

Inspection Instrument for Indicators

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

i-Checker SERIES 170

The i-Checker is specially designed to calibrate dial indicators, dial test indicators, and other electronic comparison gage heads with a stroke of up to 100mm (4").

- $\pm(0.2+L/100)\mu\text{m}$ indication accuracy.
- Directly inspects an indicator with a stroke of up to 100mm (4"). The dial test indicator, bore gage and lever-type inductive head can be inspected with optional accessories.

- Adjustment of the measurement position is very easily accomplished because of semi-automatic measurement and fully automatic measurement functions.
- Creates and prints out a simple inspection certificate.
- Saves inspection results as a CSV file for analysis by software.

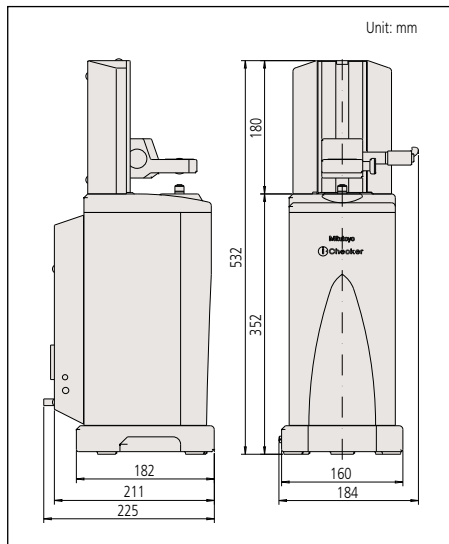


SPECIFICATIONS

Order No.*	Remarks
170-311	with $\varnothing 8\text{mm}$ bush
170-312	with $\varnothing 3/8"$ bush

* To denote your AC power cable add the following suffixes to the order No.: **A** for UL/CSA, **D** for CEE, **E** for BS, **K** for EK, **No suffix** is required for JIS/100V
* Calibration certificate and traceability system chart are attached as standard.

DIMENSIONS



Applicable Indicators

- Dial indicator
 - Hicator
 - Digimatic indicator***
 - Test indicator*
 - Bore gage**
 - Linear gage
- * requires optional test indicator attachment set.
* Contact the nearest Mitutoyo sales office for testable indicators.
** requires optional bore gage accessory.
*** requires optional SPC cable for fully automatic measurement.



Using test indicator attachment set (02ASK000)



An inspection certificate is supplied as standard. Refer to page X for details.

Technical Data

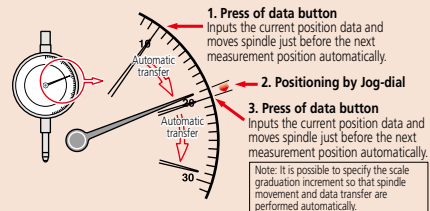
Measuring Range: 100mm/4"
Resolution: 0.02 μm /0.8 μin
Accuracy: $\pm(0.2+L/100)\mu\text{m}$ in vertical position
(at 20°C) $\pm(0.3+2L/100)\mu\text{m}$ in lateral position
L = arbitrary length (mm)
Drive method: Electric motor
Measuring Unit: Reflective-type glass linear encoder
Thermal expansion coefficient: $(8\pm 1)\times 10^{-6}/\text{K}$
Measurement method: Semi-automatic / Fully automatic*
Dimensions: 184 x 225 x 532mm (W x D x H)
Operating temperature range: 20°C \pm 3°C
Power supply: 100VAC to 240VAC \pm 10%, 50/60Hz
Mass: 20kg/44.1lbs

* Automatic measurement requires the indicator's connection cable. Additionally some form of indicator, along with a connecting machine (the optional accessory for indicator as a Digimatic power-supply unit on EF counter) will be needed.

Functions

Inspect your analog indicator semi-automatically!

The pointer of the analog indicator is positioned just before the measuring point automatically via Mitutoyo's Semi-automatic Measurement function. After that, inspection begins simply by adjusting the pointer position with the jog-dial. Because of this function, measurement time is reduced and user fatigue is practically eliminated. Additionally all functions necessary for inspection are combined in the control box so that the operator need not rely on excessive eye movement to adjust the pointer.



Fully automatic inspection of digital indicator

The Automatic Measurement function, in tandem with a digital indicator makes the spindle move so that measurement data is acquired automatically. Therefore, manual adjustment to the measurement position is unnecessary and the efficiency of every inspection is enhanced.



Create and printout a simplified inspection certificate

It is possible to create, edit and print out your own inspection certificate. Furthermore, that data can be saved as a CSV file.

Optional Accessories

- 02ASK000: Test indicator attachment set ($\varnothing 6\text{mm}$ stem)
- 02ASK180: Test indicator attachment set ($\varnothing 8\text{mm}$ stem)
- 02ASK370: Test indicator holder ($\varnothing 6\text{mm}$ stem)
- 02ASK380: Test indicator holder ($\varnothing 8\text{mm}$ stem)
- 02ASL310: Accessory for Bore gages
- 902803: $\varnothing 6\text{mm}$ dovetail grooved stem
- 902804: $\varnothing 8\text{mm}$ dovetail grooved stem
- 02ASK040: Stem bush $\varnothing 6\text{mm}$
- 02ASJ856: Stem bush $\varnothing 8\text{mm}$
- 02ASK150: Stem bush $\varnothing 8\text{mm}$, short
- 02ASL150: Stem bush $\varnothing 10$, short
- 02ASK050: Bush $\varnothing 9.5$ (Requires 02ASK070)
- 02ASK060: Stem bush $\varnothing 12\text{mm}$
- 02ASK070: Stem bush $\varnothing 15\text{mm}$
- 02ASK080: Stem bush $\varnothing 20\text{mm}$
- 02ASK710: Stem bush $\varnothing 28\text{mm}$
- 02ASK090: Stem bush 3/8"
- 02ASK130: Stem bush case
- 02ASK730: Reflector
- 937179T: Foot switch



An inspection certificate is supplied as standard. Refer to page X for details.

Optional accessory

Stand for bore gage inspection (**12AAK824**)
Can be used for the inspection of bore gages 511 series standard type and with micrometer head up to 400mm. (Refer to pages C-33 and C-39 for details.)



Application example of the stand

Stand for bore gage inspection (No. 12AAK824)

SERIES 170 — UDT-2 Dial Indicator Tester

- UDT-2 is the accuracy tester for 0.01mm resolution/graduation dial indicators, dial test indicators and bore gages.
- Stem mounting hole: $\varnothing 6$, $\varnothing 8$ mm (Metric) $\varnothing 1/4$ ", $\varnothing 3/8$ " (Inch)



170-102-10

SPECIFICATIONS

Metric			
Order No.	Range	Graduation	Accuracy
170-102-12	0 - 25mm	0.001mm	$\pm 2\mu\text{m}$

Inch			
Order No.	Range	Graduation	Accuracy
170-101-10	0 - 1"	.0001"	$\pm .0001$ "

SERIES 521 — Calibration Tester

- The Calibration Tester is specially designed to calibrate short range dial indicators, dial test indicators, and electronic gage heads.
- Universal bracket accepts any dial indicator, dial test indicator or electronic gage without any additional accessory.
- Clamping capacity: $\varnothing 4$ mm to $\varnothing 10$ mm

Calibrating a dial test indicator



521-103

SPECIFICATIONS

Metric			
Order No.	Range	Graduation	Accuracy
521-103	0 - 1mm	0.0002mm	$\pm 0.2\mu\text{m}$
521-105	0 - 5mm	0.0002mm	$\pm 0.8\mu\text{m}$

Inch			
Order No.	Range	Graduation	Accuracy
521-104	0 - .05"	.00001"	$\pm .00001$ "
521-106	0 - .2"	.00001"	$\pm .00003$ "

Dial Indicator Applications

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

Thickness Gages SERIES 547, 7

- Dial thickness gages can quickly measure the thickness of thin products such as paper and felt.
- Contact point and anvil are both made of ceramic: rust-free (**547-401** is excluded.)
- Integrated molding of the bezel and crystal ensures protection against water and oil penetration via the front face.

Standard Type



547-301



547-321

High Accuracy Type



547-401

Standard Type



7301

Lightweight Type (integrated molding of the bezel)



7331S



7321

Usage examples

Measuring paper thickness

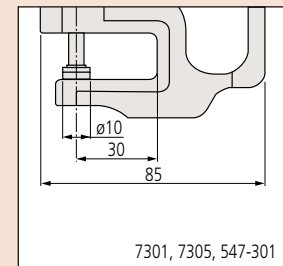


Measuring thickness of a human hair

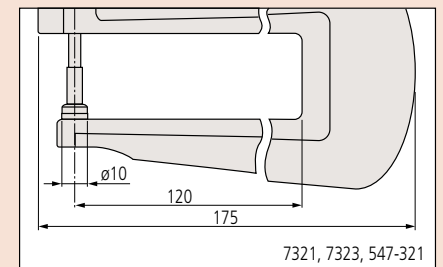


DIMENSIONS

Unit: mm



7301, 7305, 547-301



7321, 7323, 547-321

Optional Accessories

905338: SPC cable (1m) for digital models

905409: SPC cable (2m) for digital models

02AZD790F: SPC cable for U-WAVE (160mm)

Digimatic Mini-Processor DP-1VR

Refer to page A-13 for details.

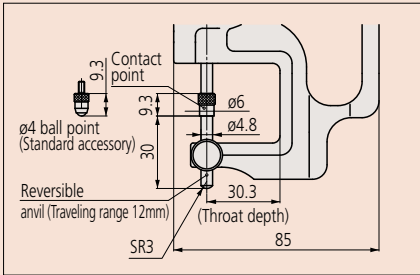
Input Tool

Convenient Interface Input Tools which enable the conversion of measurement data to keyboard signals and directly input them to cells in off-the-shelf spreadsheet software such as Excel.

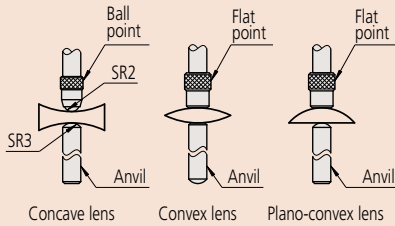
(Refer to pages A-5 to A-6 for details.)

DIMENSIONS

Unit: mm



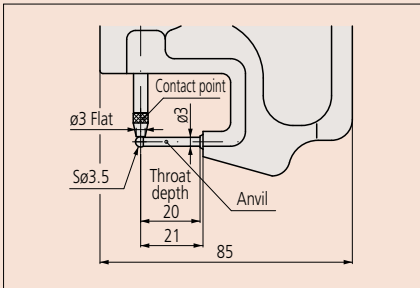
Application examples



Note: Parallelism between the flat point and anvil
547-313: 10 μ m
7313: 5 μ m

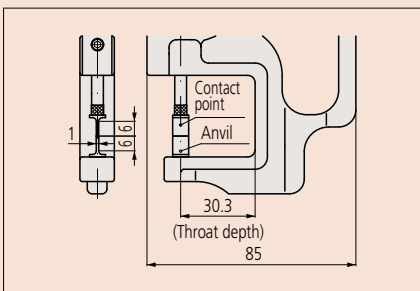
DIMENSIONS

Unit: mm



DIMENSIONS

Unit: mm



Lens thickness measurement

- Thickness of concave-convex lenses and surfaces can be measured.
- Anvils and contact points are interchangeable to enable concave surfaces to be measured.

- Provided with a ball point.



547-313



7313

Tube thickness measurement

- Pipe wall thickness, thickness of curved boards can be measured.



547-360



7360

Groove depth measurement

- Suitable for measuring narrow grooves.

- Measuring face of the contact point and anvil are blade-shaped (thickness: 1mm).



547-315



7315

Dial Indicator Applications

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

Thickness Gages SERIES 547, 7

SPECIFICATIONS

Metric					
Order No.	Range	Resolution	Accuracy	Measuring force	Remarks
547-401	0-12mm	0.001mm	±3µm	3.5N or less	High accuracy, carbide point anvil
547-301	0-10mm	0.01mm	±20µm	1.5N or less	Standard, ceramic point/anvil
547-321	0-10mm	0.01mm	±20µm	1.5N or less	Deep throat, ceramic point/anvil
547-313	0-10mm	0.01mm	±20µm	1.5N or less	Lens thickness
547-315	0-10mm	0.01mm	±20µm	1.5N or less	Groove depth
547-360	0-10mm	0.01mm	±20µm	1.5N or less	Tube thickness

Inch/Metric					
Order No.	Range	Resolution	Accuracy	Measuring force	Remarks
547-400S/ -	0-.47"	.00005"/0.001mm	±.0001"/±3µm	3.5N or less	High accuracy, carbide point anvil
- / 547-526S*	0-.47"	.0001"/0.001mm	±.0002"/±5µm	1.5N or less	Standard, ceramic point/anvil
547-300S / 547-500S*	0-.4"/0-.47"*	.0005"/0.01mm	±.001"/±20µm	1.5N or less	Standard, ceramic point/anvil
547-320S / 547-520S*	0-.4"/0-.47"*	.0005"/0.01mm	±.001"/±20µm	1.5N or less	Deep throat, ceramic point/anvil
547-312S / 547-512S*	0-.4"/0-.47"*	.0005"/0.01mm	±.001"/±20µm	1.5N or less	Lens thickness
547-316S / 547-516S*	0-.4"/0-.47"*	.0005"/0.01mm	±.001"/±20µm	1.5N or less	Groove depth
547-361S / 547-561S*	0-.4"/0-.47"*	.0005"/0.01mm	±.001"/±20µm	1.5N or less	Tube thickness

* using ID-SX Digimatic indicator.

Metric					
Order No.	Range	Graduation	Accuracy	Measuring force	Remarks
7327	0-1mm	0.001mm	±5µm	1.4N or less	Fine dial reading, ceramic point/anvil
7301	0-10mm	0.01mm	±15µm	1.4N or less	Standard, ceramic point/anvil
7305	0-20mm	0.01mm	±20µm	2.0N or less	Standard, ceramic point/anvil
7321	0-10mm	0.01mm	±15µm	1.4N or less	Deep throat, ceramic point/anvil
7323	0-20mm	0.01mm	±22µm	2.0N or less	Deep throat, ceramic point/anvil
7313	0-10mm	0.01mm	±15µm	1.4N or less	Lens thickness
7315	0-10mm	0.01mm	±15µm	1.4N or less	Groove depth
7360	0-10mm	0.01mm	±15µm	1.4N or less	Tube thickness
7331S (lightweight type)	0-10mm	0.01mm	±20µm	1.4N or less	Integrated molded bezel

Inch					
Order No.	Range	Graduation	Accuracy	Measuring force	Remarks
7326S	0-.05"	.0001"	±.0002"	1.4N or less	Fine dial reading, ceramic point/anvil
7300S	0-.5"	.001"	±.001"	1.4N or less	Standard, ceramic point/anvil
7304S	0-1"	.001"	±.002"	2.0N or less	Standard, ceramic point/anvil
7322S	0-1"	.001"	±.002"	2.0N or less	Deep throat, ceramic point/anvil
7312S	0-.5"	.001"	±.001"	1.4N or less	Lens thickness
7316S	0-.5"	.001"	±.001"	1.4N or less	Groove depth
7361S	0-.5"	.001"	±.001"	1.4N or less	Tube thickness



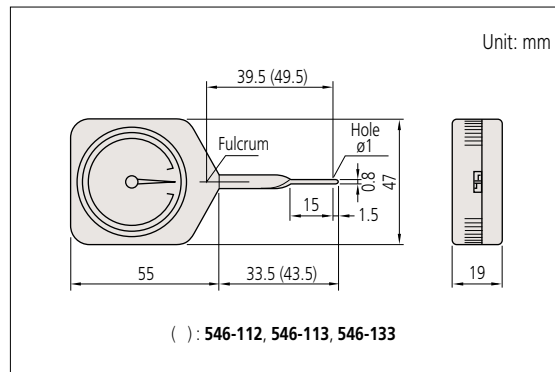
Measuring contact force on a relay



Contact Force Gage SERIES 546

- Contact Force Gages are widely used to determine the measuring force applied by an instrument to a workpiece, as well as contact forces of electrical relays, micro-switches, valves and precision springs.
- Thanks to the miniature anti-friction bearing in the fulcrum, stable measurement is guaranteed.
- 2 types are available: Standard and peak hold.

DIMENSIONS



SPECIFICATIONS

Standard			
Order No.	Graduation	Range	Accuracy
546-112	2mN	6mN - 50mN	±0.5 (division)
546-113	5mN	10mN - 100mN	
546-114	10mN	30mN - 300mN	
546-115	0.02N	0.06N - 0.5N	
546-116	0.05N	0.1N - 1N	
546-117	0.05N	0.15N - 1.5N	
546-118	0.1N	0.3N - 3N	
546-119	0.2N	0.6N - 5N	

Peak hold			
Order No.	Graduation	Range	Accuracy
—	—	—	—
546-133	5mN	10mN - 100mN	±0.5 (division)
546-134	10mN	30mN - 300mN	
546-135	0.02N	0.06N - 0.5N	
546-136	0.05N	0.1N - 1N	
546-137	0.05N	0.15N - 1.5N	
546-138	0.1N	0.3N - 3N	
546-139	0.2N	0.6N - 5N	

Dial Indicator Applications

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

Dial Caliper gage SERIES 209 — Internal Measurement Type

- Dial caliper gages are inside diameter measurement tools, which have a broader range of applications including the measurement of hole diameter and internal measurement of special shapes (grooves).

Internal measurement



SPECIFICATIONS

Metric

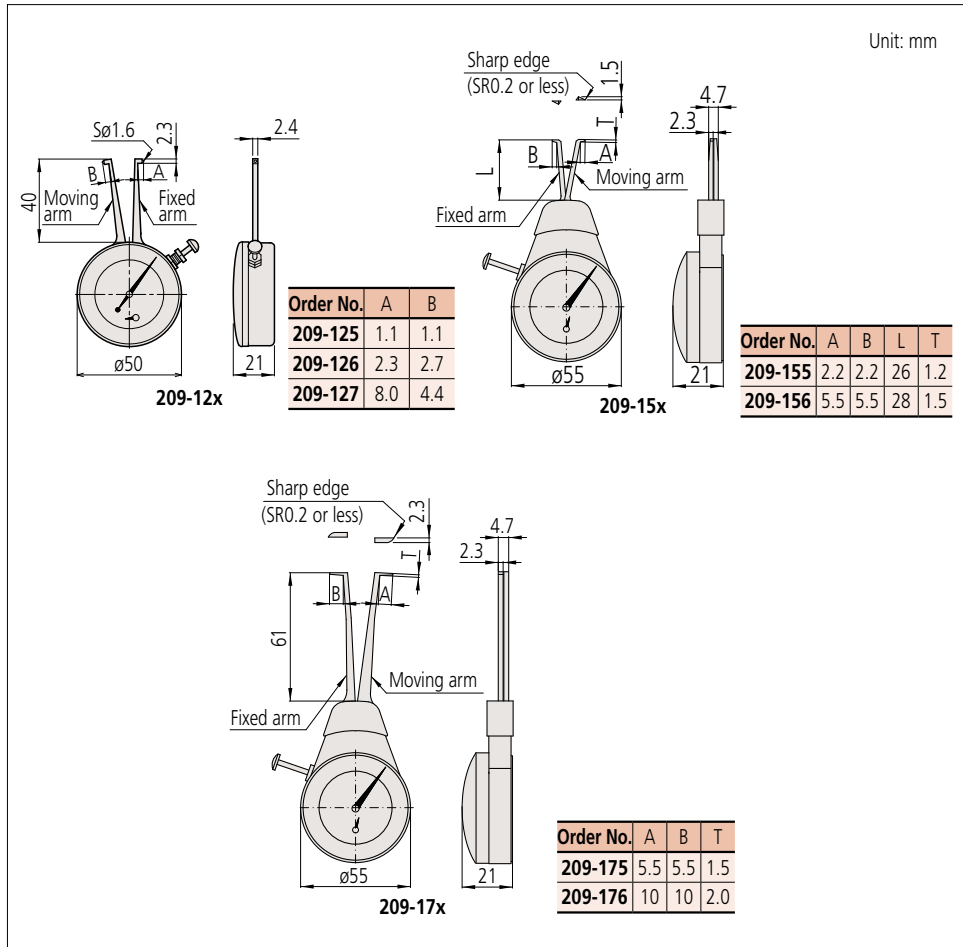
Order No.	Range	Graduation	Range of opening*1	Dial face	Accuracy	Measuring force
209-125	6 - 18mm	0.01mm	5.8 - 18.2mm	0-100-100	±40µm	2.0N or less
209-126	10 - 22mm	0.01mm	9.8 - 22.2mm	0-100-100	±40µm	2.0N or less
209-127	20 - 32mm	0.01mm	19.8 - 32.2mm	0-100-100	±40µm	2.0N or less
209-155	5 - 15mm	0.01mm	4.8 - 15.2mm	0-100	±30µm	2.0N or less
209-156	10 - 20mm	0.01mm	9.8 - 20.2mm	0-100	±30µm	2.0N or less
209-175	10 - 30mm	0.01mm	9.8 - 30.2mm	0-100-100	±40µm	2.0N or less
209-176	20 - 40mm	0.01mm	19.8 - 40.2mm	0-100-100	±40µm	2.0N or less

*1: Datum point setting is required (Reference gage available as an optional accessory).

*2: Range of opening is a value for reference. Accuracy is not guaranteed if the Dial Caliper Gage is used beyond the measuring range.

* Please note that this Dial Caliper Gage is only provided with standard models. Special size and special specification models are not supported.

DIMENSIONS



F

Optional accessories

Dial indicator
Dial protection cover: **No.21DZA000**
Refer to page C-45 for details.

Recommended dial indicators

No.2046SB: Dial indicator (Graduation: 0.01mm)
No.2109SB-10: Dial indicator (Graduation: 0.001mm)

Dial Snap Gage

- Designed for quick GO/NG judgment of diameters of cylinders and shafts in machining processes.
- Wide (13.5 x 12mm/ 1.53 x 47"), flat carbide anvils.
- Anvil retracting stroke: 2mm/.080"
- Anvil positioning range: 25mm/ 1"
- Adjustment nut: adjusts the measuring range.
- Clamp: adjustment nut
- Flatness of measuring face: 1µm
- Stability of indication: 2µm or less (stability of indicators is not included)
- The dial indicator and protection cover are optional. Also, some dial indicators and protection covers cannot be used with the dial snap gage. Consult Mitutoyo if intending to use dial indicators which are not recommended.



201-101

Note: The dial indicator and protection cover are optional.

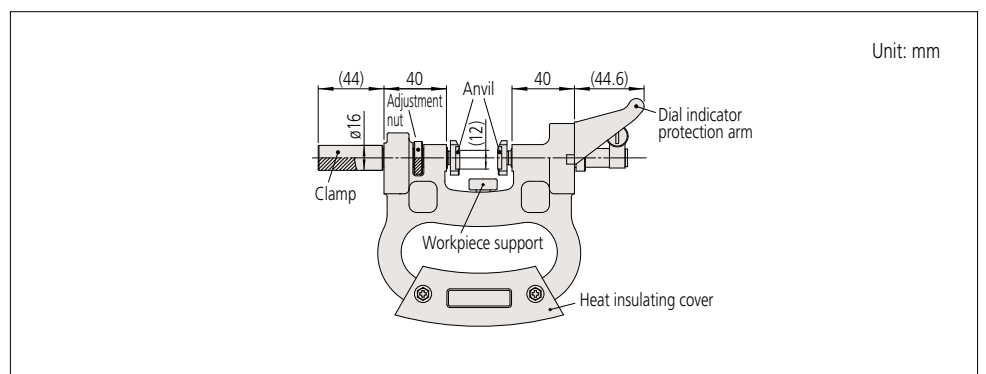
SPECIFICATIONS

Metric				
Order No.	Range	Parallelism	Measuring force	Recommended dial indicator (optional)
201-101	0 - 25mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-102	25 - 50mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-103	50 - 75mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-104	75 - 100mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-105	100 - 125mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-106	125 - 150mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-107	150 - 175mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-108	175 - 200mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-109	200 - 225mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-110	225 - 250mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-111	250 - 275mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
201-112	275 - 300mm	5µm	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)

Inch				
Order No.	Range	Parallelism	Measuring force	Recommended dial indicator (optional)
201-151	0 - 1"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-152	1 - 2"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-153	2 - 3"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-154	3 - 4"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-155	4 - 5"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-156	5 - 6"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-157	6 - 7"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-158	7 - 8"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-159	8 - 9"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-160	9 - 10"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-161	10 - 11"	.0002"	15N±3N	2803SB-10 (.0001" reading)
201-162	11 - 12"	.0002"	15N±3N	2803SB-10 (.0001" reading)

*1: Measuring force is that force present before an indicator is installed and is determined at the point where the spindle is retracted 1mm from the rest position.

DIMENSIONS



Stands

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

SERIES 7 — Magnetic Stands

- Mitutoyo's Magnetic Stands accept all dial indicators and dial test indicators (with stem $\varnothing 6$ or $\varnothing 8$) and clamp to iron or steel surfaces with a strong magnetic force.
- **7014-10**, **7031**, **7032** and **7033B** have a dovetail groove.



7010-10



7011-10



7012-10



7014-10
(without ON/OFF switching of magnetic clamping)



7033B

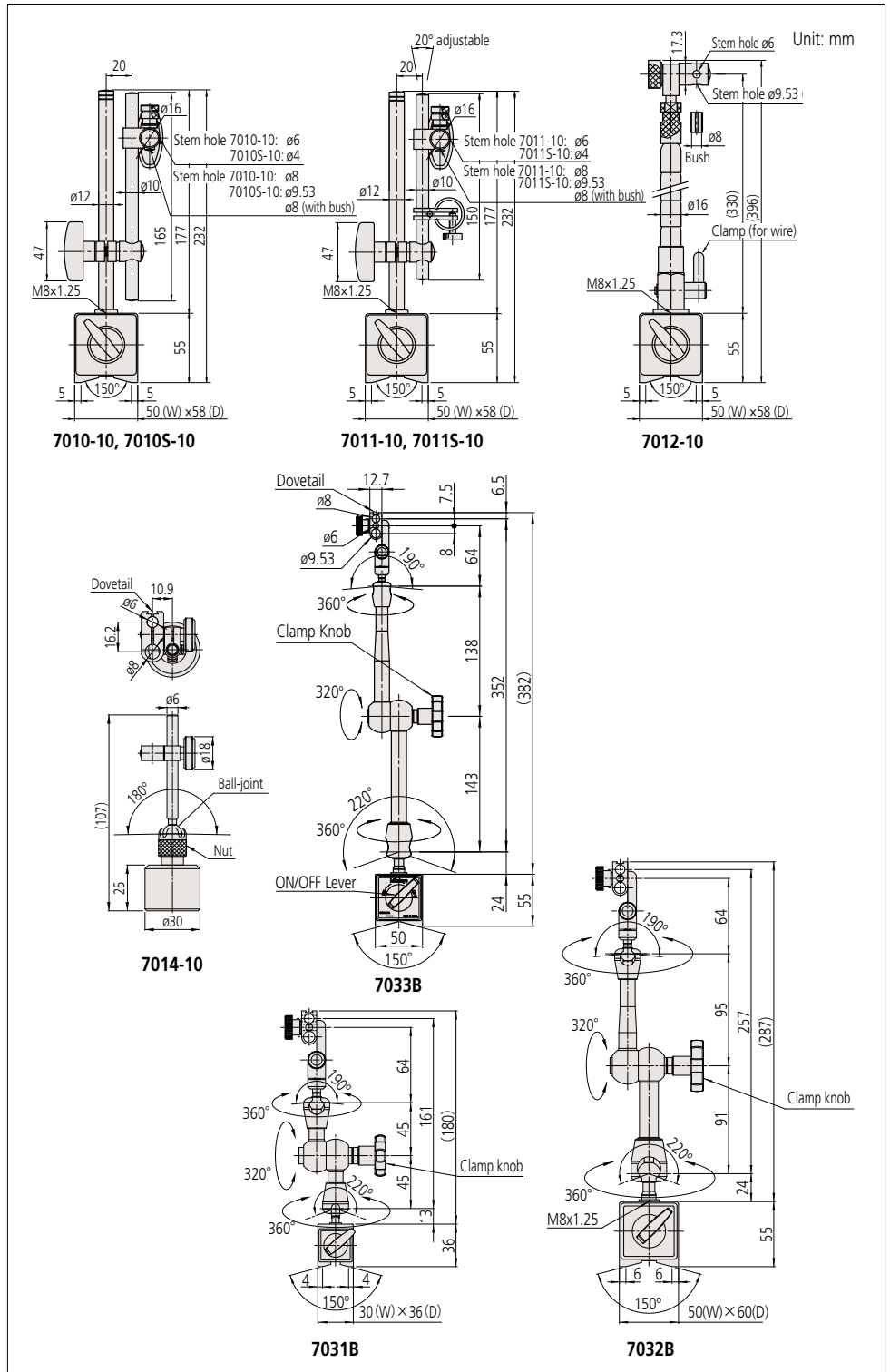


7031B



7032B

DIMENSIONS



SPECIFICATIONS

Order No.	Description	Applicable holding stem dia.	Magnetic force	Remarks
7010-10	Magnetic stand	ø6mm, ø8mm	Approx. 600N	—
7010S-10	Magnetic stand	ø4mm, ø8mm, ø9.53mm (3/8")	Approx. 600N	—
7011-10	Magnetic stand	ø6mm, ø8mm	Approx. 600N	With fine adjustment
7011S-10	Magnetic stand	ø4mm, ø8mm, ø9.53mm (3/8")	Approx. 600N	With fine adjustment
7012-10	Magnetic stand	ø6mm, ø8mm, ø9.53mm (3/8")	Approx. 600N	—
7014-10	Mini magnetic stand	ø6mm, ø8mm	Approx. 150N	Without magnet ON/OFF
7014E-10	Mini magnetic stand	ø4mm, ø9.53mm (3/8")	Approx. 150N	Without magnet ON/OFF
7033B	Universal magnetic stand	ø6, ø8mm, ø9.53mm (3/8")	Approx. 600N	With mechanical locking system
7031B	Universal magnetic stand	ø6, ø8mm, ø9.53mm (3/8")	Approx. 300N	With mechanical locking system
7032B	Universal magnetic stand	ø6, ø8mm, ø9.53mm (3/8")	Approx. 600N	With mechanical locking system

Stands

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

Dial Gage Stands SERIES 7

- Dial Gage Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.
- Anvil of 7001-10 and 7002-10: \varnothing 58mm
Anvil of 7007-10: 90mm square
- Vertical fine adjustment is available with one-touch control thanks to the parallel spring suspension.



7001-10
(with \varnothing 58mm serrated anvil)

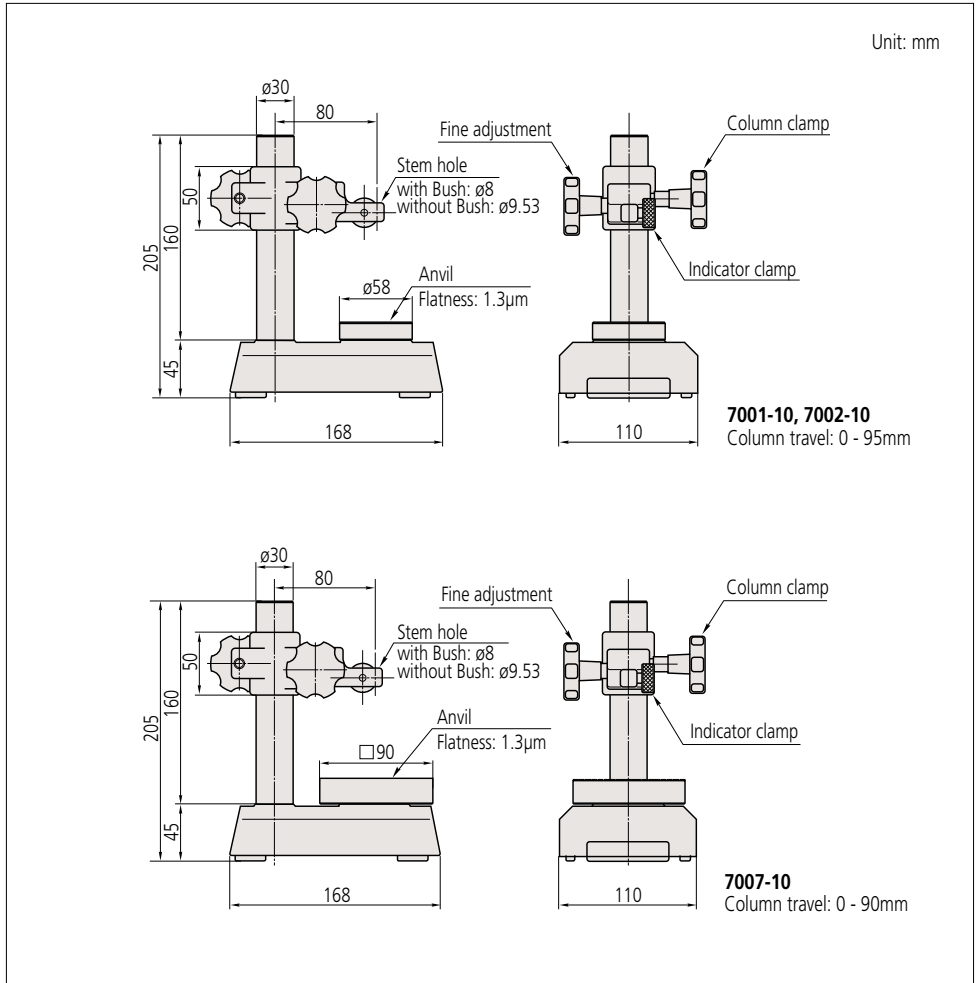


7002-10
(with \varnothing 58mm flat anvil)



7007-10
(with 90mm square anvil)

DIMENSIONS



SPECIFICATIONS

Metric		
Order No.	Stem hole	Remarks
7001-10	ø8mm, ø9.53mm	With serrated anvil
7002-10	ø8mm, ø9.53mm	With flat anvil
7007-10	ø8mm, ø9.53mm	With square anvil

* Perpendicularity of the mounting hole to the anvil: less than 0.4mm/100mm

* Take note that when mounting the high-accuracy Linear Gages (with resolution of 0.1µm or less) to these stands, it may affect the indication value depends on the perpendicularity of the mounting hole to the top surface of the anvils.

Optional Accessories

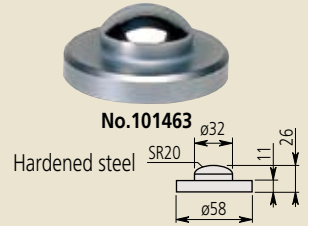
101462: Hardened steel serrated anvil



101461: Hardened steel flat anvil



101463: Hardened steel domed anvil*
*Not available for 7007-10.

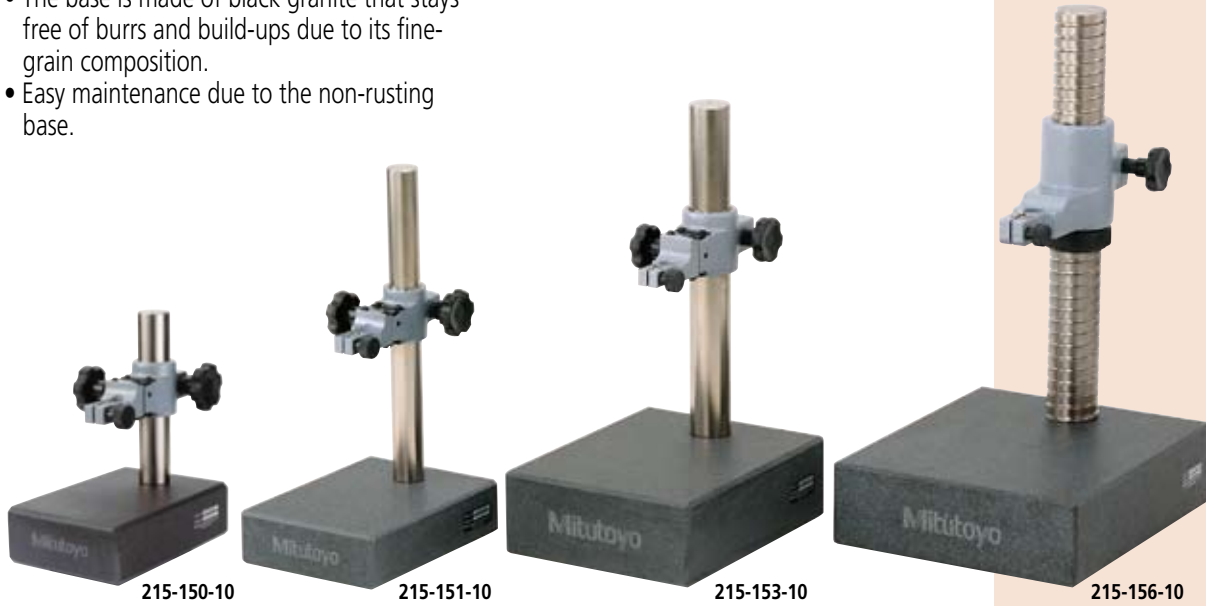


Stands

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

SERIES 215 — Granite Comparator Stands

- The base is made of black granite that stays free of burrs and build-ups due to its fine-grain composition.
- Easy maintenance due to the non-rusting base.



SPECIFICATIONS

Order No.	Granite base size (W x D x H)	Column travel	Stem hole	Remarks
215-150-10	120 x 180 x 50mm	110mm	ø8mm, ø9.53mm	With fine adjustment of 1mm range
215-151-10	150 x 200 x 50mm	250mm	ø8mm, ø9.53mm	With fine adjustment of 1mm range
215-153-10	200 x 250 x 80mm	260mm	ø8mm, ø9.53mm	With fine adjustment of 1mm range
215-156-10	300 x 250 x 80mm	275mm	ø8mm, ø9.53mm, ø20mm	With fine adjustment over the entire travel

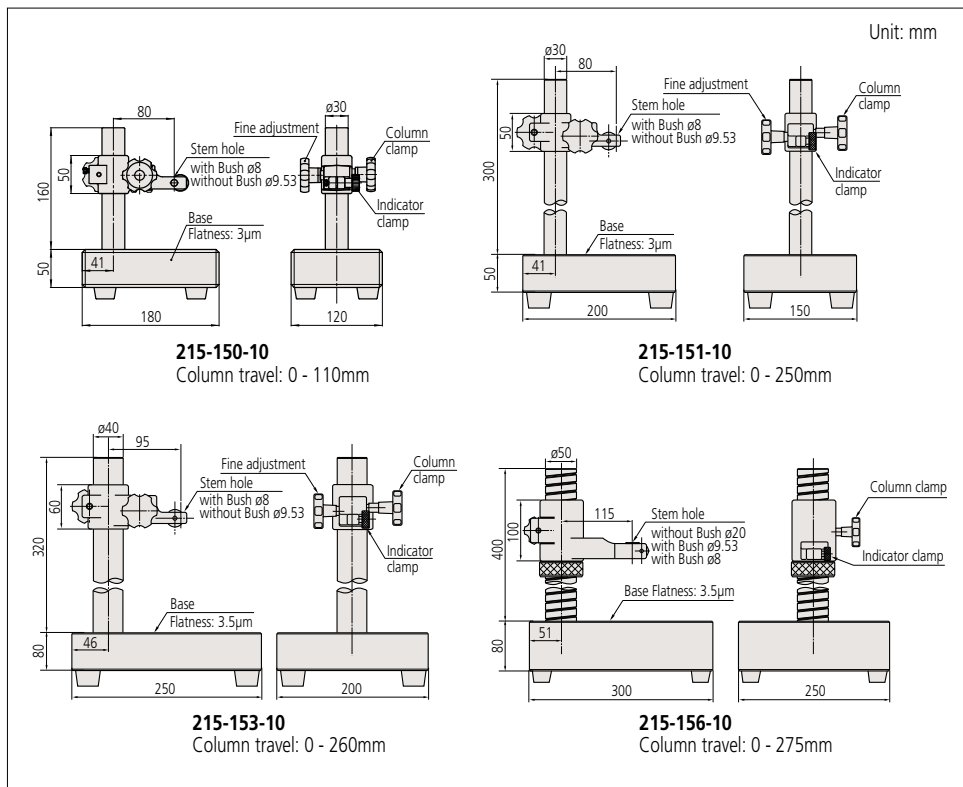
* Perpendicularity of the mounting hole to the anvil: less than 0.2mm/100mm.

* Take note that when mounting the high-accuracy Linear Gages (with resolution of 0.1µm or less) to these stands, it may affect the indication value depends on the perpendicularity of the mounting hole to the top surface of the anvils.

Optional Accessories

- 21JAA329: ø8mm bush
 - 21JAA330: ø9.53mm bush
 - 21JAA331: ø15mm bush
- only available for 215-156-10

DIMENSIONS



SERIES 215 — Comparator Stands



Application example using Digimatic Indicator ID-H.

- Comparator Stands have a very stable cast-iron base that enables precise measurement.
- The partially serrated anvil prevents very flat workpieces from wringing to it and the 2.3 μ m flatness (or better) promotes accurate measurement.
- The **215-505-10** model has a threaded column which enables easy and precise coarse adjustment.
- Serrated anvils 110x110mm are supplied with **215-405-10**, and 150x150mm with **215-505-10** models.



215-405-10

SPECIFICATIONS

Order No.	Square anvil size (W x D)	Column travel	Stem hole	Remarks
215-405-10	110 x 110mm	235mm	\varnothing 8mm, \varnothing 9.53mm	With fine adjustment of 1mm range
215-505-10	150 x 150mm	275mm	\varnothing 8mm, \varnothing 9.53mm, \varnothing 20mm	With fine adjustment over the entire travel

* Perpendicularity of the mounting hole to the anvil: less than 0.4mm/100mm

* Take note that when mounting the high-accuracy Linear Gages (with resolution of 0.1 μ m or less) to these stands, it may affect the indication value depends on the perpendicularity of the mounting hole to the top surface of the anvils.

Optional Accessories

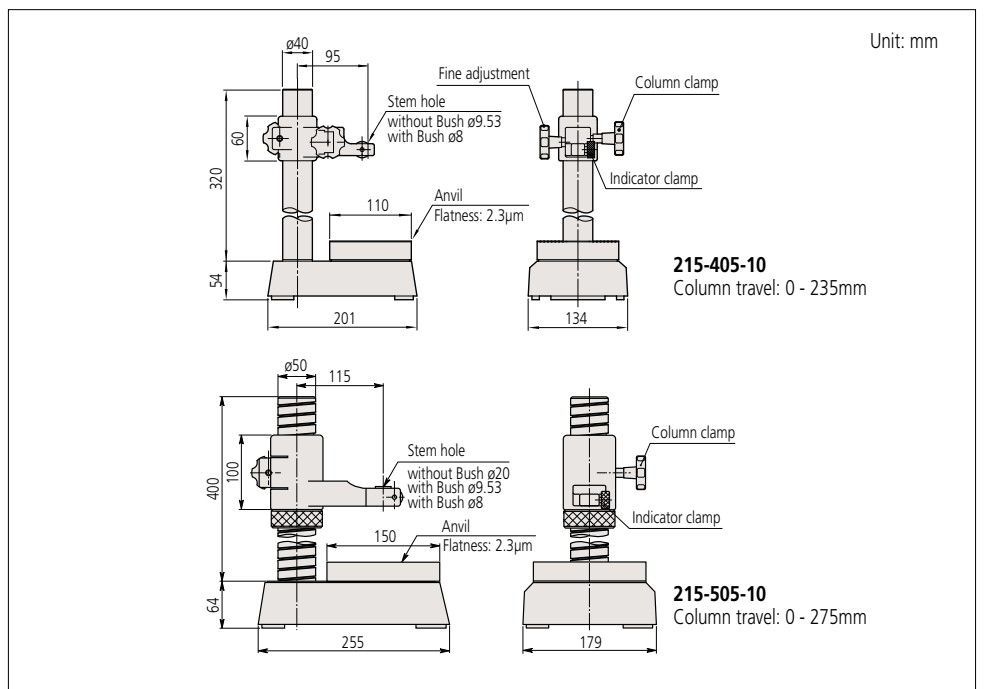
21JAA329: \varnothing 8mm bush*

21JAA330: \varnothing 9.53mm (3/8") bush*

21JAA331: \varnothing 15mm bush*

* Only available for **215-505-10**.

DIMENSIONS



Stands

Comparison measuring instruments which ensure high quality, high accuracy and reliability.

SERIES 519 — Transfer Stand

- Transfer Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.



519-109-10
(with a serrated anvil)

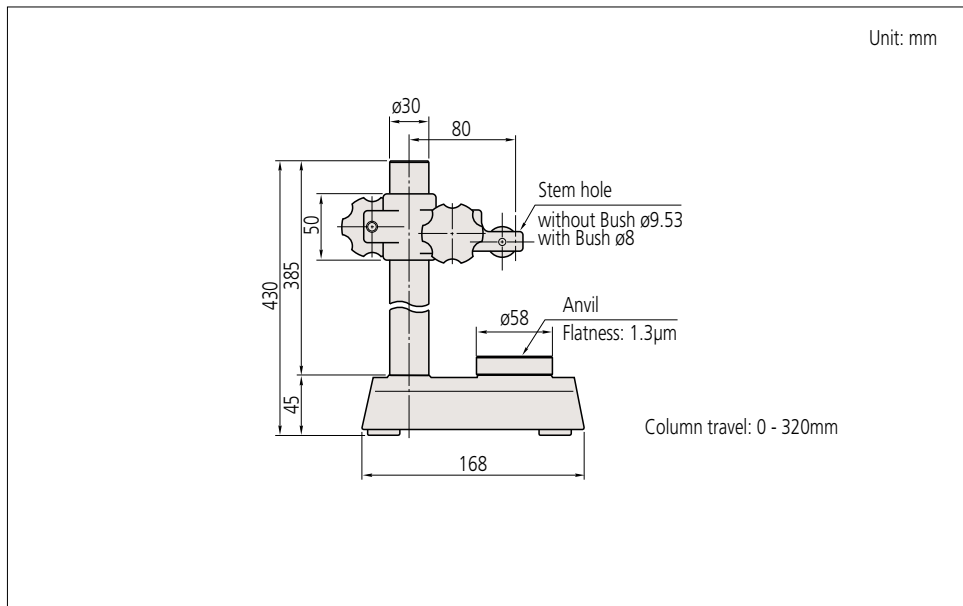
SPECIFICATIONS

Metric		
Order No.	Stem hole	Remarks
519-109-10	ø8mm, ø9.53mm	With serrated anvil

* Perpendicularity of the mounting hole to the anvil: less than 0.4mm/100mm

* Take note that when mounting the high-accuracy Linear Gages (with resolution of 0.1µm or less) to these stands, it may affect the indication value depends on the perpendicularity of the mounting hole to the top surface of the anvils.

DIMENSIONS

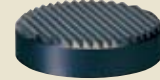


Optional Accessories

101462: Hardened steel Serrated anvil

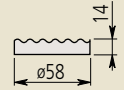
101461: Hardened steel flat anvil

101463: Hardened steel domed anvil



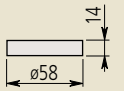
No.101462

Hardened steel



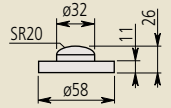
No.101461

Hardened steel



No.101463

Hardened steel



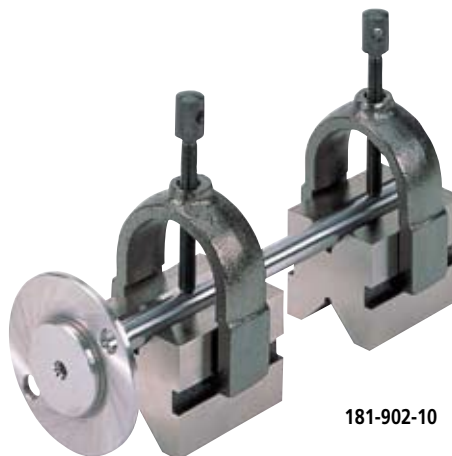
Accuracy

	Mitutoyo	Reference JIS B 7540 Grade 1, 100mm or less
Bottom-surface flatness	2µm or less	10µm or less
V-surface flatness	2µm or less	10µm or less
Parallelism between the bottom-surface and the cylinder on the V-surface	7.5µm or less	10µm or less
Inclination of the V-anvil against the bottom-surface	10µm or less	10µm or less
Parallelism between the side surface and the cylinder on the V-surface	7.5µm or less	20µm or less
Difference in the height of a pair of V-Blocks	9µm or less	10µm or less

Optional Accessories

No.101462 Serrated anvil (standard accessory)

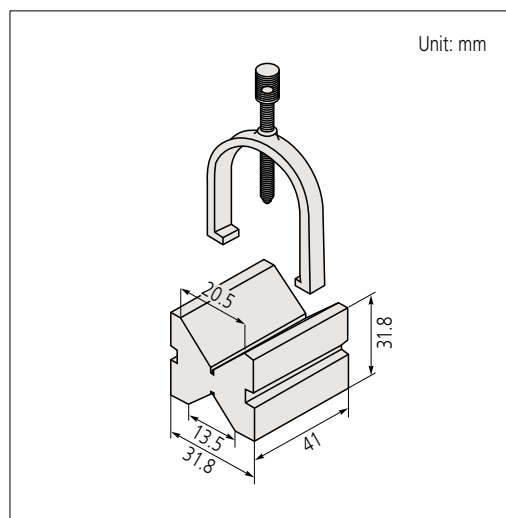
V-Block Set SERIES 181



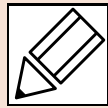
SPECIFICATIONS

Metric			Inch		
Order No.	Max. workpiece dia.	Remarks	Order No.	Max. workpiece dia.	Remarks
181-902-10	25mm	With clamp	181-901-10	1"	With clamp

DIMENSIONS

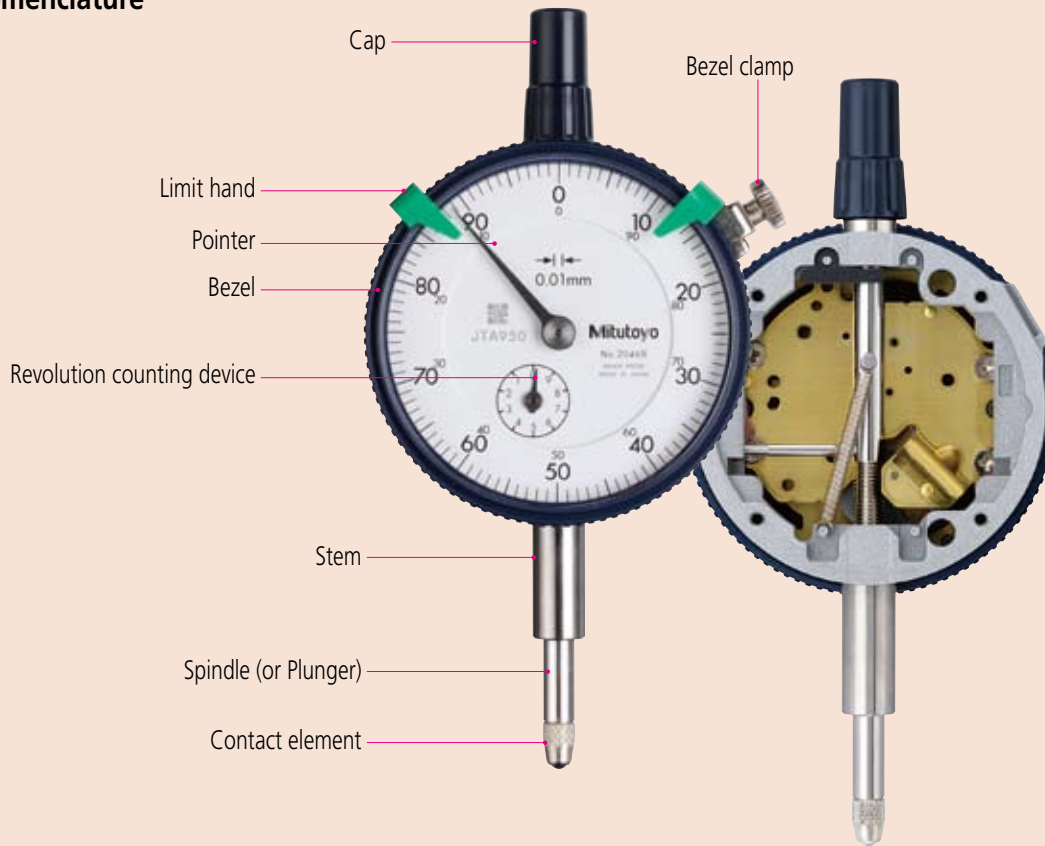


Quick Guide to Precision Measuring Instruments



Dial Gages and Digital Indicators

Nomenclature



Dial faces

0.01mm



Continuous dial
(Bi-directional graduation)



Balanced dial (Multi-revolution)



Continuous dial (Reverse reading)



Balanced dial (One revolution)

0.001mm



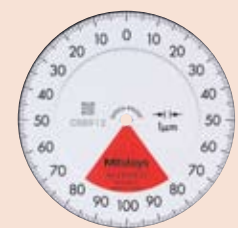
Continuous dial
(Standard scale spacing)



Balanced dial (Multi-revolution)



Continuous dial (Double scale spacing)



Balanced dial (One revolution)

- Continuous dial: For direct reading
- Balanced dial: For reading the difference from a reference surface
- Reverse reading dial: For depth or bore gage measurement
- One revolution dial: For error-free reading of small differences

Mitutoyo's Response to Dial Indicator Standard B7503: 2011

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for inspection certificates for horizontal or opposite posture if required.
- The old JIS Standard indicates that "the uncertainty of calibration" is evaluated inclusively. On the other hand, the new JIS Standard indicates that conformity or nonconformity to specification is verified based on JIS B 0641-1 and that it is preferred that the uncertainty is evaluated based on ISO/TS 14253-2 and ISO/IEC Guide 98. Therefore, we perform shipping inspection of dial indicators inclusive of the uncertainty of calibration as usual.

Dial Indicator Standard B7503 : 2011 (Extract from JIS/Japanese Industrial Standards)

Item	Calibration method	Diagram of calibration setup in vertical posture (example)	Tools for calibration (example)
Indication error	Hold the dial indicator with its spindle set vertically downward, retract the spindle (retraction direction) to set the dial hand at the zero point, and determine the indication error at the below-mentioned measurement points with reference to the dial graduations. - Every 1/10 revolution for the first two revolutions - Every half revolution for the next five revolutions - Every revolution for the next 25 revolutions - Every 5 revolutions for after the 25th revolution For one revolution type dial indicators and indicators whose graduations are not factors of 10, determine the indication errors at the closest measurement points mentioned above.		For 0.01mm graduation dial indicators: A micrometer head or other measuring unit with 0.5μm graduation or less and instrumental error of ±1μm and a supporting stand. For dial indicators other than the above: A micrometer head or other measuring unit with 1μm graduation or less and ±1μm instrumental error and a supporting stand.
Retrace error	Next, retract the spindle more than three graduations over the entire measuring range, reverse the spindle displacement (extension direction), and determine the indication errors at the same points measured during spindle retraction. Then determine the indication errors and the retrace errors with reference to the bidirectional indication errors thus obtained. When automatically reading errors by automatic inspection machine, determine the gap between the dial hand and the graduation mark with reference to the displacement of the measuring instrument.		
Repeatability	Apply the contact point of the dial indicator perpendicularly to the upper face of a measuring stage, retract and extend the spindle quickly and slowly five times at a desired position within the measuring range and determine the maximum difference between the five indications obtained.		Measuring stage Supporting stand
Measuring Force	Holding a dial indicator, retract and extend the spindle continuously and gradually, and measure the measuring force at the zero, middle and end points in the measuring range. The largest value: maximum measurement force The smallest value: minimum measurement force The maximum difference in contact force measured when the spindle is retracting and extending at the same measuring position: difference in the measurement force		Supporting stand Top pan type spring scale (graduation: 0.02N or less) or force gage (sensitivity: 0.02N or less)

Maximum permissible error

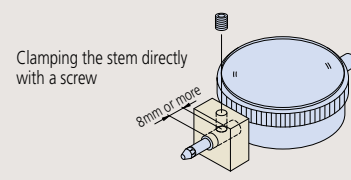
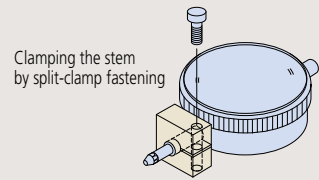
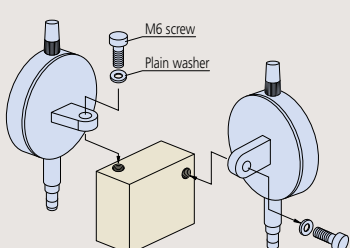
Graduation (mm)	Maximum permissible error (MPE) by measurement characteristics -- dial indicators with the bezel dia. 50mm or more								Maximum permissible error (MPE) by measurement characteristics --dial indicators with the bezel dia. 50mm or less and back plunger type dial indicators											
	0.01								0.005	0.001		0.01				0.005	0.002	0.001		
Measuring range (mm)	1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	Over 10 and up to 20	Over 20 and up to 30	Over 30 and up to 50	Over 50 and up to 100	5 or less	1 or less	Over 1 and up to 2	Over 2 and up to 5	1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	5 or less	1 or less	1 or less	
Retrace error	3	3	3	3	5	7	8	9	3	2	2	3	4	4	4	5	3.5	2.5	2	
Repeatability	3	3	3	3	4	5	5	5	3	0.5	0.5	1	3	3	3	3	3	1	1	
Indication error	Arbitrary 1/10 revolution	5	5	5	5	8	10	10	12	5	2	2	3.5	8	8	8	9	6	2.5	2.5
	Arbitrary 1/2 revolution	8	8	9	9	10	12	12	17	9	3.5	4	5	11	11	12	12	9	4.5	4
	Arbitrary One revolution	8	9	10	10	15	15	15	20	10	4	5	6	12	12	14	14	10	5	4.5
	Entire measuring range	8	10	12	15	25	30	40	50	12	5	7	10	15	16	18	20	12	6	5

MPE for one revolution type dial indicators does not define the indication error of arbitrary 1/2 and 1 revolution.

* Values in the table above apply at 20°C, which JIS B0680 defines as the standard temperature.

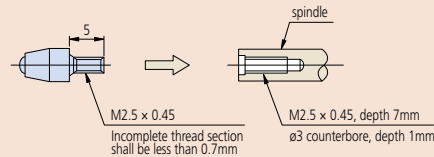
* The measurement characteristics of a dial indicator have to meet both maximum permissible error (MPE) and measurement force permissible limits (MPL) at any position within the measuring range in any posture when the measurement characteristics are not specified by the manufacturer.

■ Mounting a Dial gage

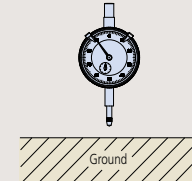
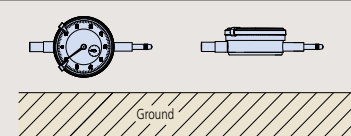
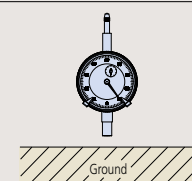
Stem mounting	Method	 <p>Clamping the stem directly with a screw</p>	 <p>Clamping the stem by split-clamp fastening</p>
	Note	<ul style="list-style-type: none"> • Mounting hole tolerance: $\varnothing 8G7(+0.005 \text{ to } 0.02)$ • Clamping screw: M4 to M6 • Clamping position: 8mm or more from the lower edge of the stem • Maximum clamping torque: 150N-cm when clamping with a single M5 screw • Note that excessive clamping torque may adversely affect spindle movement. 	<ul style="list-style-type: none"> • Mounting hole tolerance: $\varnothing 8G7(+0.005 \text{ to } 0.02)$
Lug mounting	Method		
	Note	<ul style="list-style-type: none"> • Lugs can be changed 90 degrees in orientation according to the application. (The lug is set horizontally when shipped.) • Lugs of some Series 1 models (No. 1911T-10, 1913T-10&1003T), however, cannot be altered to horizontal. • To avoid cosine-effect error, ensure that any type of gage or indicator is mounted with its spindle in line with the intended measurement direction. 	

■ Contact point

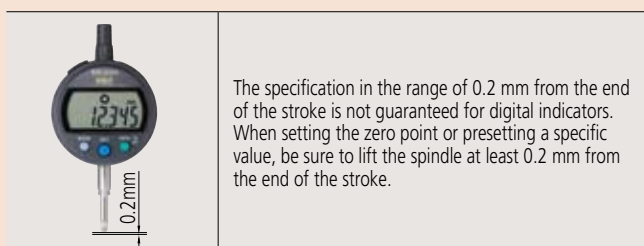
- Screw thread is standardized on M2.5x0.45 (Length: 5mm).
- Incomplete thread section at the root of the screw shall be less than 0.7mm when fabricating a contact point.



■ Measuring orientation

Position	Remarks
Vertical position (contact point downward) 	If measurement is performed with the lateral position or upside-down position, the measuring force is less than in the vertical position. In this case be sure to check the operation and repeatability of the indicator or digital display. For guaranteed-operation specifications according to positions of digital indicators and dial gages, refer to the product descriptions in a general catalog.
Lateral position (spindle horizontal) 	
Upside-down position (contact point upward) 	

■ Setting the origin of a digital indicator



■ Care of the spindle

- Do not lubricate the spindle. Doing so might cause dust to accumulate, resulting in a malfunction.
- If the spindle movement is poor, wipe the upper and lower spindle surfaces with a dry or alcohol-soaked cloth. If the movement is not improved by cleaning, contact Mitutoyo for repair.
- Before making a measurement or calibration, please confirm if the spindle moves upward and downward smoothly, and stability of the zero point.

Dial Test Indicator Standard B7533-1990 (Extract from JIS/Japanese Industrial Standards)

No.	Item	Calibration method	Diagram of calibration setup	Tools for calibration	
1	Wide-range accuracy	(1) For an indicator of 0.01 mm graduation: Displace the contact point so as to move the pointer clockwise in increments of 0.1 mm with reference to the graduations from the zero point to the end point of the measuring range while taking readings of the calibration tool at each point and determine this accuracy from the error curve drawn by plotting the differences of each "indicator reading - calibration tool reading". (2) For an indicator of 0.002 mm graduation: Displace the contact point so as to move the pointer clockwise in increment of 0.02 mm with reference to the graduations from the zero point to the end point of the measuring range while taking readings of the calibration tool at each point and determine this accuracy from the error curve drawn by plotting the differences of each "indicator reading - calibration tool reading". The instrumental error of the calibration tool shall be compensated prior to this measurement.		Micrometer head or measuring unit (graduation: 1µm or less, instrumental error: within ±1µm), supporting stand	
2	Adjacent error				
3	Retrace error	After the completion of the wide-range accuracy measurement, reverse the contact point from the last point of measurement while taking readings at the same scale graduations as for the wide-range accuracy measurement and determine the retrace error from the error curve plotted.			
4	Repeatability	a	Holding the dial test indicator with its stylus parallel with the top face of the measuring stage, displace the contact point quickly and slowly five times at a desired position within the measuring range and determine the maximum difference in indication.		Measuring stage, Supporting stand, and Gauge block of grade 1 as stipulated by JIS B7506 (Gauge block)
		b	Holding the stylus parallel to a gauge block placed on the measuring stage, move the gauge block to and fro and left to right under the contact point within the measuring range and determine the maximum difference in indication.		
5	Measuring force	Holding an indicator by the case or stem, displace the contact point gradually and continuously in the forward and backward directions respectively and take a reading of measuring force at the zero, middle and end points of the measuring range in each direction. •Performance The maximum measuring force in the forward direction shall not exceed 0.5N. The difference between the maximum and minimum measuring forces in one direction shall not exceed 0.2N (20gf). Note that the smallest possible measuring force is desirable for indicators.		Top pan type spring scale (graduation: 2gf or less) or force gage (sensitivity: 0.02N or less)	

Notes: There are no JIS standards applicable to models with a graduation of 0.001 mm. Therefore, referring to JIS B 7533-1990 for inspecting the wide-range accuracy and adjacent error, the accuracy is measured by moving the contact point 0.01 mm clockwise from the start point of the measuring range to the end point with reference to the graduations.

● Accuracy of indication

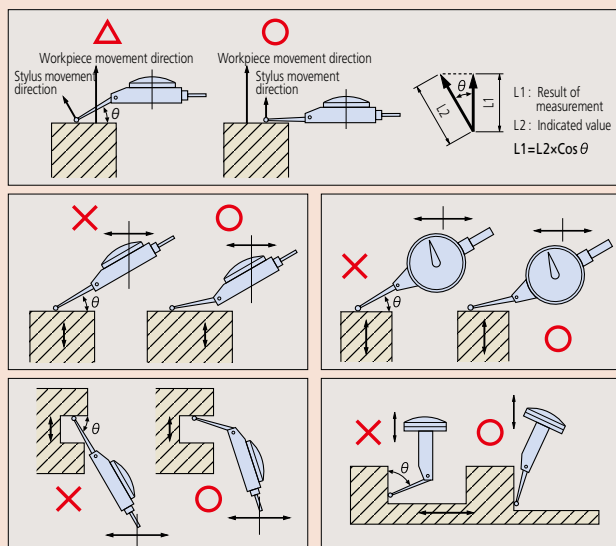
Permissible indication errors of dial test indicators are as per the table below.

Graduation (mm)	Measuring range (mm)	Wide range accuracy	Adjacent error	Repeatability	Retrace error
0.01	0.5	5	5	3	3
	0.8	8			4* ¹
	1.0	10			
0.002	0.2	3	2	1	2
	0.28				

*1: Applies to indicators with a stylus over 35 mm long.
Remarks: Values in the table above apply at 20°C.

■ Dial Test Indicators and the Cosine Effect

Always minimize the angle between movement directions during use.



The reading of any indicator will not represent an accurate measurement if its measuring direction is misaligned with the intended direction of measurement (cosine effect). Because the measuring direction of a dial test indicator is at right angles to a line drawn through the contact point and the stylus pivot, this effect can be minimized by setting the stylus to minimize angle θ (as shown in the figures). If necessary, the dial reading can be compensated for the actual θ value by using the table below to give the result of measurement.
Result of measurement = indicated value x compensation value

Compensating for a non-zero angle

Angle	Compensation value
10°	0.98
20°	0.94
30°	0.86
40°	0.76
50°	0.64
60°	0.50

Examples

If a 0.200mm measurement is indicated on the dial at various values of θ , the result of measurements are:
For $\theta = 10^\circ$, $0.200\text{mm} \times .98 = 0.196\text{mm}$
For $\theta = 20^\circ$, $0.200\text{mm} \times .94 = 0.188\text{mm}$
For $\theta = 30^\circ$, $0.200\text{mm} \times .86 = 0.172\text{mm}$