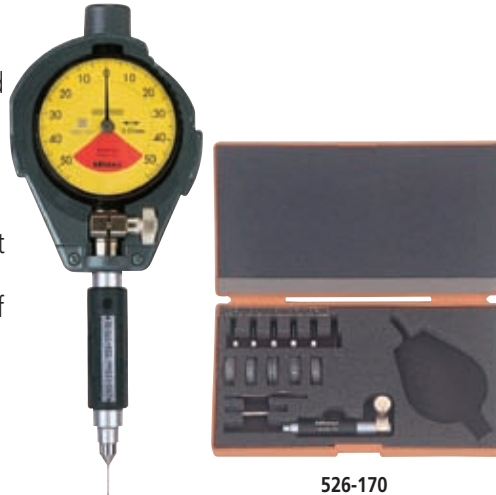


Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 526 — for Extra Small Holes

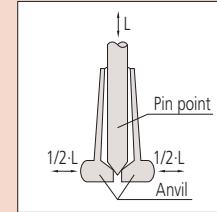
- These gages are designed to measure the diameters of very small holes. The radial displacement of the split-ball anvil is converted to axial displacement of the measuring rod, which is shown on the dial indicator.
- Dial indicators and protection covers are optionally available. Some indicators and 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-30 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
215-120-10: Stand for small holes

Recommended dial indicators

Metric models: **2046SB** (0.01mm)
2972TB (0.01mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977TB (.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")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

SPECIFICATIONS

Metric

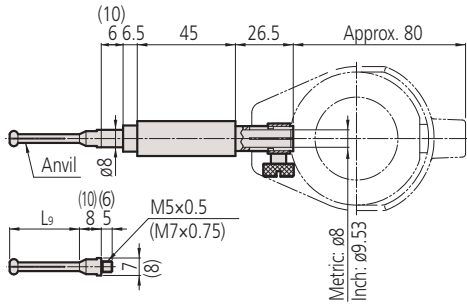
| Order No. | Range | Bore gage | Content of set | | | | | Probing depth |
|----------------|-------------|----------------|--|-----------------------|--------|-----------|--------------|---------------|
| | | | Dial indicator | Dial protection cover | Anvil | Pin point | Setting ring | |
| 526-170 | 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 | .06-.157" | 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 | .06-.157" | 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

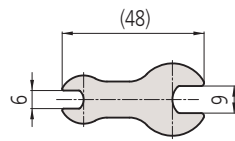


() : 3.7 - 7.3mm / .145 - .29 range model

STANDARD ACCESSORIES

| Bore gage (Main body) | | | Anvil | | Pin point | Setting ring mm/inch | Wrench Parts No. |
|--------------------------|------------|-------------|-----------------|----------------|-------------|-------------------------|---------------------|
| | Marked No. | Parts No. | Measuring range | L ₉ | | | |
| 526-170 526-175 | 1.0 | 201414 | 0.95-1.15mm | .037-.045" | 11.5mm/.45" | 201435 | 210188 |
| | 1.1 | 201415 | 1.07-1.25mm | .042-.049" | | | |
| | 1.2 | 201416 | 1.17-1.35mm | .046-.053" | | | |
| | 1.3 | 201417 | 1.27-1.45mm | .050-.057" | | | |
| | 1.4 | 201418 | 1.37-1.55mm | .054-.061" | | | |
| 526-160 526-165 | 1.75 | 201419 | 1.50-1.90mm | .060-.075" | 17.5mm/.68" | 201436 | 210188 |
| | 2.00 | 201420 | 1.80-2.20mm | .070-.085" | | | |
| | 2.25 | 201421 | 2.05-2.45mm | .080-.095" | | | |
| | 2.50 | 201422 | 2.25-2.75mm | .090-.105" | | | |
| | 2.75 | 201423 | 2.50-3.00mm | .100-.115" | 22.5mm/.88" | 201437 | |
| | 3.00 | 201424 | 2.75-3.25mm | .110-.125" | | | |
| | 3.25 | 201425 | 3.00-3.50mm | .120-.135" | | | |
| | 3.50 | 201426 | 3.25-3.75mm | .130-.145" | | | |
| 3.75 | 201427 | 3.50-4.00mm | .140-.157" | 32.0mm/1.25" | 201438 | 210188 | |
| 4.0 | 201428 | 3.70-4.30mm | .145-.170" | | | | |
| 4.5 | 201429 | 4.20-4.80mm | .165-.190" | | | | |
| 5.0 | 201430 | 4.70-5.30mm | .185-.210" | | | | |
| 5.5 | 201431 | 5.20-5.80mm | .205-.230" | | | | |
| 6.0 | 201432 | 5.70-6.30mm | .225-.250" | 32.0mm/1.25" | 201438 | 210188 | |
| 6.5 | 201433 | 6.20-6.80mm | .245-.270" | | | | |
| 7.0 | 201434 | 6.70-7.30mm | .265-.290" | | | | |

Wrench
No.210188



Thickness: 1.5

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 526 — for Extra Small Holes



526-101

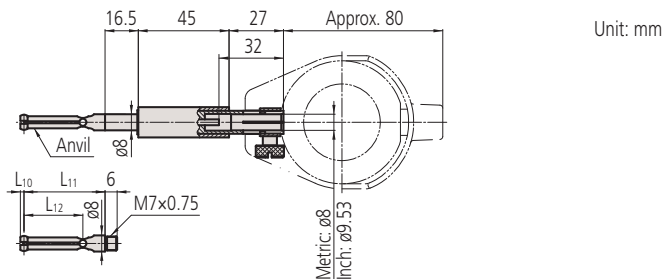
* The dial indicator and the protection cover are optional.

SPECIFICATIONS

| Metric | | Content of set | | | | | Probing depth |
|-----------|---------|----------------|------------------------------------|-----------------------|--------|------|---------------|
| Order No. | Range | Bore gage | 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 | |

| Inch | | Content of set | | | | | Probing depth |
|-----------|--------|----------------|-----------------------------------|-----------------------|--------|-------|---------------|
| Order No. | Range | Bore gage | 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" | 526-103 | 2923SB-10 (Graduation: .0001") | 21DZA000 | 6 pcs. | 1.25" | |
| 526-123 | .4-.7" | 526-104 | | | 8 pcs. | 2.42" | |
| 526-119 | .3-.4" | 526-103 | 2922SB (Graduation: .0005") | 21DZA000 | 6 pcs. | 1.25" | |
| 526-120 | .4-.7" | 526-104 | | | 8 pcs. | 2.42" | |

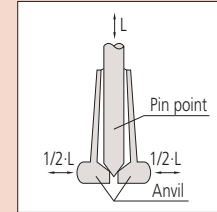
DIMENSIONS



STANDARD ACCESSORIES

| Bore gage (Main body) | Marked No. | Parts No. | Anvil | | | L10 | L11 | L12 | Wrench Parts No. |
|--------------------------|------------|-----------|-----------------|------------|------------|------------|--------------|--------|---------------------|
| | | | Measuring range | | | | | | |
| 526-101 526-103 | 1 | 102469 | 7.0 - 7.5mm | .28 - .30" | 1.8mm/.07" | 40mm/1.57" | 29.2mm/1.15" | 102148 | |
| | 2 | 102470 | 7.5 - 8.0mm | .30 - .32" | | | | | |
| | 3 | 102471 | 8.0 - 8.5mm | .32 - .34" | | | | | |
| | 4 | 102472 | 8.5 - 9.0mm | .34 - .36" | | | | | |
| | 5 | 102473 | 9.0 - 9.5mm | .36 - .38" | | | | | |
| | 6 | 102474 | 9.5 - 10.0mm | .38 - .40" | | | | | |
| 526-102 526-104 | 1 | 102454 | 10 - 11mm | .40 - .44" | 2.1mm/.08" | 46mm/1.81" | 38mm/1.50" | 102148 | |
| | 2 | 102455 | 11 - 12mm | .44 - .48" | | | | | |
| | 3 | 102456 | 12 - 13mm | .48 - .52" | | | | | |
| | 4 | 102457 | 13 - 14mm | .52 - .56" | | | | | |
| | 5 | 102458 | 14 - 15mm | .56 - .60" | 2.7mm/.11" | | | | |
| | 6 | 102459 | 15 - 16mm | .60 - .64" | | | | | |
| | 7 | 102460 | 16 - 17mm | .64 - .68" | | | | | |
| | 8 | 102461 | 17 - 18mm | .68 - .72" | | | | | |

Measurement principle



Technical Data

Accuracy
Metric models: 7-10mm, 4µm / 10-18mm, 6µm
Inch models: .3-.4", .00016" / .4-.7", .00024"
Repeatability
Metric models: 2µm
Inch models: .00008"

Optional accessories

-: Dial indicator (See Chapter F)
21DZA000: Dial protection cover
 -: Setting ring (See page C-47)
215-120-10: Stand for small holes

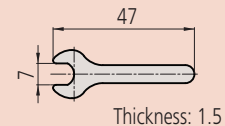
Recommended dial indicators

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

Recommended digimatic indicators

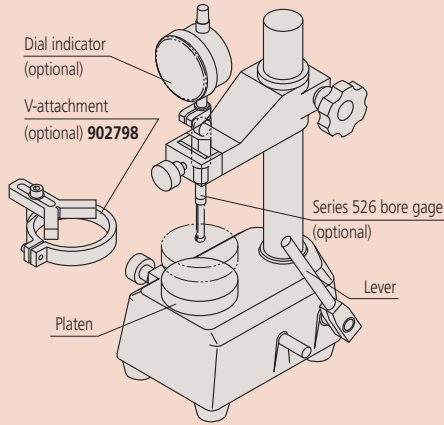
Metric models: 543-264B (ID-C112GB, 0.001mm)
Inch models: 543-266B (ID-C112GEB, 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

Wrench
No.102148



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).

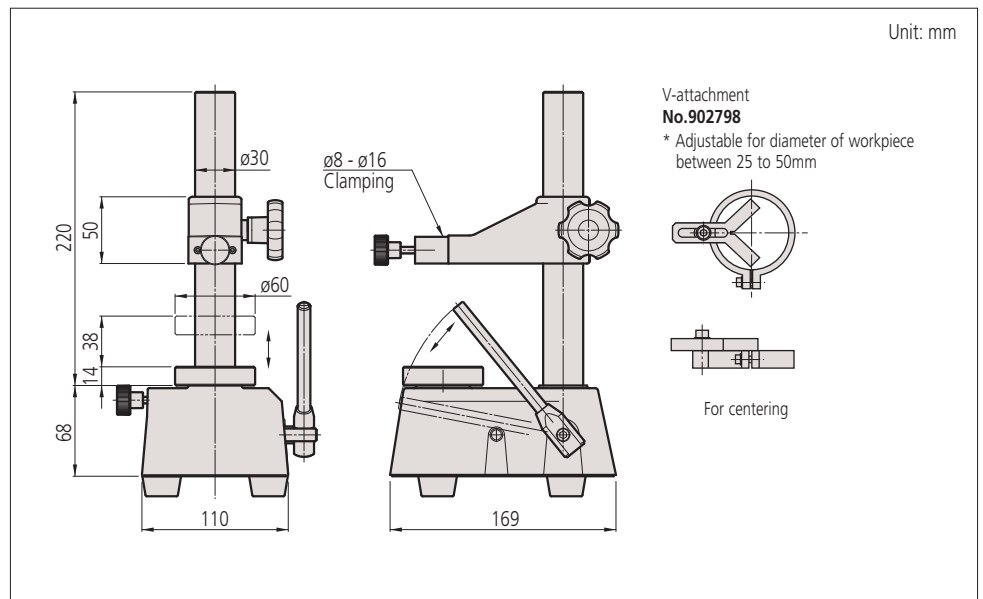


215-120-10

SPECIFICATIONS

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

DIMENSIONS



Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511 — for Small Holes

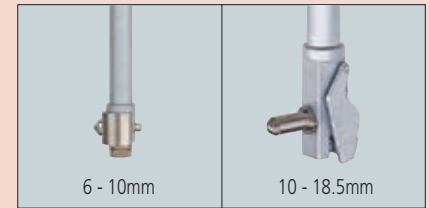
- The interchangeable anvils used on this gage are made of high-grade tool steel.
- The dial indicator is fully protected by a rugged cover.
- Dial indicators and protection covers are optionally available. Some indicators and protection covers cannot be used with these bore gages. Contact a Mitutoyo sales office if considering the use of dial indicators or Digimatic indicators other than recommended models.
- Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to page C-47)



511-201

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

Recommended digimatic indicators

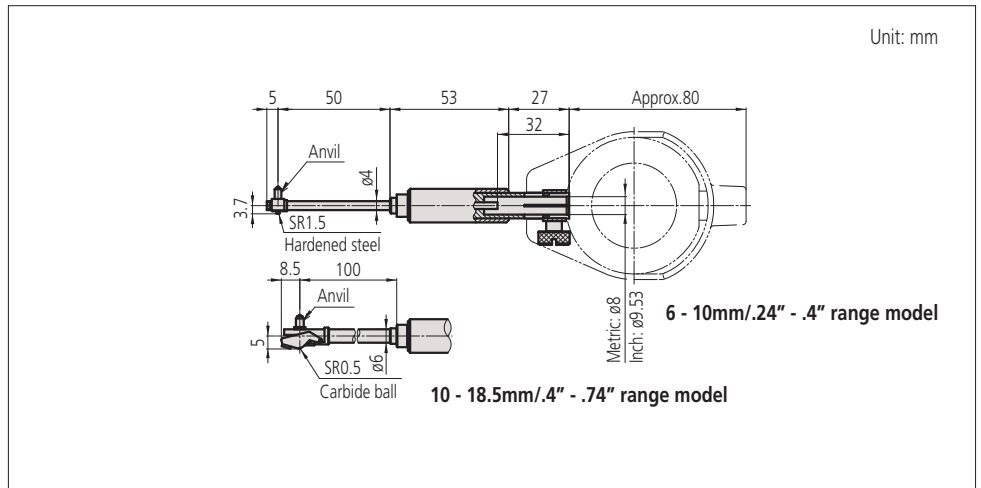
Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

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" |

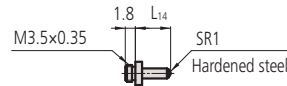
DIMENSIONS



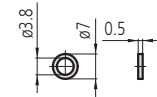
511-209/511-214
Anvil



511-201/511-205
Anvil



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



No.204355

STANDARD ACCESSORIES

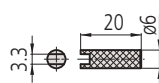
| Bore gage (Main body) | Anvil | | | | | Interchangeable Washer Parts No. | Wrench Parts No. |
|----------------------------------|------------|---------------|--------|------|------------|-------------------------------------|---------------------|
| | Marked No. | Parts No. | Size*1 | | L13 | | |
| 511-209 511-214 | 1 | 952168 | 6.0mm | .24" | 1.2mm/.05" | Not supplied | 206709 |
| | 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" | | |

| Bore gage (Main body) | Anvil | | | | | Interchangeable Washer Parts No. | Wrench Parts No. |
|------------------------------------|------------|---------------|--------|------|-----------|-------------------------------------|---------------------|
| | Marked No. | Parts No. | Size*1 | | L14 | | |
| 511-201*2 511-205 | 1 | 204356 | 10.0mm | .40" | 2mm/.08" | 204355 | 204354 |
| | 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" | | |

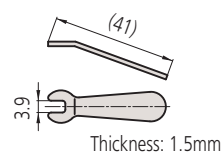
*1 Indication of measuring size.

*2 Equipped with an anvil fixing plate.

Wrench
No.206709



No.204354

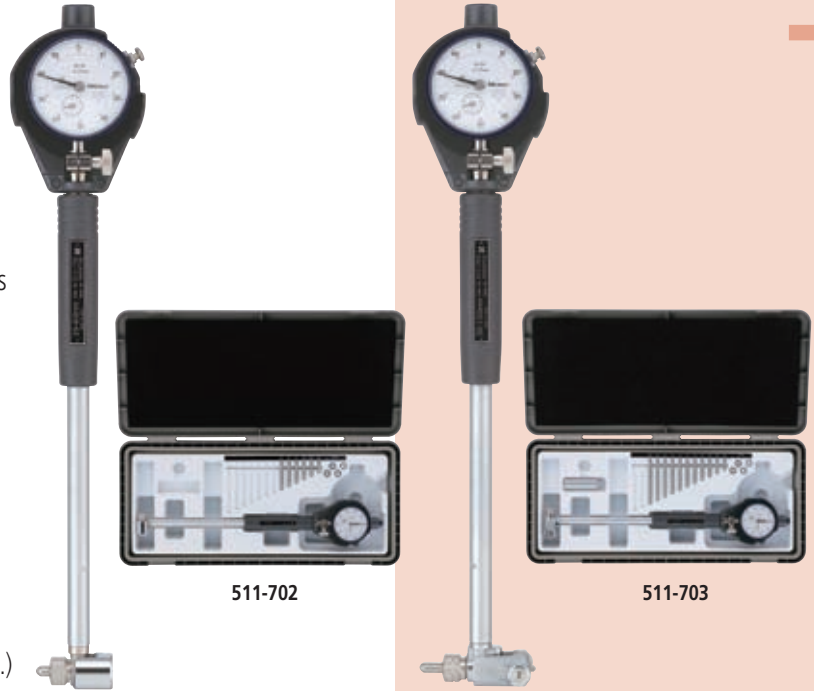


Bore Gages

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-45.)
- 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-46 and C-47.)



511-702

511-703

Dial indicators and protection covers are optional.

SPECIFICATIONS

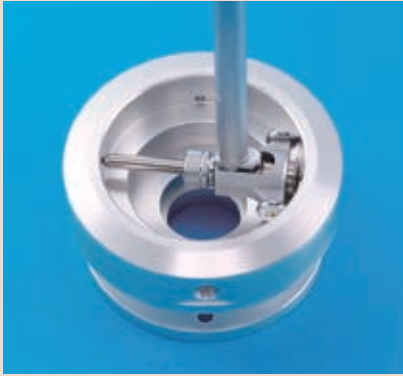
| Metric | | | | | | Content of set | | | | | | | Probing depth |
|-----------|-----------|-------------------------|-----------------|-------------|-----------|------------------------------------|-----------------------|---------|------------------------|--------------|--------------|-------|---------------|
| Order No. | Range | Stroke of contact point | Measuring force | Guide force | 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 | 1.6mm | 5N or less | 10N or less | 511-703 | Not supplied | Not supplied | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 150mm | |
| 511-704 | 100-160mm | | | | 511-704 | | | 13 pcs. | | | | | |
| 511-705 | 160-250mm | | | | 511-705 | | | 6 pcs. | | | | | |
| 511-706 | 250-400mm | | | | 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 | 1.6mm | 5N or less | 10N or less | 511-703 | 2109SB-10 (Graduation: 0.001mm) | 21DZA000 | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 150mm | |
| 511-724 | 100-160mm | | | | 511-704 | | | 13 pcs. | | | | | |
| 511-725 | 160-250mm | | | | 511-705 | | | 6 pcs. | | | | | |
| 511-726 | 250-400mm | | | | 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 | 1.6mm | 5N or less | 10N or less | 511-703 | 2046SB (Graduation: 0.01mm) | 21DZA000 | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 150mm | |
| 511-714 | 100-160mm | | | | 511-704 | | | 13 pcs. | | | | | |
| 511-715 | 160-250mm | | | | 511-705 | | | 6 pcs. | | | | | |
| 511-716 | 250-400mm | | | | 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 | | | | | | Content of set | | | | | | | Probing depth |
|-----------|------------|-------------------------|-----------------|-------------|-----------|-----------------------------------|-----------------------|---------|------------------------|--------------|--------------|----|---------------|
| Order No. | Range | Stroke of contact point | Measuring force | Guide force | 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" | .063" | 5N or less | 10N or less | 511-733 | Not supplied | Not supplied | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 6" | |
| 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" | .047" | 4N or less | 6N or less | 511-731 | 2923SB-10 (Graduation: .0001") | 21DZA000 | 9 pcs. | 2 pcs. | Not supplied | 1 pc. | 4" | |
| 511-752 | 1.4-2.5" | | | | 511-732 | | | 6 pcs. | | | | | |
| 511-753 | 2.0-6.0" | .063" | 5N or less | 10N or less | 511-733 | 2923SB-10 (Graduation: .0001") | 21DZA000 | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 6" | |
| 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" | .047" | 4N or less | 6N or less | 511-731 | 2922SB (Graduation: .0005") | 21DZA000 | 9 pcs. | 2 pcs. | Not supplied | 1 pc. | 4" | |
| 511-742 | 1.4-2.5" | | | | 511-732 | | | 6 pcs. | | | | | |
| 511-743 | 2.0-6.0" | .063" | 5N or less | 10N or less | 511-733 | 2922SB (Graduation: .0005") | 21DZA000 | 11 pcs. | 4 pcs. | 1 pc. | Not supplied | 6" | |
| 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) A 2" sub-anvil is supplied with 511-733, and a 3" sub-anvil is supplied with 511-736.

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



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

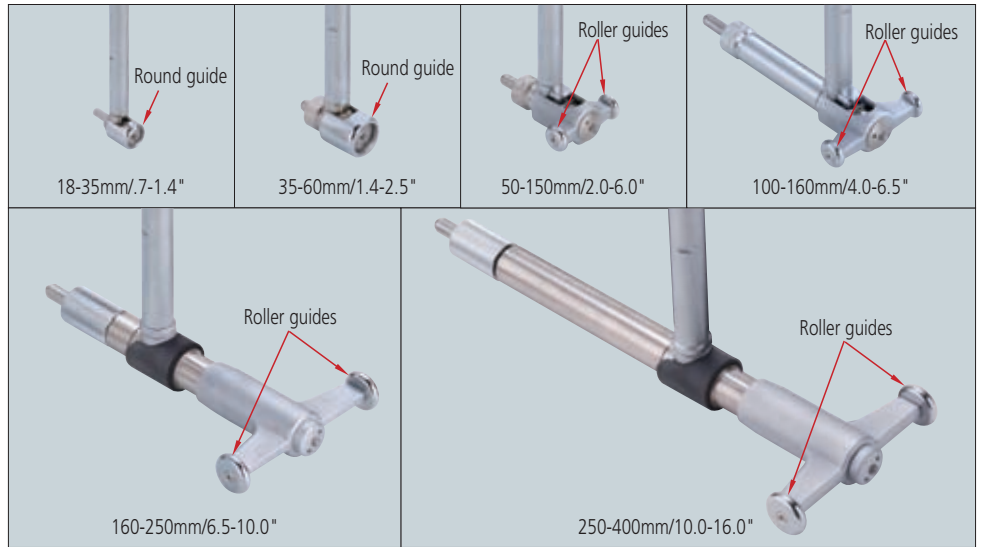
Metric models: **2046SB** (0.01mm)
2972TB (0.01mm - One revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977TB (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

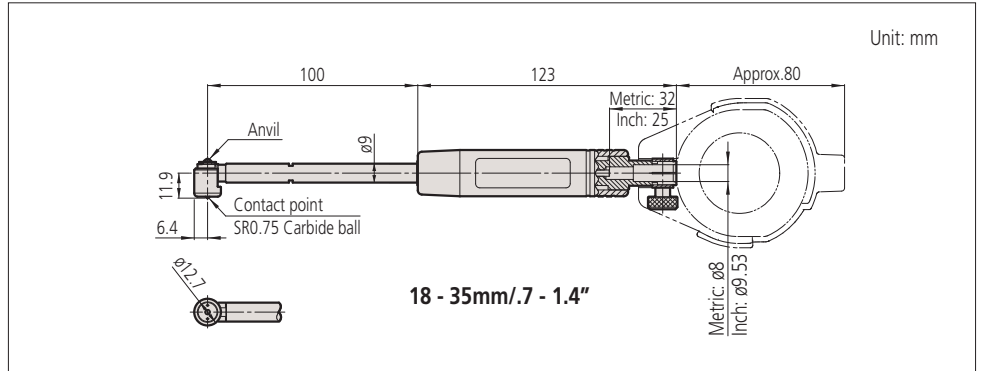
Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")

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

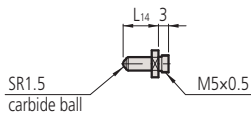
Contact Points



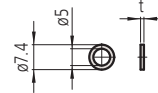
DIMENSIONS



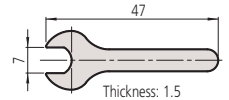
Anvil



Interchangeable washer



Wrench
102148



STANDARD ACCESSORIES

| Bore gage (Main body) | Anvil | | | | | | Interchangeable washer | | Wrench |
|----------------------------------|------------|------------------|--------|-------|--------|------|--------------------------------|--------------------------|---------------|
| | Marked No. | Parts No. | Size*1 | | L14 | | 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" | | | |

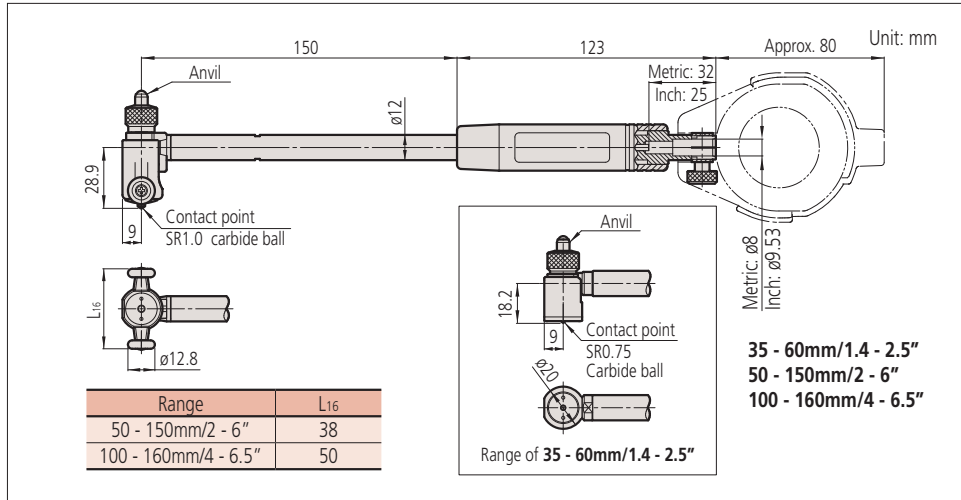
*1 Indication of measuring size.

Bore Gages

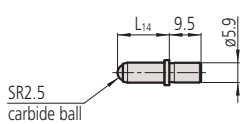
For easy and accurate measurement of inside diameters

Bore Gages SERIES 511

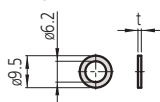
DIMENSIONS



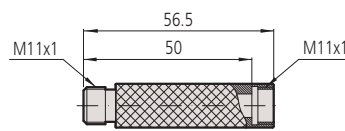
Anvil



Interchangeable washer



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



102178

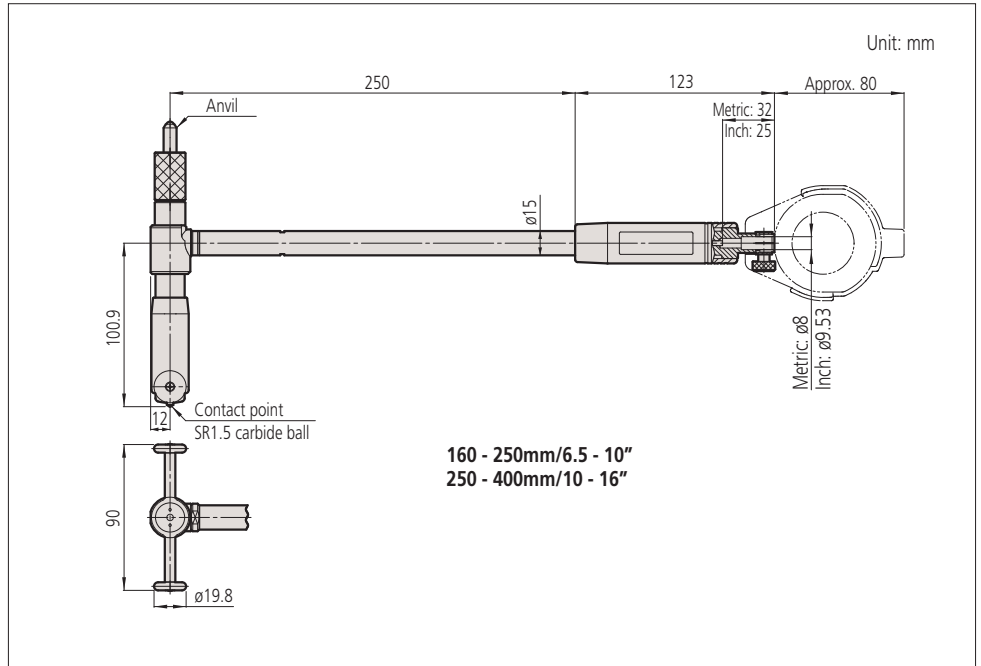
Notes: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

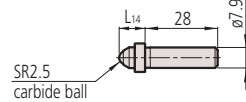
| Bore gage (Main body) | Marked No. | Parts No. | Anvil | | | Interchangeable washer | | Sub-Anvil |
|--|---------------|-----------|---------------|---------------|-----------|------------------------|------------------|--------------------------|
| | | | Size*1 | L14 | Parts No. | t | Parts No. | |
| 511-702 511-732 | 1 | 21DZA232A | 35mm | 1.38" | 5.5mm | .22" | | |
| | 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 | 1 | 21DZA232A | 50mm (100mm) | 1.97" (3.94") | 5.5mm | .22" | | |
| | 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" | 205457 | 0.5mm/.02" |
| | 10 | 21DZA232L | 95mm (145mm) | 3.69" (5.71") | 50.5mm | 1.99" | 205458 | 1.0mm/.04" |
| | 11 | 21DZA232M | 100mm (150mm) | 3.88" (5.91") | 55.5mm | 2.19" | 205459 205460 | 2.0mm/.08" 3.0mm/.12" |
| 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" | | |

*1 Indication of measuring size.

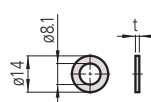
DIMENSIONS



Anvil

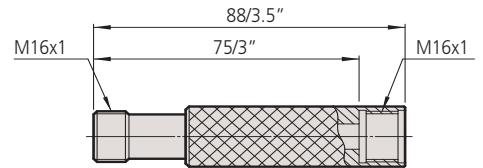


Interchangeable washer



Sub-anvil

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



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

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

STANDARD ACCESSORIES

| Bore gage (Main body) | Anvil | | | | | Interchangeable washer | | Sub-Anvil |
|--|---------------|-----------|---------------|-----------------|-----------------|------------------------|--|--|
| | Marked No. | Parts No. | Size*1 | | L ₁₄ | Parts No. | t | Parts No. |
| 511-705 511-735 | 1 | 21DZA241A | 160mm | 6.30" | 10.0mm | .39" | 205467 205461 205462 205463 205464 205465 205466 | Metric: 202974 (75mm) Inch: 202975 (3.0") |
| | 2 | 21DZA241B | 175mm | 6.89" | 25.0mm | .98" | | |
| | 3 | 21DZA241C | 190mm | 7.48" | 40.0mm | 1.57" | | |
| | 4 | 21DZA241D | 205mm | 8.07" | 55.0mm | 2.17" | | |
| | 5 | 21DZA241E | 220mm | 8.66" | 70.0mm | 2.76" | | |
| | 6 | 21DZA241F | 235mm | 9.25" | 85.0mm | 3.35" | | |
| 511-706 511-736 () Used 75mm/3" Sub-Anvil | 1 | 21DZA241A | 250mm (325mm) | 9.84" (12.80") | 10.0mm | .39" | Metric: 202974 (75mm) Inch: 202975 (3.0") | |
| | 2 | 21DZA241B | 265mm (340mm) | 10.43" (13.39") | 25.0mm | .98" | | |
| | 3 | 21DZA241C | 280mm (355mm) | 11.02" (13.98") | 40.0mm | 1.57" | | |
| | 4 | 21DZA241D | 295mm (370mm) | 11.61" (14.57") | 55.0mm | 2.17" | | |
| | 5 | 21DZA241E | 310mm (385mm) | 12.20" (15.16") | 70.0mm | 2.76" | | |

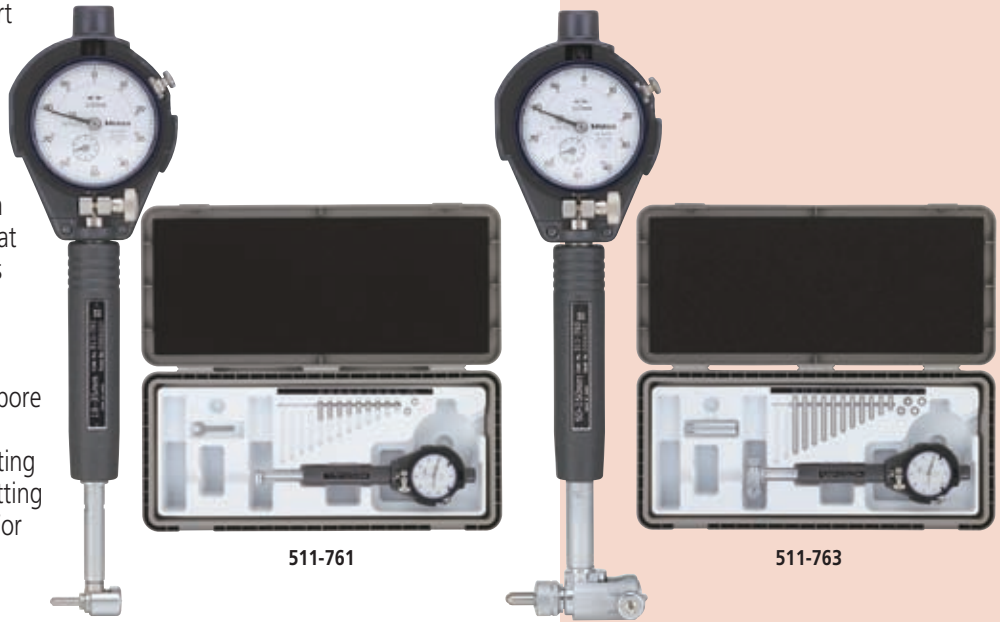
*1 Indication of measuring size.

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511 — Short Leg Type

- Compact and lightweight due to the short length below the grip.
- Longer plunger stroke with no affect on accuracy.
- Carbide 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%.
- 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-46 and C-47.)



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. | | | | |
| 511-763 | 50-150mm | 511-763 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 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. | | | | |
| 511-773 | 50-150mm | 511-763 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 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. | | | | |
| 511-768 | 50-150mm | 511-763 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 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. | | | | |
| 511-783 | 2.0-6.0" | 511-783 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 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. | | | | |
| 511-793 | 2.0-6.0" | 511-783 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 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. | | | | |
| 511-788 | 2.0-6.0" | 511-783 | 11 pcs. | 4 pcs. | 1 pc. | | | | | | | |
| 511-789 | 4.0-6.5" | 511-784 | 13 pcs. | | Not supplied | | | | | | | |

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

2) A 2" sub-anvil is supplied with 511-783.

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

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

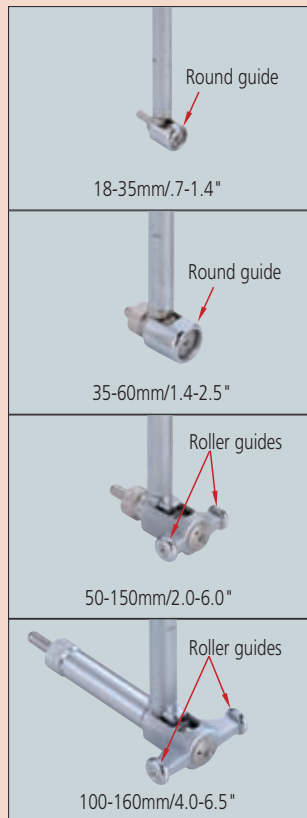
Recommended dial indicators

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

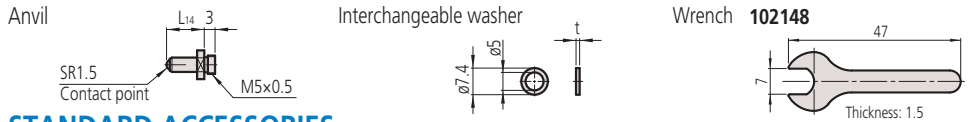
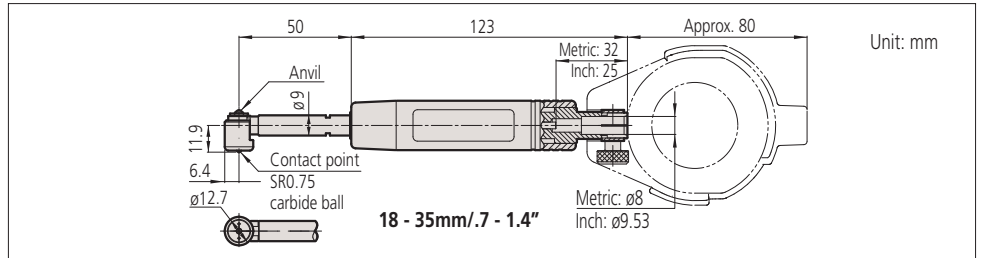
Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB, 0.001mm)
Inch models: **543-266B** (ID-C112GEB, 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

Contact Points



DIMENSIONS

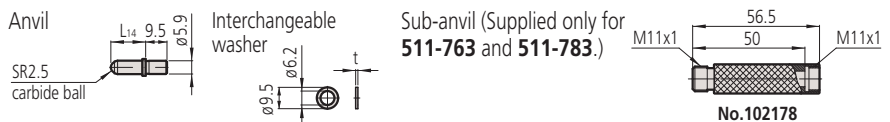
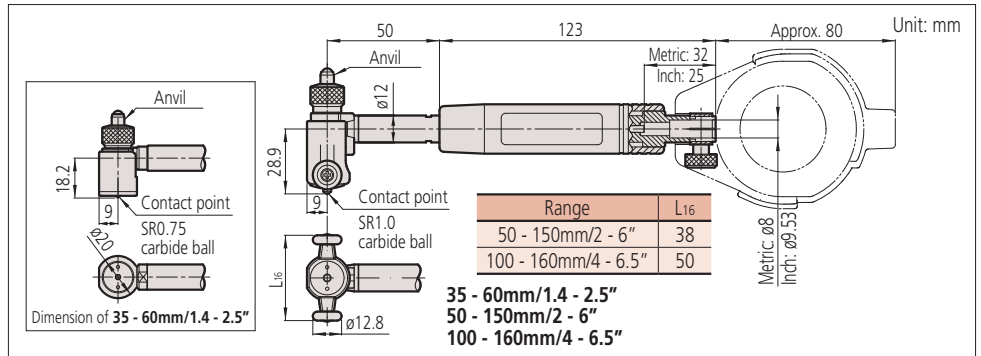


STANDARD ACCESSORIES

| Bore gage (Main body) | Anvil | | | | | | Interchangeable washer | | Wrench Parts No. |
|----------------------------------|------------|-----------|--------|-------|--------|-----------|--------------------------------|--------------------------|------------------|
| | Marked No. | Parts No. | Size*1 | L14 | 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" | | | |

*1 Indication of measuring size.

DIMENSIONS



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

STANDARD ACCESSORIES

| Bore gage (Main body) | Anvil | | | | | | Interchangeable washer | | Sub-Anvil Parts No. | | | |
|--|------------|------------------|---------------|---------------|--------|-----------|--|--|----------------------------|--|--|----------------------------|
| | Marked No. | Parts No. | Size*1 | L14 | 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" | | | | | | |
| 511-764 511-784 | 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" | | | | | | |
| | 12 | 21DZA232N | 155mm | 6.10" | 60.5mm | 2.38" | | | | | | |
| | 13 | 21DZA232P | 160mm | 6.30" | 65.5mm | 2.58" | | | | | | |

*1 Indication of measuring size.

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages SERIES 511 — with Micrometer Head

- Micrometer head is attached to the anvil for accurate dimensional setting.
- Longer plunger stroke with no affect on 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-45.)
- 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-46 and C-47.)



511-804



511-806

Dial indicators and protection covers are optional.

SPECIFICATIONS

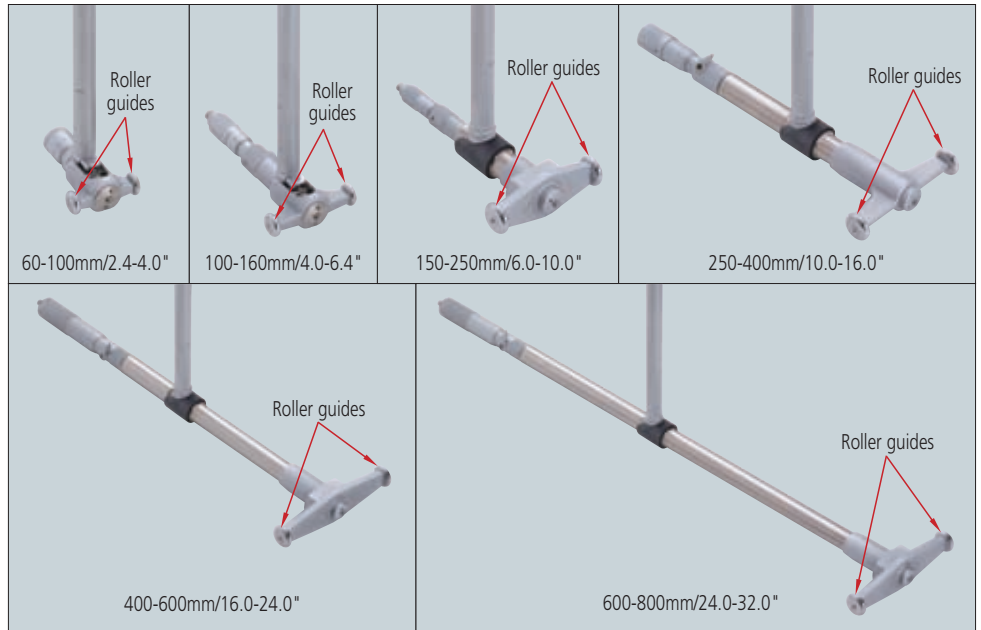
| Metric | | | | | | | | | | | | | |
|-----------|-----------|-------------------------|-----------------|-------------|----------------|------------------------------------|-----------------------|-----------------|-----------|--------|---------------|--------|-------|
| Order No. | Range | Stroke of 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

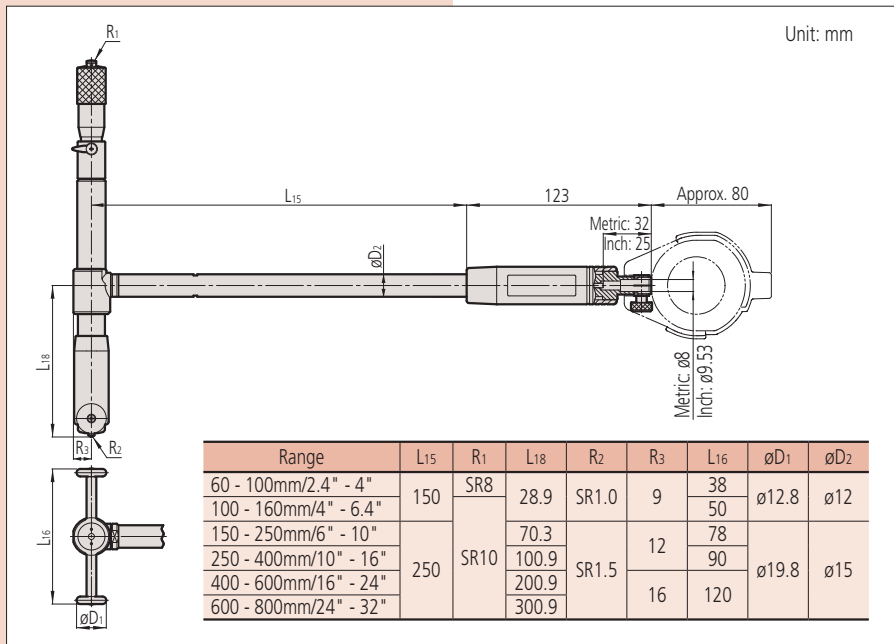
Recommended dial indicators

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

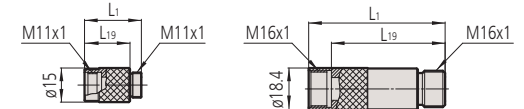
Recommended digimatic indicators

Metric models: **543-264B** (ID-C112GB: 0.001mm)
Inch models: **543-266B** (ID-C112GEB: 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

DIMENSIONS



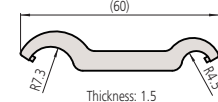
Sub-anvil



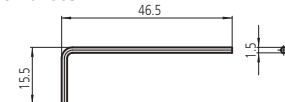
Notes: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Wrench

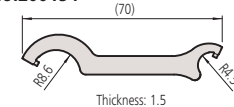
No.301336



No.202863



No.200154



STANDARD ACCESSORIES

| Metric | Bore gage (Main body) | | Micrometer head | | Sub-Anvil | | | | Wrench | | | |
|---------|-----------------------|--------|-----------------|------------|-----------|------|------|-----------------|-----------------|-------|-------|-----------------|
| | Parts No. | Stroke | Screw size | Marked No. | Parts No. | L1 | L19 | Parts No. | | | | |
| 511-803 | 21DZA267 | 10mm | M11x1 | 10mm | 208892 | 15mm | 10mm | 301336 (2 pcs.) | | | | |
| | | | | 20mm | | | | | 208894 | 25mm | 20mm | 202863 (1 pcs.) |
| 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 | Bore gage (Main body) | | Micrometer head | | Sub-Anvil | | | | Wrench | | | |
|---------|-----------------------|--------|-----------------|------------|-----------|------|-----|-----------------|-----------------|------|-----|-----------------|
| | Parts No. | Stroke | Screw size | Marked No. | Parts No. | L1 | L19 | Parts No. | | | | |
| 511-833 | 21DZA272 | .4" | M11x1 | .4" | 208893 | .6" | .4" | 301336 (2 pcs.) | | | | |
| | | | | .8" | | | | | 208895 | 1.0" | .8" | 202863 (1 pcs.) |
| 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" | 208893 | .6" | .4" | 301336 (2 pcs.) | | | | |
| | | | | .8" | | | | | 208895 (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

- Capable of ID measurement near the bottom face of a hole.
- 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-46 and C-47.)



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 | | | | 511-402 | | | 6 pcs. | 4 pcs. | |
| 511-403 | 50-100mm | | | | 511-403 | | | 11 pcs. | | |
| 511-404 | 50-150mm | 511-404 | 11 pcs. | 4 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 | | | | 511-402 | | | 6 pcs. | 4 pcs. | |
| 511-423 | 50-100mm | | | | 511-403 | | | 11 pcs. | | |
| 511-424 | 50-150mm | 511-404 | 11 pcs. | 4 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 | | | | 511-402 | | | 6 pcs. | 4 pcs. | |
| 511-413 | 50-100mm | | | | 511-403 | | | 11 pcs. | | |
| 511-414 | 50-150mm | 511-404 | 11 pcs. | 4 pcs. | | | | | | |

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

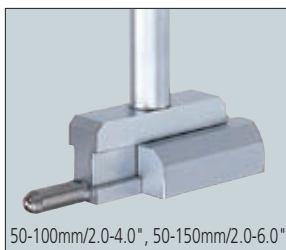
2) A 4" sub-anvil is supplied with 511-406, and a 2" sub-anvil is supplied with 511-409.

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

Contact Points



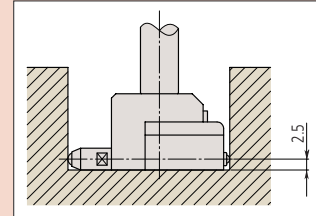
15-35mm/6-1.4"



50-100mm/2.0-4.0", 50-150mm/2.0-6.0"



511-402



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

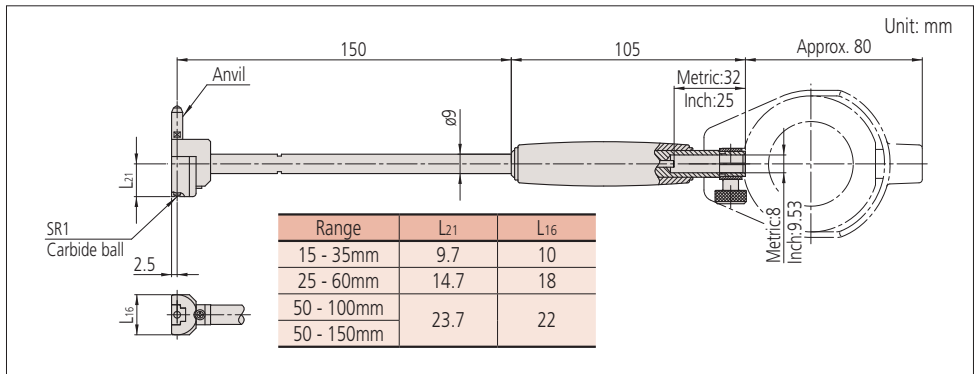
Metric models: 2046SB (0.01mm)
2972TB (0.01mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
2922SB (.0005")
Inch models: 2977TB (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators

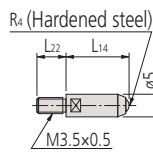
Metric models: 543-264B (ID-C 112GB: 0.001mm)
Inch models: 543-266B (ID-C 112GEB: 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

| 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" | | | | 511-407 | | | 6 pcs. | 4 pcs. | |
| 511-408 | 2.0-4.0" | | | | 511-408 | | | 11 pcs. | | |
| 511-409 | 2.0-6.0" | 511-409 | 11 pcs. | 4 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" | | | | 511-407 | | | 6 pcs. | 4 pcs. | |
| 511-443 | 2.0-4.0" | | | | 511-408 | | | 11 pcs. | | |
| 511-444 | 2.0-6.0" | 511-409 | 11 pcs. | 4 pcs. | | | | | | |
| 511-431 | .6-1.4" | .047" | 4N or less | 6N or less | 511-406 | 2922SB | 21DZA000 (Graduation: .0005") | 11 pcs. | 1 pc. | 6" |
| 511-432 | 1.4-2.4" | | | | 511-407 | | | 6 pcs. | 4 pcs. | |
| 511-433 | 2.0-4.0" | | | | 511-408 | | | 11 pcs. | | |
| 511-434 | 2.0-6.0" | 511-409 | 11 pcs. | 4 pcs. | | | | | | |

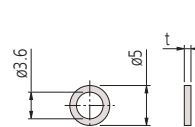
DIMENSIONS



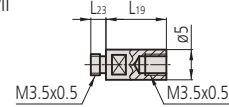
Anvil



Interchangeable washer

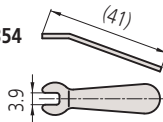


Sub-anvil

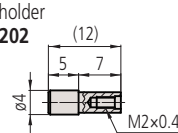


Notes: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

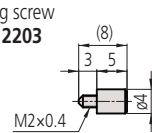
Wrench
No.204354



Washer holder
No.212202



Locking screw
No.212203



Thickness: 1.5mm

STANDARD ACCESSORIES

| Metric | | Anvil | | | | | Interchangeable washer | | Sub-Anvil | | | |
|--|------------|-----------|---------------|-------|---------|------|------------------------|-------|-----------|-------|--------|-------|
| Bore gage (Main body) | Marked No. | Parts No. | Size*1 | L22 | R4 | L14 | Parts No. | t | Parts No. | L23 | L19 | |
| | | | | | | | | | | | | |
| 511-401 () Used 10mm Sub-Anvil | 1 | 212131 | 15mm (25mm) | 2.5mm | SR1mm | 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 | 7.5mm | SR1.5mm | 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 | 7.5mm | SR1.5mm | 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 50mm Sub-Anvil | 1 | 212142 | 50mm (100mm) | 7.5mm | SR1.5mm | 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 | | | | | | |

*1 Indication of measuring size.

| Inch | | Anvil | | | | | Interchangeable washer | | Sub-Anvil | | | |
|---|------------|-----------|---------------|-----|--------|-------|------------------------|------|-----------|------|--------|------|
| Bore gage (Main body) | Marked No. | Parts No. | Size*1 | L22 | R4 | L14 | Parts No. | t | Parts No. | L23 | L19 | |
| | | | | | | | | | | | | |
| 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" 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-46 and C-47.)



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™ (Refer to page IX for details.)

Technical Data

| | |
|----------------------|--|
| Accuracy: | Metric models 3µm Inch models .00012" Excluding quantizing error |
| Repeatability: | Metric models 2µm Inch models .00008" |
| Adjacent error: | Metric models 2µm Inch models .00008" |
| Battery: | SR44 (2 pc), 938882 , for initial operational checks (standard accessory) |
| 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

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

Optional Accessories

21DZA089: Extension rod 250 mm (10")

21DZA081: Extension rod 500 mm (20")

Up to four extension rods can be jointed, and the maximum length 2m is allowed.

Refer to page A-21 for details

Connecting cables for Input Tool/ Digimatic Mini-Processor, etc.

1m: **905338**

2m: **905409**

USB Input Tool Direct (2m): 06ADV380F

Connecting cables for **U-WAVE-T**

For standard (160mm): **02AZD790F**

For foot switch: **02AZE140F**

— : Setting ring (See page C-47.)

Example of connection

When connecting four pieces of 500mm extension rods

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

Usage example



Rectangular gauge blocks

* 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

* Available only for 511-501/521

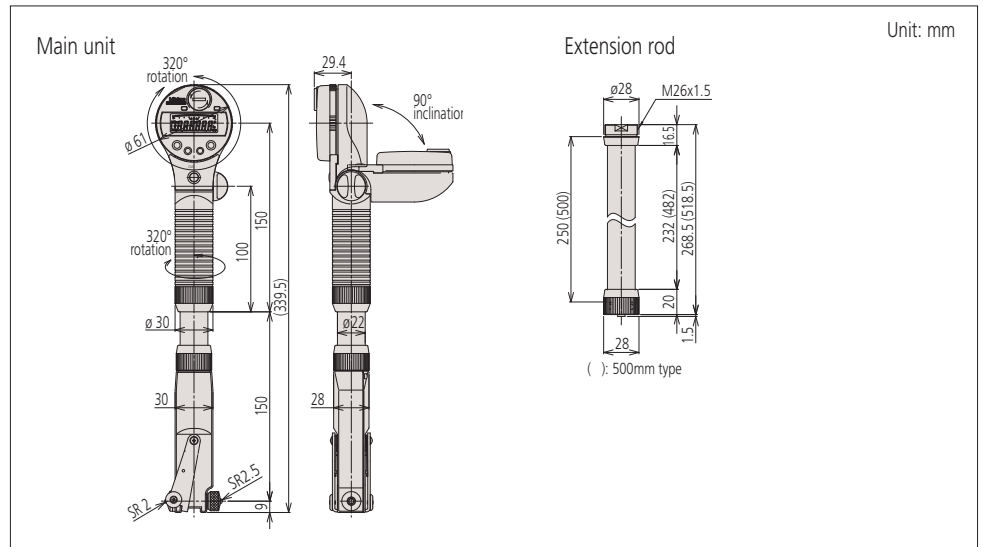
516-119-10

516-119-60 with calibration certificate

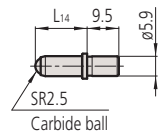
| Description | Order No. | Qty | |
|---------------------------|-------------------|-------------------|---|
| Nominal length (mm) | 1 | 614611-021 | 1 |
| | 2 | 614612-021 | 1 |
| | 3 | 614613-021 | 1 |
| | 5 | 614615-021 | 1 |
| | 10 | 614671-021 | 1 |
| | 20 | 614672-021 | 1 |
| | 30 | 614673-021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

* Equivalent to JIS B 7506 Grade 0

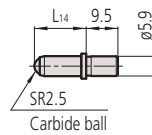
DIMENSIONS



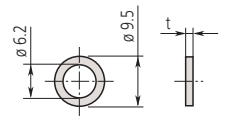
Anvil



Anvil



Interchangeable washer



STANDARD ACCESSORIES

| Bore gage (Main body) | Anvil | | | | Interchangeable washer | | |
|----------------------------------|------------|------------------|--------|------|------------------------|--|--|
| | Marked No. | Parts No. | Size*1 | L14 | 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" | | |

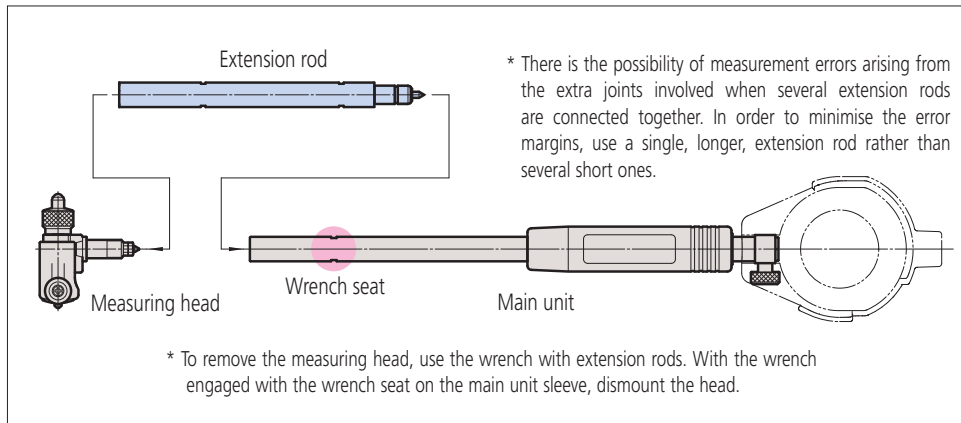
*1 Indication of measuring size.

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.

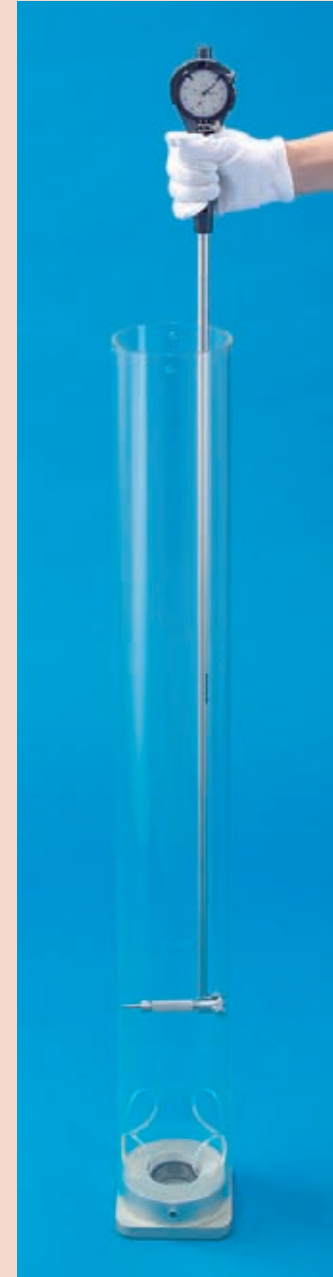
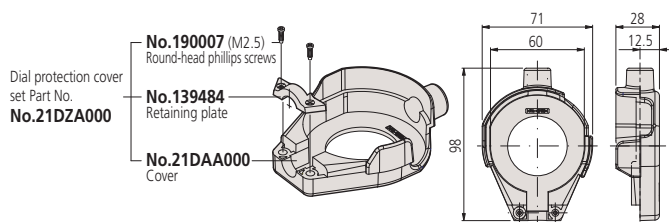


SPECIFICATIONS

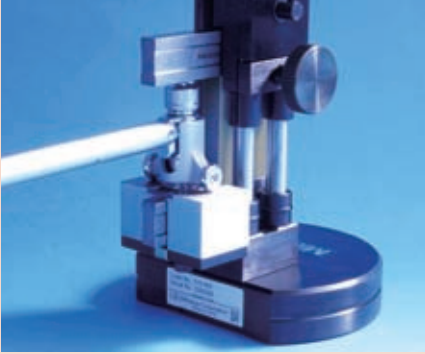
| Applicable model Order No. | Extension rod length | | | | | Extension rod diameter | Wrench part No. |
|-------------------------------|----------------------|--------|--------|--------|--------|------------------------|-----------------|
| | 125m | 250m | 500m | 750m | 1000m | | |
| 511-701/501-731 | 953549 | 953550 | 953551 | — | — | ø9mm | 102148 |
| 511-702/501-732 | | | | | | | |
| 511-703/501-733 | | | | | | | |
| 511-704/501-734 | 953552 | 953553 | 953554 | 953555 | 953556 | ø12mm | 212556 |
| 511-803/501-833 | | | | | | | |
| 511-804/501-834 | | | | | | | |
| 511-705/501-735 | | | | | | | |
| 511-706/501-736 | | | | | | | |
| 511-805/501-835 | 953557 | 952361 | 953558 | 953559 | 953560 | ø15mm | 212556 |
| 511-806/501-836 | | | | | | | |
| 511-807/501-837 | | | | | | | |
| 511-808/501-838 | | | | | | | |

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
0.5µm (Parallelism 1µm)

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.



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.

Steel Setting Rings

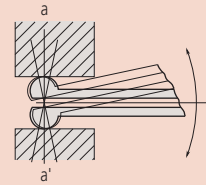


CERA Setting Rings



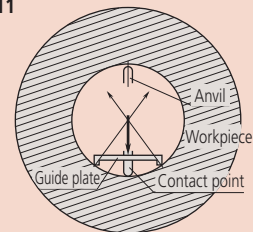
How to read the indicated value

Series 526



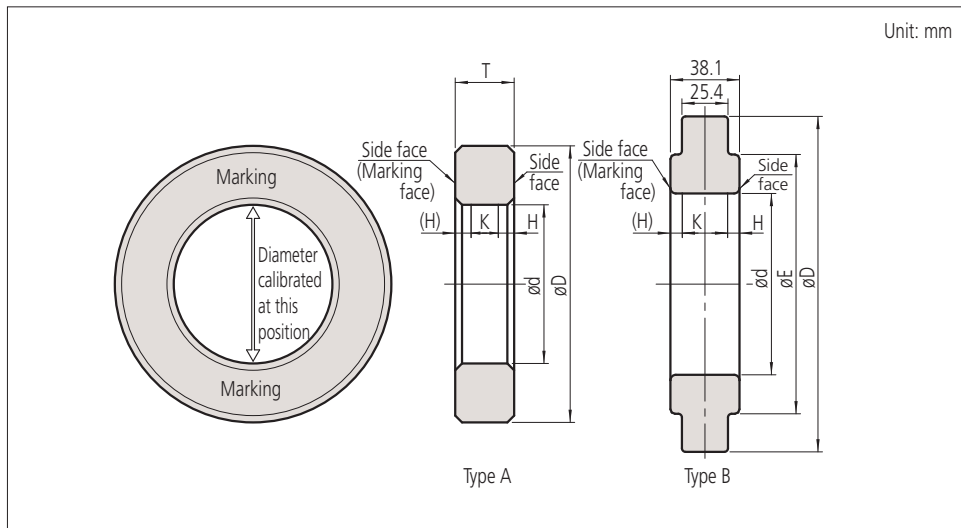
The 526 series has a gage head with high curvature. Alignment with the diameter (a-a') is achieved by rotating the gage head in the direction indicated by the arrow, and the reading is the maximum value read from the dial indicator.

Series 511



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

DIMENSIONS



Suffix

- 177-***-12:** With Inspection Certificate (provides a record of the calibrated diameter)
- 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

Notes:

- The Inspection Certificate is not a substitute for a calibration certificate as it is updated.
- A more detailed inspection certificate describing roundness and cylindricity is available on request.

SPECIFICATIONS

Steel Setting Rings

Metric

| Order No. | Nominal size ϕ d | 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 (μ m)*1 | Roundness/Cylindricity (μ m)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-220 | 1mm | 20 | — | 4 | A | ± 10 | ± 1.5 | 1 | 1.6 | 0.8 |
| 177-222 | 1.1mm | 20 | — | 4 | A | ± 10 | ± 1.5 | 1 | 1.6 | 0.8 |
| 177-225 | 1.2mm | 20 | — | 4 | A | ± 10 | ± 1.5 | 1 | 1.6 | 0.8 |
| 177-227 | 1.3mm | 20 | — | 4 | A | ± 10 | ± 1.5 | 1 | 1.6 | 0.8 |
| 177-230 | 1.4mm | 20 | — | 4 | A | ± 10 | ± 1.5 | 1 | 1.6 | 0.8 |
| 177-236 | 1.75mm | 25 | — | 5 | A | ± 10 | ± 1.5 | 1 | 1.6 | 1.8 |
| 177-239 | 2mm | 25 | — | 5 | A | ± 10 | ± 1.5 | 1 | 1.6 | 1.8 |
| 177-242 | 2.25mm | 25 | — | 5 | A | ± 10 | ± 1.5 | 1 | 1.6 | 1.8 |
| 177-208 | 2.5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-246 | 2.75mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-248 | 3mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-250 | 3.25mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-252 | 3.5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-255 | 3.75mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-204 | 4mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-257 | 4.5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-205 | 5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-263 | 5.5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-267 | 6mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-271 | 6.5mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-275 | 7mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-125 | 8mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-279 | 9mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-126 | 10mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-284 | 12mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-132 | 14mm | 38 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |

Inch

| Order No. | Nominal size ϕ d | Dimensions (mm) | | | Type | Accuracy | | | | |
|-----------|-----------------------|-----------------|----------|----|------|---|---|---------------------------------|------------------------------------|--|
| | | ϕ D | ϕ E | T | | Tolerance between the nominal size and the actual diameter (inch) | Uncertainty of marked diameter value (inch)*1 | Roundness/Cylindricity (inch)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-209 | .1" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-206 | .16" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-207 | .24" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-281 | .275" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 3.4 |
| 177-179 | .35" | 32 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-283 | .425" | 32 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-180 | .5" | 32 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-181 | .6" | 38 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-182 | .65" | 45 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-183 | .7" | 45 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-287 | .8" | 45 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-184 | 1" | 53 | — | 15 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 3.0 | 9.0 |
| 177-289 | 1.2" | 71 | — | 15 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 3.0 | 9.0 |
| 177-185 | 1.4" | 71 | — | 15 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 3.0 | 9.0 |
| 177-291 | 1.6" | 71 | — | 15 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 3.0 | 9.0 |
| 177-186 | 1.8" | 85 | — | 15 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 3.5 | 8.0 |

CERA Setting Rings

Metric

| Order No. | Nominal size ϕ d | 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 (μ m)*1 | Roundness/Cylindricity (μ m)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-418 | 4mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-420 | 6mm | 25 | — | 7 | A | ± 10 | ± 1.5 | 1 | 1.7 | 3.6 |
| 177-423 | 8mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-424 | 10mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-425 | 12mm | 32 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-427 | 16mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-429 | 20mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-430 | 25mm | 53 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-431 | 30mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-432 | 35mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-433 | 40mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-434 | 45mm | 85 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |

*1 Actual diameter is marked in 0.001 mm increments.

*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.

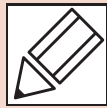
| Order No. | Nominal size ϕ d | Dimensions (mm) | | | Type | Accuracy | | | | |
|-----------|-----------------------|-----------------|----------|-------------|------|---|---|-------------------------------------|------------------------------------|--|
| | | ϕ D | ϕ E | T | | Tolerance between the nominal size and the actual diameter (μ m) | Uncertainty of marked diameter value (μ m)*1 | Roundness/Cylindricity (μ m)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-177 | 16mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-133 | 17mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-285 | 18mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-286 | 20mm | 45 | — | 10 | A | ± 10 | ± 1.5 | 1 | 2.0 | 6.0 |
| 177-139 | 25mm | 53 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-288 | 30mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-140 | 35mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-290 | 40mm | 71 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.2 | 8.6 |
| 177-178 | 45mm | 85 | — | 15 | A | ± 10 | ± 1.5 | 1 | 3.7 | 7.6 |
| 177-146 | 50mm | 85 | — | 20 | A | ± 20 | ± 1.5 | 1 | 3.7 | 12.6 |
| 177-292 | 60mm | 112 | — | 20 | A | ± 20 | ± 1.5 | 1 | 3.7 | 12.6 |
| 177-314 | 62mm | 112 | — | 20 | A | ± 20 | ± 1.5 | 1.5 | 3.7 | 12.6 |
| 177-147 | 70mm | 112 | — | 20 | A | ± 20 | ± 1.5 | 1.5 | 3.7 | 12.6 |
| 177-316 | 75mm | 125 | — | 25 | A | ± 20 | ± 1.5 | 1.5 | 4.2 | 16.6 |
| 177-294 | 80mm | 125 | — | 25 | A | ± 20 | ± 1.5 | 1.5 | 4.2 | 16.6 |
| 177-318 | 87mm | 140 | — | 25 | A | ± 20 | ± 1.5 | 1.5 | 4.2 | 16.6 |
| 177-148 | 90mm | 140 | — | 25 | A | ± 20 | ± 1.5 | 1.5 | 4.2 | 16.6 |
| 177-296 | 100mm | 160 | — | 25 | A | ± 20 | ± 1.5 | 2 | 4.2 | 16.6 |
| 177-298 | 125mm | 210 | 168 | | B | ± 20 | ± 2.5 | 2 | 5.3 | 27.5 |
| 177-300 | 150mm | 235 | 187 | | B | ± 20 | ± 2.5 | 2 | 5.3 | 27.5 |
| 177-302 | 175mm | 260 | 215 | | B | ± 20 | ± 2.5 | 2.5 | 5.3 | 27.5 |
| 177-304 | 200mm | 311 | 244 | 38.1 (25.4) | B | ± 20 | ± 2.5 | 2.5 | 5.3 | 27.5 |
| 177-306 | 225mm | 337 | 264 | | B | ± 20 | ± 2.5 | 2.5 | 5.3 | 27.5 |
| 177-308 | 250mm | 362 | 290 | | B | ± 20 | ± 2.5 | 3 | 5.3 | 27.5 |
| 177-310 | 275mm | 413 | 321 | | B | ± 20 | ± 2.5 | 3 | 5.3 | 27.5 |
| 177-312 | 300mm | 438 | 340 | | B | ± 20 | ± 2.5 | 3 | 5.3 | 27.5 |

| Order No. | Nominal size ϕ d | Dimensions (mm) | | | Type | Accuracy | | | | |
|-----------|-----------------------|-----------------|----------|------|------|---|---|---------------------------------|------------------------------------|--|
| | | ϕ D | ϕ E | T | | Tolerance between the nominal size and the actual diameter (inch) | Uncertainty of marked diameter value (inch)*1 | Roundness/Cylindricity (inch)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-187 | 2" | 85 | — | 20 | A | $\pm .0008$ " | $\pm .00006$ " | .00004" | 3.5 | 13.0 |
| 177-293 | 2.4" | 112 | — | 20 | A | $\pm .0008$ " | $\pm .00006$ " | .00004" | 3.5 | 13.0 |
| 177-315 | 2.5" | 112 | — | 20 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 12.0 |
| 177-188 | 2.8" | 112 | — | 20 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 12.0 |
| 177-317 | 3" | 125 | — | 25 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 17.0 |
| 177-295 | 3.2" | 125 | — | 25 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 17.0 |
| 177-319 | 3.5" | 140 | — | 25 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 17.0 |
| 177-189 | 3.6" | 140 | — | 25 | A | $\pm .0008$ " | $\pm .00006$ " | .00006" | 4.0 | 17.0 |
| 177-297 | 4" | 160 | — | 25 | A | $\pm .0008$ " | $\pm .00006$ " | .00008" | 4.0 | 17.0 |
| 177-299 | 5" | 210 | 168 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00008" | 5.0 | 28.1 |
| 177-301 | 6" | 235 | 187 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00008" | 5.0 | 28.1 |
| 177-303 | 7" | 260 | 215 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00010" | 5.0 | 28.1 |
| 177-305 | 8" | 311 | 244 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00010" | 5.0 | 28.1 |
| 177-307 | 9" | 337 | 264 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00010" | 5.0 | 28.1 |
| 177-309 | 10" | 362 | 290 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00012" | 5.0 | 28.1 |
| 177-311 | 11" | 413 | 321 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00012" | 5.0 | 28.1 |
| 177-313 | 12" | 438 | 340 | 38.1 | B | $\pm .0008$ " | $\pm .00010$ " | .00012" | 5.0 | 28.1 |

Inch

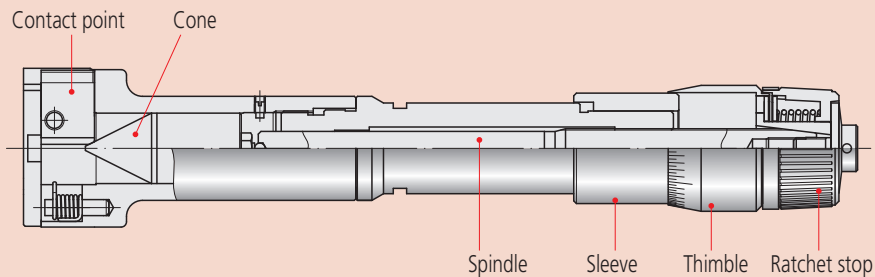
| Order No. | Nominal size ϕ d | Dimensions (mm) | | | Type | Accuracy | | | | |
|-----------|-----------------------|-----------------|----------|----|------|---|---|---------------------------------|------------------------------------|--|
| | | ϕ D | ϕ E | T | | Tolerance between the nominal size and the actual diameter (inch) | Uncertainty of marked diameter value (inch)*1 | Roundness/Cylindricity (inch)*2 | Distance from the side face H (mm) | Size of warranted calibration surface K (mm) |
| 177-518 | .16" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-520 | .24" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-522 | .275" | 25 | — | 7 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.5 | 4.0 |
| 177-523 | .35" | 32 | — | 10 | A | $\pm .0004$ " | $\pm .00006$ " | .00004" | 1.8 | 6.4 |
| 177-524 | .425" | 32 | — | 1 | | | | | | |

Quick Guide to Precision Measuring Instruments



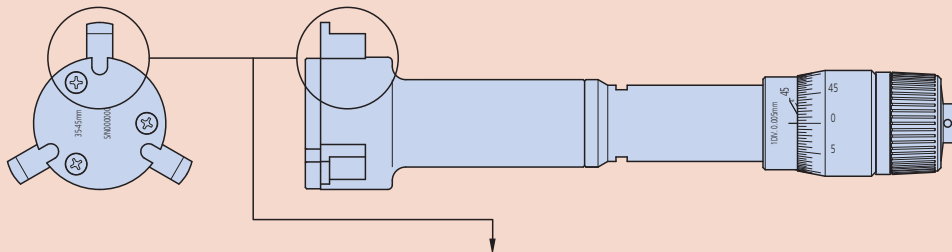
Internal Micrometers

Nomenclature



Custom-ordered Products (Holtest / Borematic)

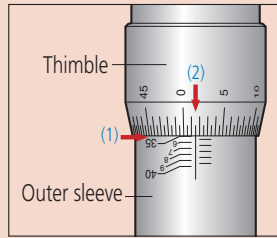
Mitutoyo can custom-build an internal micrometer best suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required. Please note that, depending on circumstances, such a micrometer will usually need to be used 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 | | | |

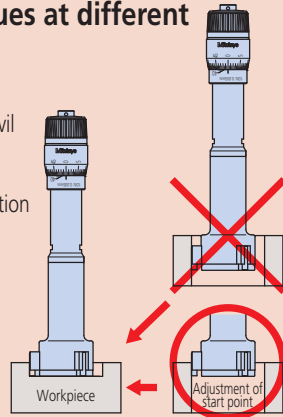
How to Read the Scale

| | |
|-------------------|----------------|
| 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

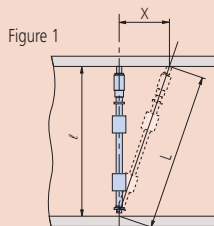


Figure 1
 ℓ : Inside diameter to be measured
 L : Length measured with axial offset X
 X : Offset in axial direction
 $\Delta \ell$: Error in measurement
 $\Delta \ell$: $L - \ell = \sqrt{\ell^2 + X^2} - \ell$

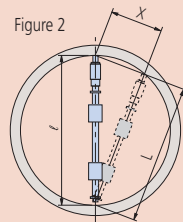
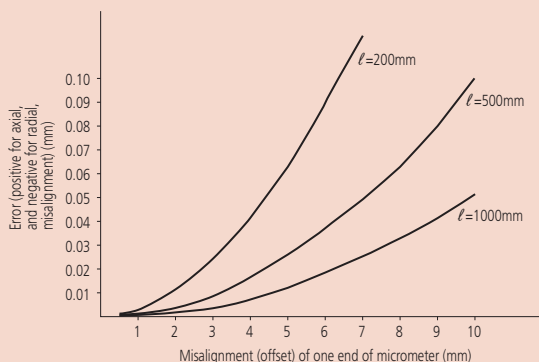


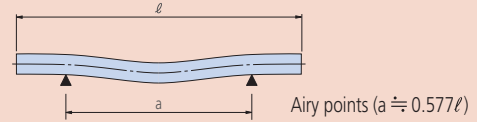
Figure 2
 ℓ : Inside diameter to be measured
 L : Length measured with radial offset X
 X : Offset in radial direction
 $\Delta \ell$: Error in measurement
 $\Delta \ell$: $L - \ell = \sqrt{\ell^2 - X^2} - \ell$

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.

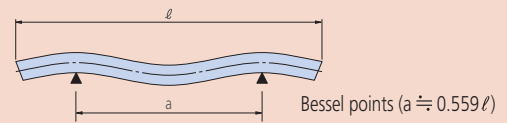


Airy and Bessel Points

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.



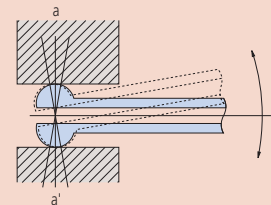
The ends of a bar (or micrometer) can be made exactly horizontal by spacing the two supports symmetrically as shown above. These points are known as the 'Airy Points' and are commonly used to ensure that the ends of a length bar are parallel to one another, so that the length is well defined.



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).

