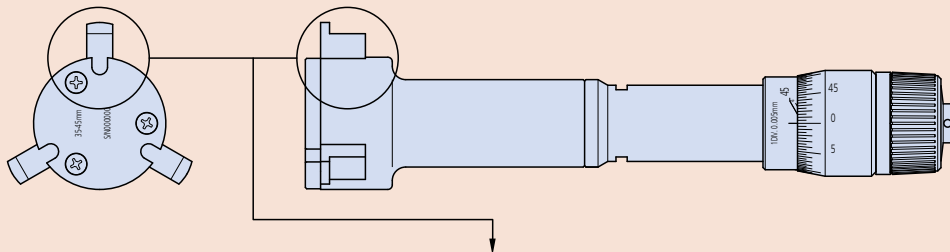
Internal Micrometers

Nomenclature



Custom-ordered Products (Holtest / Borematic)

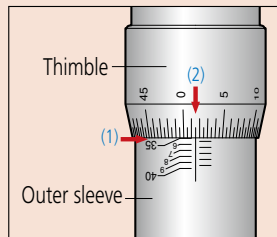
Mitutoyo can custom-build an internal micrometer best suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required. Please note that, depending on circumstances, such a micrometer will usually need to be used 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 16mm (differs depending on the workpiece profile.) ● Dimension l should be as follows: For $W =$ less than 2mm: $l =$ less than 2mm For $W =$ 2mm or more: $l =$ 2mm 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 internal micrometer an additional initial cost for the master ring gage 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 Radius=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			

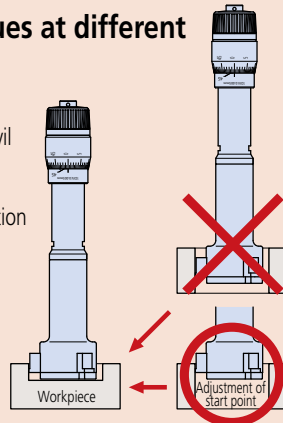
How to Read the Scale

Graduation	0.005mm
(1) Outer sleeve	35 mm
(2) Thimble	0.015 mm
Reading	35.015 mm



Changes in measured values at different measuring points

When Holtest is used, the measured value differs between measurement across the anvil and the measurement only at the tip of the anvil due to the product mechanism. Adjust the start point under the same condition before measurement.



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

Measurement error due to temperature variation of micrometer

Heat transfer from the operator to the micrometer should be minimized to avoid any significant measuring error due to temperature difference between the workpiece and micrometer. If the micrometer is held directly by hand when measuring, use gloves or hold the heat-insulator (if fitted).

Misalignment Errors

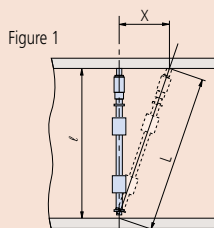


Figure 1
 l : Inside diameter to be measured
 L : Length measured with axial offset X
 X : Offset in axial direction
 Δl : Error in measurement
 $\Delta l: L-l = \sqrt{l^2 + X^2} - l$

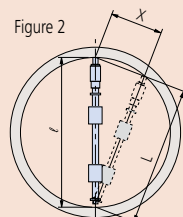
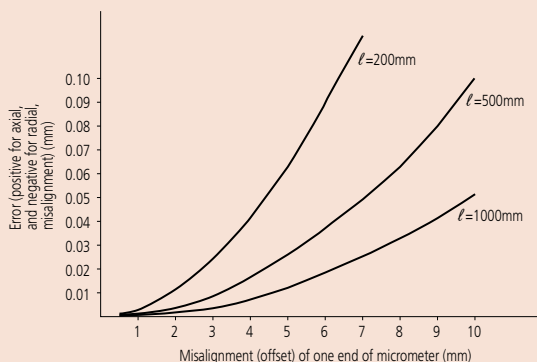


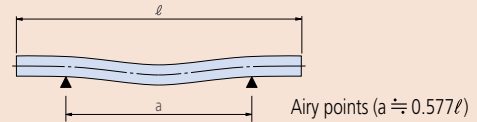
Figure 2
 l : Inside diameter to be measured
 L : Length measured with radial offset X
 X : Offset in radial direction
 Δl : Error in measurement
 $\Delta l: L-l = \sqrt{l^2 - X^2} - l$

If an 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.

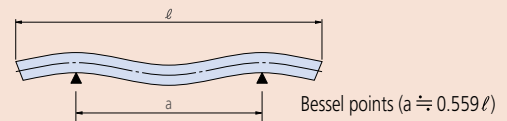


Airy and Bessel Points

When a length standard bar or internal 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.



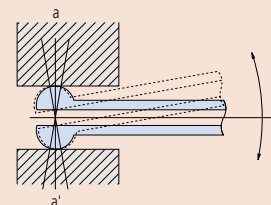
The ends of a bar (or micrometer) can be made exactly horizontal by spacing the two supports symmetrically as shown above. These points are known as the 'Airy Points' and are commonly used to ensure that the ends of a length bar are parallel to one another, so that the length is well defined.



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.

Bore Gages

- Mitutoyo bore gages for small holes feature contact elements with a large curvature so they can be easily positioned for measuring the true diameter (in the direction $a-a'$) of a hole. The true diameter is the minimum value seen on the dial gage while rocking the bore gage as indicated by the arrow.



- The spring-loaded guide plate on a Mitutoyo two-point bore gage automatically ensures radial alignment so that only an axial rocking movement is needed to find the minimum reading (true diameter).

