

ABSOLUTE Digimatic Indicator ID-CNX

Refer to page F-5 for details.

Dial Test Indicator

Refer to page F-67 for details.

Inspection Instruments for Indicators (i-Checker)

Refer to page F-77 for details.

Mitutoyo

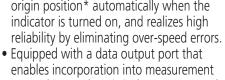
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ABSOLUTE Digimatic Indicator ID-SX2 SERIES 543

- Cost-effective oriented design **ID-SX2** indicators come with the minimum of functionality for ease of use. There is a choice of models in the lineup allowing selection of 0.01 mm, 0.001 mm or inch-based measurement resolutions.
- IP53 dust/water protection level The models listed below also provide IP53 dust/ water protection level specifications:

543-794(B)-10, 543-795(B)-10 and 543-796(B)-10

- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high
- enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)



* Refer to "Origin Setting of Digimatic Indicators" on page



SPECIFICATIONS

Metric	ı						ISO/JIS	Type A	SME/AN	SI/AGD type
Order No.	Range (mm)	Resolution (mm)	Maximum MPE _E *2	permissible e Hysteresis МРЕн	rror*1 (mm) Repeatability MPER	Measuring force MPL (N)	Back type	Battery life* ³	Net mass (g)	Dust/Water protection level*4
543-790-10 543-790B-10 543-794-10 543-794B-10	12.7	0.001	0.003	0.002	0.002	1.5 or less 2.5 or less	Flat With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	150 140 155 155	IP42 IP53
543-781-10 543-781B-10	12./	0.01	0.02	0.02	0.01	1.5 or less		Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42

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			Maximum permissible error*1			Measuring				Dust/Water
Order No.	Range	Resolution	MPE _E *2	Hysteresis MPE _H	Repeatability MPE _R	force MPĽ (N)	Back type	Battery life*3	Net mass (g)	protection level*4
543-791-10 543-791B-10 543-792-10 543-792B-10 543-793B-10		0.00005 in /0.001 mm 0.0001 in /0.001 mm	±0.0001 in /0.003 mm	0.0001 in /0.002 mm	0.0001 in /0.002 mm	1.5 or less	With lug Flat	Approx. 18,000 hours (Continuous use) Approx. 5 years	165 140	IP42
543-795B-10 543-795B-10 543-796B-10		0.00005 in /0.001 mm				2.5 or less	Flat	(Normal use)	155 155 155	IP53
543-782B-10 543-782B-10 543-783B-10		0.0005 in /0.01 mm	±0.0010 in /0.02 mm	0.0010 in /0.02 mm	0.0005 in /0.01 mm	1.5 or less	With lug Flat With lug Flat	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	140	IP42

- *1 These values apply at 20 °C.
- *2 Error of indication for the total measuring range
- *3 The battery life varies, depending on the number of times a Digimatic indicator is used as well as the way it is used. The values listed above are approximations.
- *4 This is only valid when the data socket cover is in place. Does not apply if the cover is removed, a lifting accessory is attached, or a connecting cable is attached.

Note: Regarding origin setting, refer to "Origin Setting of Digimatic Indicators" on page F-25



ABSOLUTE



e SPECIFICATIONS

Technical Data

- Display: 6-digit LCD, sign
- Usable orientation: All Scale type: ABSOLUTE electrostatic linear encoder
- Battery: SR44 (1 pc.), 938882 for initial operational checks (standard accessory)
 Maximum response speed: Unlimited (except for scanning)
- measurement)

Functions

- Origin set (Zero-setting)
- Measuring direction switching
 Data output
- Low battery voltage alarm displayError alarm display

Optional Accessories

Lifting lever

Lifting knob





Lifting lever 21EZA198
Lifting knob 21EZA105 Lifting cable 21JZA295
• SPC Cable: 905338 (1 m)

905409 (2 m)

 USB Input Tool Direct (2 m): **06AFM380F** Note: Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument.

Input Tool Series
IT-020U (USB Keyboard Signal Conversion Type): 264-020

IT-007R (RS-232C Communication Conversion Type):

Connecting Cables for **U-WAVE-T** (160 mm): **02AZD790F**

For foot switch: **02AZE140F**

Digimatic Mini-Processor DP-1VA LOGGER: 264-505
 Contact points for Mitutoyo's digimatic indicators (Refer to pages F-57 to F-60 for details.)

Interchangeable backs for SERIES 2 models (Refer to page F-61 for details.)

Measuring stands (Refer to pages F-84 to F-91 for details.)

IP53 dust/water protection level*

Level 5: Dust protection

While complete protection against intrusion of dust is not provided, protection is adequate to prevent dust intrusion in amounts that would inhibit the prescribed operations and safety of the electronic equipment.

Level 3: Protection against spraying water The product suffers no harmful effects when subjected to water sprayed at an angle of up to 60° on both sides.

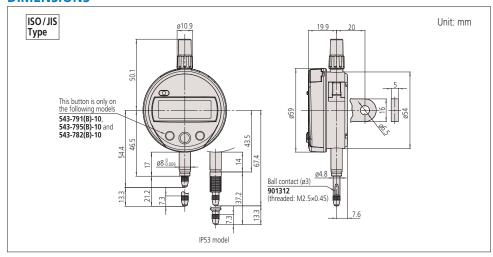
For details on the dust/water protection level test conditions, refer to IEC 60529: 2001 and JIS C 0920: 2003.

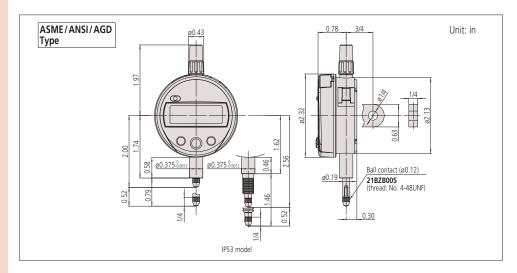
* IP code is the degree of protection against the intrusion of solid foreign objects and water.

Mitutoyo offers a lineup of coolant proof, ID-N/B indicators that have excellent resistance to oil, water and dust and so are suitable for use in environments that include splashing cutting fluid. (Refer to page F-8 for

F-3

DIMENSIONS







ABSOLUTE Digimatic Indicator ID-CNX SERIES 543 — Standard Type

- Supports bidirectional communication between the ID-C and the computer, enabling data output to a computer and setting of various functions of **ID-C** from a computer.
- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Tolerance judgment can be performed by setting upper and lower tolerance limits. The judgment result (GO/NO-GO) can be displayed in full-size characters.
- An analog bar indicator has been integrated to make upper/lower limit and turnover point reading more comfortable.
- Battery life of approx. 2.5 years under normal use has been achieved with only one battery.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)
- * Refer to "Origin Setting of Digimatic Indicators" on page









A large LCD with an analog bar graph to improve the readability of measurement values.

543-705B



Three large buttons

The ease of use has been greatly enhanced thanks to these three large buttons. The user can freely set any frequently used function to the buttons.



Count direction switching, tolerance

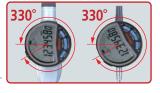
- Data output (when connected to an external device)
- Data hold (when no external device is connected)

Switches between the ABS (preset) and INC (zeroset) measurement modes judgment setting, resolution switching, scale factor setting, and function lock setting

inch/mm conversion

330° rotary display

The display can be rotated 330°, allowing use at a position where you can easily read the measurement value



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Calibration schedule warning

An icon is displayed on the LCD to notify the user of the set calibration schedule. This function facilitates the proper precision management of the measuring instrument.



The calibration schedule warning icon starts blinking at a set time (e.g. 1 week before the calibration date) before the limit. If the limit is exceeded, the entire screen starts blinking to notify **MeasurLink** ENABLED





Technical Data

Display: 7-digit LCD, sign, and analog bar
Battery: CR2032 (1 pc.) for initial operational checks

(standard accessory)

• Battery life: Approx. 2,700 hours of continuous use.

Approx. 2.5 years under normal use.

Note: Depends on use of the indicator. The above values are reference values

• Maximum response speed: Unlimited (except for scanning measurement)

Functions

• Peak detection (MAX/MIN)

- Runout range measurement (MAX MIN)

- Zero-setting (INC system)
 Presetting (ABS system)
 Measuring direction switching
- Tolerance judgment
 Resolution switching
 (For 0.0005 mm or 0.00002 inch resolution type)
- Simple calculation: f(x) = Ax
- Function Lock
- Calibration schedule warning
- Auto power ON/OFFData output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery/voltage alarm displayError alarm display

Optional Accessories

• Lifting

Lifting lever: 21EZA198 (12.7 mm/0.5 inch type)

Lifting cable: 21JZA295 (stroke 12.7 mm: 12.7 mm/0.5 inch type)

Lifting knob:

21EZA105 (12.7 mm/0.5 inch type)*1 21EZA197 (25.4 mm/1 inch type) 21EZA200 (50.8 mm/2 inch type)

Lifting lever: 21EAA426 (for measuring range: 25.4 and

(supplied with 25.4 mm and 50.8 mm models as standard.)

*1 Not available for low measuring force models.

• Auxiliary spindle spring:

• QACA571 (25.4 mm/1 inch type)*2

• QACA773 (50.8 mm/2 inch type)*2

*2 Required when orienting the indicator upside down.

06AGL011 (1 m) 06AGL021 (2 m)

USB Input Tool Direct (2 m): 06AGQ001F
Input Tool Series

IT-020U (USB Keyboard Signal Conversion Type):

IT-007R (RS-232C Communication Conversion Type): 264-007

Connecting Cables for U-WAVE-T (160 mm): 02AZG011 For foot switch: 02AZG021
 Connecting unit for U-WAVE-TM/TMB: 02AZF700 (12.7 mm/0.5 inch type)

Digimatic Mini-Processor DP-1VA LOGGER: 264-505
 Contact points for Mitutoyo's digimatic indicators (Refer to pages F-57 to F-60 for details.)

Interchangeable backs for SERIES 2 models (Refer to page F-61 for details.)

Measuring stands (Refer to pages F-84 to F-91 for details.)

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SPECIFICATIONS

Spindle orientation for measuremen	ıt
• Standard models with measuring range 12.7 mm:	
Usable in all orientations.	

- Models with measuring range 25.4 or 50.8 mm: Usable between the contact point pointing downward and spindle in horizontal orientation. To use the contact point pointing upward, the auxiliary spindle spring (optional) is required.
- Low measuring force model: See "Setting measuring force on low measuring force models" below.

Setting measuring force on low measuring force models

The measuring force of models with low measuring force can be set by combining standard accessory springs and weights.

• 543-715(B)/716(B)/717(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
	Yes	Yes	0.5 or less
Pointing vertically	Yes	No	0.4 or less
downward	No	Yes	0.3 or less
	No	No	0.2 or less
Horizontal	Yes	No	0.3 or less

Note: Operation using configurations other than shown above is not guaranteed.

• 543-705(B)/706(B)/707(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
	Yes	Yes	0.7 or less
Pointing vertically	Yes	No	0.6 or less
downward	No	Yes	0.4 or less
	No	No	Not quaranteed

Note: Operation using configurations other than shown above is not guaranteed.

Metric						ISO/JIS	type AS	ME/ANSI	/AGD type
Order No.			Resolution	Maximum pe	rmissible error	MPE*1 (mm)	Measuring force	Net mass (g)	
w/lug	Flat back	Range (mm)	(mm)	MPE _E *3	Hysteresis MPE _H	Repeatability MPE _R	MPL (N)	w/lug	Flat back
543-700	543-700B	12.7	0.0005/	0.003	0.002	0.002	1.5 or less	175	165
543-705 * ²	543-705B*2	12.7					0.4 to 0.7	170	160
_	543-720B	25.4					1.8 or less	_	195
_	543-730B	50.8	(selectable)	0.005			2.3 or less	_	260
543-710	543-710B	12.7					0.9 or less	170	160
543-715 * ²	543-715B*2	12.7	0.01	0.02	0.02	0.01	0.2 to 0.5	165	155
_	543-725B	25.4	0.01		0.02	0.01	1.8 or less	_	190

^{*1} These values apply at 20 °C.

543-735B

Incl	h/Metric		ı							
	Orde	r No.			Maximum	permissible e	rror MPE*1	Measuring force	Net mass (g)	
W	v/lug	Flat back	Range	Resolution	MPEE*3	Hysteresis MPE _H	Repeatability MPE _R	MPL (N)	w/lug	Flat back
54	3-701	543-701B		0.00002/				1.5 or less	175	165
54	3-702	543-702B	0.5 in/	0.00005/				1.5 or less	195	165
54	3-706* ²	543-706B*2	12.7 mm	0.0001/	±0.00012 in			0.4 to 0.7	170	160
54	3-707* ²	543-707B*2		0.0005 in	/0.003 mm	0.00008 in	0.00008 in	0.4 to 0.7	190	160
	_	543-721B	1 in/	0.0005/		/0.002 mm	/0.002 mm	1.8 or less	_	195
	_	543-722B	25.4 mm	0.001/				1.8 or less	_	195
	_	543-731B	2 in/	0.01 mm	±0.0002 in			2.3 or less	_	260
	_	543-732B	50.8 mm	(selectable)	/0.005 mm			2.3 or less	_	260
54	3-711	543-711B						0.9 or less	170	160
54	3-712	543-712B	0.5 in/					0.9 or less	190	160
54	3-716* ²	543-716B*2	12.7 mm		±0.001 in			0.2 to 0.5	165	155
54	3-717 * ²	543-717B*2		0.0005 in/	/0.02 mm	0.001 in	0.0005 in	0.2 to 0.5	185	155
	_	543-726B	1 in/	0.01 mm		/0.02 mm	/0.01 mm	1.8 or less	_	190
	_	543-727B	25.4 mm					1.8 or less	_	190
	_	543-736B	2 in/		±0.0015 in			2.3 or less	_	245
	_	543-737B	50.8 mm		/0.04 mm			2.3 or less	_	245

^{*1} These values apply at 20 °C.

DIMENSIONS

12.7 mm range models ISO/JIS Unit: mm ASME/ANSI/AGD Unit: in Type Type 1.20 30.5 20. 1.74 46.5 54.4 Ø0.375-0.0012 ø8 -0.009 Ball contact (ø0.12) Ball contact (ø3) _ <u>ø</u>0.19 21BZB005 (thread: No. 4-48UNF) 901312 (threaded: M2.5×0.45) 0.30

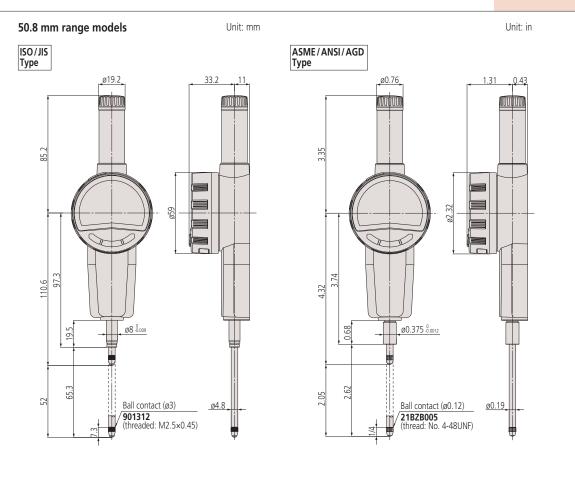
Note: Products with an Order No. suffixed "B" have a plain back, and other models have a center-lug back. Refer to page F-61 for details of the backs.



^{*2} Low measuring force

^{*3} Error of indication for the total measuring range

^{*2} Low measuring force *3 Error of indication for the total measuring range



Note: Products with an Order No. suffixed "B" have a plain back, and other models have a center-lug back. Refer to page F-61 for details of the backs.



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Mitutovo reserves the gight to change any or all aspects of any product specification, including prices, designs and service content, without notice

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models

Functions

- Zero-setting (INC system)Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- LCD readout reversal
- Resolution switching (For 0.001 mm or 0.00005 in resolution type)
- Data output
- Display value holding (when no external device is connected)

 • Low battery voltage alarm display

 • Error alarm display

ABSOLUTE Digimatic Indicator ID-N/B SERIES 543 — with Dust/Water **Protection Conforming to IP66**

- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Rated to IP66: can be used satisfactorily even in adverse environments where the indicator is subject to splashing by cutting fluid or coolant.
- Slim body design (body width: only 35 mm) is advantageous in multipoint measurement situations where space is restricted. The LCD readout can also be rotated 180° to allow reading from the most convenient direction.
 - * Refer to "Origin Setting of Digimatic Indicators" on page
- Succeeded in digitalization of the Back Plunger type widely used for dial indicators for ID-B. A 5 mm-stroke plunger with a higher degree of accuracy has been implemented by adopting a direct reading scale for plunger displacement.
- Tolerance judgment can be performed by setting upper and lower tolerance limits. The judgment result (GO/NO-GO) can be displayed in full-size characters.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)





Rated to IP66 water- and dust-proofing standard and oil resistance improved.



Body width 35 mm



LCD readout reversal function

F-8

SPECIFICATIONS

Inch/Metric

Metric			ISO/JIS type ASME/ANSI/AGD type							
Order No.	Range (mm)	Resolution (mm)	Maxi	mum permissible error (mi	Measuring force MPL (N)	Remarks				
	Nailye (IIIII)	Nesolution (IIIII)	MPE _E *	Hysteresis MPEн	Repeatability MPER	ivieasuring force wird (N)	Nemdiks			
543-570	12.7	0.01	0.02	0.02	0.01	2.5 or less	Slim type			
543-580	5.0	0.01	0.02	0.02	0.01	2.0 or less	Back Plunger type			
543-575	12.7	0.01/0.001	0.01/0.003	0.002	0.002	2.5 or less	Slim type			
543-585	5.0	(selectable)	0.01/0.003	0.002	0.002	2.0 or less	Back Plunger type			

Maximum permissible error

			IVIF LE	TTYSTETESIS IVIT LH	Nepeatability Wir LK		
543-571	0.5	0.0005 in/0.01 mm	±0.001 in/0.02 mm	0.001 in/0.02 mm	0.0005 in/0.01 mm	2.5 or less	Slim type
543-581	0.2	0.0003 111/0.01 111111	±0.001 111/0.02 111111	0.001 111/ 0.02 111111	0.0003 111/0.01 111111	2.0 or less	Back Plunger type
543-576	0.5	0.00005/0.0005 in 0.001/0.01 mm	±0.0001 in/0.003 mm	0.0001 in/0.002 mm	0.0001 in/0.002 mm	2.5 or less	Slim type
543-586	0.2	(selectable)	±0.0001 111/0.003 111111	0.0001 111/ 0.002 111111	0.0001 111/ 0.002 111111	2.0 or less	Back Plunger type

^{*} Error of indication for the total measuring range Note: One silver oxide button cell (SR44) for monitor included

Range (in)

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Measuring force MPL (N)

Resolution

Typical applications







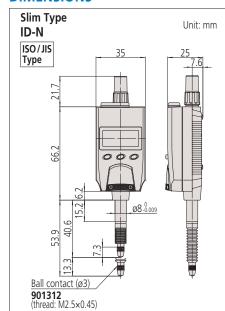


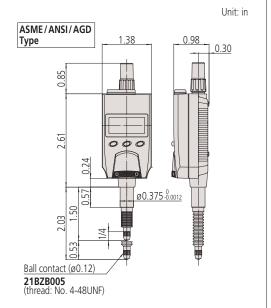






DIMENSIONS

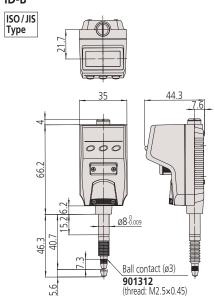


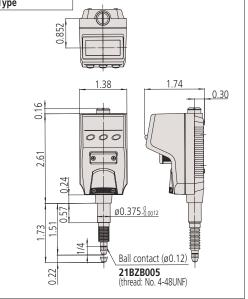


ASME/ANSI/AGD

F-9

Back plunger Type





Optional Accessories

- Lug
 21EZA145 (ISO/JIS type)
 21EZA146 (ASME/ANSI/AGD type)
 Control points for Mitutovo's digimal

 Lug
 21EZA146 (ASME/ANSI/AGD type)
- Contact points for Mitutoyo's digimatic indicators. (Refer to pages F-57 to F-60 for details.)
 Lifting knob (only for ID-N)
 21EZA105 (ISO/JIS type) 21EZA150 (ASME/ANSI/AGD type) Spindle can be manually lifted. Remove the spindle cap for **ID-N** and attach the lifting knob to the spindle. Note that water resistance is not maintained in this configuration.

Typical application using the lifting knob



- Arm for ID-B (made-to-order)
- For oil resistance (NBR) 21EAA423 (for ID-N) 21AAB562 (for ID-B) For durability (silicone) 238774 (for ID-N) 21EAA212 (for ID-B)



- USB Input Tool Direct (2 m): 06AFM380G
- Input Tool Series
- IT-020U (USB Keyboard Signal Conversion Type): 264-020
 IT-007R (RS-232C Communication Conversion Type): 264-007
 Connecting Cables for U-WAVE-T (160 mm): 02AZD790G

- For foot switch: **02AZE140G** Digimatic Mini-Processor **DP-1VA LOGGER**: **264-505** Bifurcated connecting cable with zero-setting terminal: **21EAA210** (1 m) **21EAA211** (2 m)

Two of the wires inside the cable are separated for zero setting without touching the SET switch on the main body. Use these wires in combination with commercially available switches. Zero setting is performed by briefly connecting these two wires together (less than a second), and ABS preset & recall by connecting for a second or more.

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Functions

- Peak detection (MAX/MIN)
- Runout (MAX MIN) Hold

- Note: Peak detection 1) Sampling rate: 50 readings/s 2) Capturing speed: 50 µm/s (max.)
- Zeroset (INC system)Preset function (ABS system)
- Measuring direction switching
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Resolution selection
 Simple calculation f(x) =Ax
- Analog bar resolution selection

- Key lock
 in/mm conversion (inch/mm type)
 Display hold (when no external device is connected)
 Data output

- Data output
 External PC setting input
 Display rotation (330°)
 Low battery voltage alarm display
 Error alarm display

Optional Accessories

Lifting lever 21EZA198 Lifting knob 21EZA105 • SPC Cable: 905338 (1 m)

905409 (2 m)

USB Input Tool Direct (2 m): 06AFM380F
 Input Tool Series

IT-020U (USB Keyboard Signal Conversion Type): 264-020

IT-007R (RS-232C Communication Conversion Type): **264-007**Connecting Cables for **U-WAVE-T** (160 mm):

02AZD790F

For foot switch: 02AZE140F

• Digimatic Mini-Processor DP-1VA LOGGER: 264-505

• Parameter setup kit: 21EZA313

Note: Parameter setting software (can be downloaded for free from the Mitutoyo website) is also required.



Parameter setting software



ABSOLUTE Digimatic Indicator ID-C SERIES 543 — Peak-Value Hold Type

- Run-out/MAX-MIN Hold function enables GO/NG judgment*1 for peak or difference
- Five buttons, status icons, and clear button indications allow for easy operation of a wide variety of functions.
- Wide LCD and new analog bar graph are now standard on all models.
- The ABS (absolute) scale restores the last origin position*2 automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)

 - *1 Tolerance judgment results cannot be output. *2 Refer to "Origin Setting of Digimatic Indicators" on page



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	etric	10113					ISO/JI	S type	ASME/ANSI/	AGD type
Order No.		Range	Resolution	Maximum permissible error (mm)			Measuring		Battery life	Net mass
(w/lug, flat back)		(mm)	MPE _E *1	Hysteresis MPE _H	Repeatability MPE _R	force MPL (N)	Power supply	(normal use)*2	(g)	
54	3-300-10	12.7	0.001/	0.003	0.002	0.002	1 E or loss	CR2032×1 pc.	A 1	180
54	3-300B-10*3		0.01 (selectable)	0.003	0.002	0.002	1.5 01 1633	CNZUJZX1 PC.	Approx. 1 year	170

Inch/Metric	L								
Order No.			Maxir	num permiss	ible error	Measuring force MPL (N)	Power supply	Battery life (normal use)*2	Net mass
(w/lug, flat back	Range	Resolution	MPE _E *1	Hysteresis MPE _H	Repeatability MPE _R				(g)
543-301-10		0.00005/		0.00010 in /0.002 mm	0.00010 in	1.5 or less	CR2032×1 pc.	Approx. 1 year	180
543-301B-10*	0.5 1117								170
543-302-10	12.7 mm				/0.002 mm				195
543-302B-10*	3								170

*1 Error of indication for the total measuring range

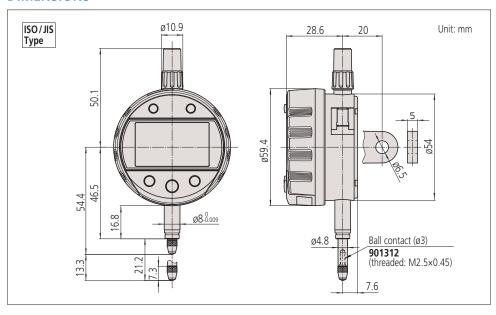
*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.

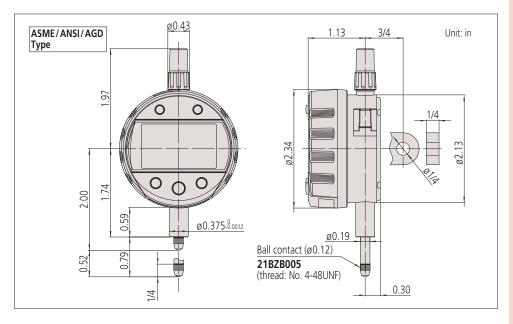
*3 Flat back





DIMENSIONS





F-11

Mitutoyo







Functions

- Minimum value detection Note: Peak detection
 - 1) Sampling rate: 50 readings/s 2) Capturing speed: 50 µm/s (max.)
- Preset (3 Preset values can be stored)
- Tolerance judgment (3 sets of upper and lower limits can be stored)
- Resolution selection
- Analog bar resolution selection
- Key lock
- Display hold (when no external device is connected)Data saving/calling
- (when no external device is connected)
- Data outputExternal PC setting input
- Display rotation (330°
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

• SPC Cable:

905338 (1 m) 905409 (2 m)

- USB Input Tool Direct (2 m): 06AFM380F
 Input Tool Series

IT-020U (USB Keyboard Signal Conversion Type):

IT-007R (RS-232C Communication Conversion Type): 264-007

Connecting Cables for U-WAVE-T (160 mm): 02AZD790F

- For foot switch: 02AZE140F
 Digimatic Mini-Processor DP-1VA LOGGER: 264-505
 Parameter setup kit: 21EZA313

Note: Parameter setting software (can be downloaded for free from the Mitutoyo website) is also required.

The ABSOLUTE Digimatic Bore Gage



ABSOLUTE Digimatic Bore Gages, which integrate the display with a bore gage measuring unit, are also available. Refer to pages C-47 and C-48 for details.



ABSOLUTE Digimatic Indicator ID-C SERIES 543 — Bore Gage Type

- Dedicated to inside measurement with minimum-value Hold and tolerance judgment functions*1.
 - Use together with a Mitutoyo bore gage (refer to pages C-29 to C-46 for details).
- Five buttons, status icons, and clear button indications allow for easy operation of a wide variety of functions.
- Wide LCD and new analog bar graph are now standard on all models.
- Can store up to three sets of master reference values and tolerances, alleviating the need for multiple settings to master
- The ABS (absolute) scale restores the last origin position*2 automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)
- *1 Tolerance judgment results cannot be output.
- *2 Refer to "Origin Setting of Digimatic Indicators" on page



SPECIFICATIONS

Order No. (mm) (mm) MPEε*1 Hysteresis MPEH Repeatability MPER force MPL supply (normal use)*2 543.310R-10 12.7 0.001/0.01 0.003 0.002 0.002 1.5 or less CR2032 Approx 1 year 1	Metric SO/JIS type ASME/ANS										GD type
543-310B-10 12.7 0.001/0.01 0.003 0.002 0.002 1.5 or less CR2032 Approx. 1 year		Order No.	, ,			Hysteresis	Repeatability	force MPL			Net mass (g)
(selectable)		543-310B-10	12.7	0.001/0.01 (selectable)	0.003	0.002	0.002	1.5 or less	CR2032 ×1 pc.	Approx. 1 year	170

Inch/Metr	ic _								
			Maxim	Maximum permissible error			D	Dattan, life	Net mass
Order N	o. Range	Resolution	MPE _E *1	Hysteresis MPE _H	Repeatability MPE _R	force MPL (N)	Power supply	Battery life (normal use)*2	
543-311B	-10 0.5 in/	0.00005/0.0001/ 0.0005 in,	±0.00010 in	0.00010 in	0.00010 in	1.5 or less	CR2032	Approx 1 year	170
543-312B	- 10 12.7 mm	0.001/0.01 mm (selectable)	/0.003 mm	/0.002 mm	/0.002 mm	1.5 01 1655	×1 pc.	Approx. 1 year	170

*1 Error of indication for the total measuring range

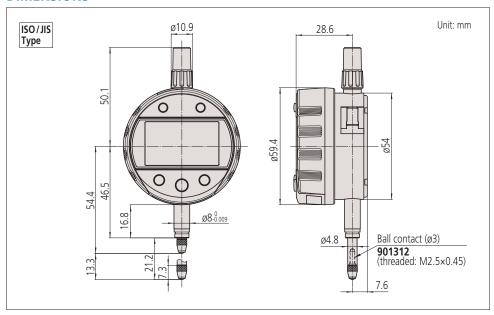
*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only. Note: Flat-back type only.

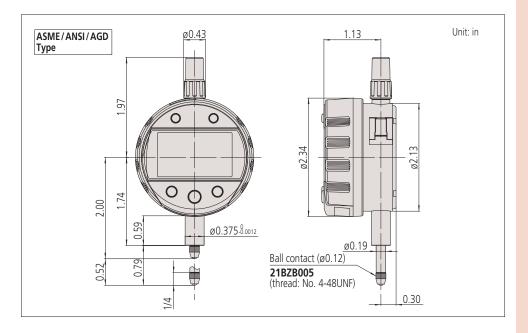






DIMENSIONS







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Functions

- Calculation $f(x') = Ax' + B + Cx'^{-1}$
- (x'=x+offset)
- Peak detection (MAX/MIN)Runout (MAX MIN) Hold

Note: Peak detection

- 1) Sampling rate: 10 readings/s
 2) Capturing speed: 10 µm/s (max.)
 Settings can be changed to:
 1) Sampling rate: 50 readings/s

- 2) Capturing speed: 50 μm/s (max.)
 Zero-setting (INC system)
 Preset (ABS system)

- Tolerance judgment (3 pairs of ABS, INC memory function)
- Analog bar resolution selectable Key lock
- Display hold (when no external device is connected)
 Data output
 External PC setting input

- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display
- Resolution switching*

Resolution (mm)						
0.0002	0.005	0.1				
0.0005	0.01	0.2				
0.001	0.02	0.5				
0.002	0.05	1				

Resolution (in)						
0.00001	0.0002	0.005				
0.00002	0.0005	0.01				
0.00005	0.001	0.02				
0.0001	0.002	0.05				

* Since the calculation resolution is one micrometer (0.001 mm), using sub-micrometer resolution settings may result in the 4th-place digit being unreliable, particularly when B is set to a very low value and C=0. It does not change at all with certain combinations of calculation coefficient (for example, A=1, B=C=0). The 3rd-place digit representing micrometers (if displayed) is always

Optional Accessories

• Lifting

Lifting lever 21EZA198 Lifting knob **21EZA105**• SPC Cable:

905338 (1 m) 905409 (2 m)

- USB Input Tool Direct (2 m): 06AFM380F

• Input Tool Series
IT-020U (USB Keyboard Signal Conversion Type): 264-020

IT-007R (RS-232C Communication Conversion Type): 264-007

Connecting Cables for U-WAVE-T (160 mm): 02AZD790F

For foot switch: 02AZE140F

- Digimatic Mini-Processor DP-1VA LOGGER: 264-505
- Parameter setup kit: 21EZA313

Note: Parameter setting software (can be downloaded for free from the Mitutoyo website) is also required.

ABSOLUTE Digimatic Indicator ID-C SERIES 543 — Calculation Type

- Calculation function operates on spindle displacement.
 - Entering the appropriate formula factors for a fixture dedicated to the application enables direct measurement readout, thereby eliminating any need for the conversion tables previously needed for those applications where fixtures are typically used.
- Five buttons, status icons, and clear button indications allow for easy operation of a wide variety of functions.
- Wide LCD and new analog bar graph are now standard on all models.
- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)
 - * Refer to "Origin Setting of Digimatic Indicators" on page



SPECIFICATIONS

	Metric						ISO/JIS	type	ASME/ANSI/A	GD type
		Range	Decolution	Maximum permissible error*1 (mm)		Measuring force		Dattan, life	Not moss	
	Order No.	(mm)	Resolution (selectable)	MPE _E *2	Hysteresis MPEн	Repeatability MPE _R	MPL (N)	Power supply	Battery life (normal use)*4	Net mass (g)
ĺ	543-340B-10	12.7	12 steps*4	0.003	0.002	0.002	1.5 or less		Approx. 1 year	170
	543-590B-10	25.4					1.8 or less*3	CR2032×1 pc.		190
	543-595B-10	50.8		0.006			2.3 or less*3			260

Inch/Metric

men/ weare									
		Desclution	Maximum		n permissible error*1			Dotton, life	Not mass
Order No.	Range	Resolution (selectable)	MPE _E *2	Hysteresis MPE _H	Repeatability MPE _R	Measuring force MPL (N)	Power supply	Battery life (normal use)*4	Net mass (g)
543-341B-10	0.5 in					1.5 or less			170
543-342B-10	/12.7 mm		±0.0001 in /0.003 mm	0.0001 in /0.002 mm	0.0001 in /0.002 mm	1.5 01 1633	- '	Approx. 1 year	170
543-591B-10	1 in	12 steps*4				1.8 or less*3			190
543-592B-10	/25.4 mm	12 steps				1.0 01 1635			190
543-596B-10	2 in		±0.00025 in			2.3 or less*3			260
543-597B-10	/50.8 mm		/0.006 mm			2.3 Of less"			200

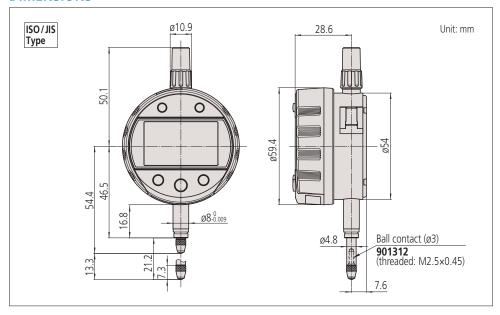
- *1 Valid for resolution set to 0.001 mm/0.00005 in and coefficients A=1, B=0 and C=0.
- *2 Error of indication for the total measuring range
 *3 Applies for a spindle orientation between the spindle pointing vertically downward to the spindle horizontal.
- *4 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only. Note: Flat-back type only.

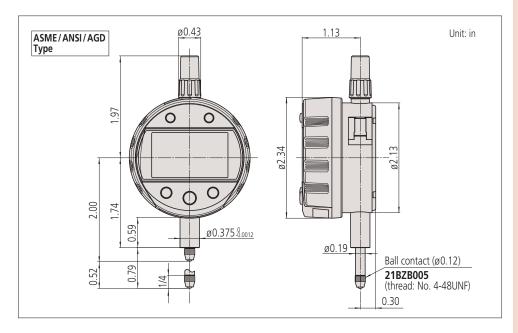






DIMENSIONS





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Mitutoyo

Mitutovo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without not

Typical applications









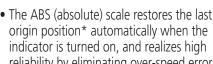
Examples	Examples of measuring various features								
Item		D=Countersink di	iameter/Groove width	; H=Countersink dep	th/Groove depth	R=Outside radius	of round object	R=Inside radius of round object	R=Outside radius of round object
Fixture type*1									
Contact point		Cone	Ball		Cone			_	
Measuring method x: Spindle displacement			Ball Ball Ball Ball Ball Ball Ball Ball		e e e e e e e e e e e e e e e e e e e		21 21		D D D D D D D D D D D D D D D D D D D
Calculation		D=Ax	D=Ax+B	H=Ax+B	D=Ax	R=Ax	R=Ax-	+B+Cx ⁻¹	$R=A(x+d)+B+C(x+d)^{-1}$
	$\begin{vmatrix} A & -2\tan\frac{\theta}{2} & -2\tan\frac{\theta}{2} & -1 \end{vmatrix}$		$-2 tan \frac{\theta}{2}$	$-\frac{\sin\frac{\theta}{2}}{1-\sin\frac{\theta}{2}}$	1/2	$-\frac{1}{2}$	1/2		
Coefficient values	В	0	$2r\left(\frac{1}{\cos\frac{\theta}{2}}-\tan\frac{\theta}{2}\right)$	$\left r \left(\frac{1}{\sin \frac{\theta}{2}} - 1 \right) - \frac{d}{2 \tan \frac{\theta}{2}} \right $	0	0	-r	r	- <i>r</i>
	С	0	0	0	0	0	$\frac{L^2}{2}$	$-\frac{L^2}{2}$	<u>L</u> ²
Origin offset value (function ON/OFF)	d	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)	d (ON)
ORIGIN-set posi (x=0 position)	tion								
Displayed measurer value at ORIGIN- set position (Value displayed when x=		0	Value of coefficient B	0	0	0	Err 30* ² (Overflow error of Display value)		Depends on value of d



^{*1} A dedicated fixture for a workpiece can be made to order.
*2 The error is cleared when the measured value returns to the displayable range as a result of moving the spindle.

ABSOLUTE Digimatic Indicator ID-C SERIES 543 — Signal Output Function Type

- Enables GO/NG judgment to be output to external equipment for a measurement result against the peak values set. Solid-state switching provides high reliability by avoiding metallic switch contacts.
- The signal can be output to an external device such as a sequencer. The GO/NG judgment result is also indicated by the green/red LED and the signs on LCD.
- A peak-detection function makes runout measurements easy.
- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Provided with a 4 m cable.
- External power supply required is 5-24 VDC/ 100 mA (max.).





- Dust-water protection level: IP54.
- * Refer to "Origin Setting of Digimatic Indicators" on page



SPECIFICATIONS

Metric					ISO/JIS ty	pe ASME	/ANSI/AGD type
Order No.	Range (mm)	Resolution (mm)		m permissible err Hysteresis MPEн	or (mm) Repeatability MPER	Measuring force MPL (N)	Net mass (g)
543-350-10 543-350B-10* ²	12.7	0.001/0.01 (selectable)	0.003	0.002	0.002	2.5 or less	295 285

Inch / Metric

men men -							
			Maxii	mum permissible	error	Measuring force	
Order No.	Range	Resolution	MPE _E *1	Hysteresis MPE _H	Repeatability MPE _R	MPL (N)	Net mass (g)
543-351-10		0.00005/0.0001/					295
543-351B-10*2	/12.7 mm	0.0005 in,	±0.00010 in	0.0001 in /0.002 mm	0.0001 in /0.002 mm	2.5 or less	285
543-352-10							295
543-352B-10*2							285

*1 Error of indication for the total measuring range

*2 Flat back

Note 1: LCD readout does not rotate.

Note 2: MAX/MIN holding: sample rate is 100 readings/s; max. rate of change of reading is 100 µm/s or less. Note 3: Standard contact point: **901312** (ISO/JIS type), **21BZB005** (ANSI/AGD type)





Functions

Signal output
(-NG/OK/+NG, N-ch open drain, logical invert is available)
Remote control (peak start preset/zero-set)
Peak detection (MAX/MIN)
Runout range measurement (MAX - MIN)

Zero-setting (INC system)
 Presetting (ABS system)
 Measuring direction switching
 Tolerance judgment (3 pairs of ABS, INC memory function)

Resolution switchingSimple calculation: f(x) =Ax

Key lock
 Calibration mode (Signal output in Digimatic code format)

· Error alarm display

Optional Accessories

Optional Accessories

• Lifting*

Lifting lever 21EZA198

Lifting lever 21EZA105

• Digimatic power supply unit: 21EZA345

To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for KC. No suffix is required for JIS/100VAC.

Used in the calibration mode when executing automatic inspection using i-Checker IC2000.

In such a case, purchase connecting cable 21EAA194 (1 m), or 21EAA190 (2 m).

Note: It can't be used as a power suppy when using in the normal mode.

normal mode.

Contact points for Mitutoyo's digimatic indicators.*2

Interchangeable backs for SERIES 2 models (Refer to page F-61 for details.)

*1 Dust-water protection is not guaranteed. *2 Refer to pages F-57 to F-60 for details.

Output signals and LCD display

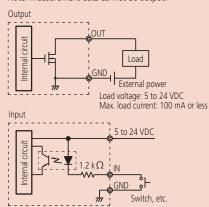
Wire	– NG	OK	+ NG	ABS data composition error
Orange (– NG)	Low	High	High	High
Green (OK)	High	Low	High	High
Brown (+ NG)	High	High	Low	High
LED	Red	Green	Red	Red flashing
LCD	4	0	₽	"x.xxE" indication

Note: Logical invert is available.

I/O Specifications

	Wire	Signal	1/0	Description	
	Black	– V (GND)	_	Connected to minus (-) terminal	
	Red	+ V	_	Power supply (5 to 24 VDC)	
	Orange Green	– NG		Tolerance judgment	
		OK	0	result output: Only the	
	Brown	+ NG	0	terminal corresponding to a judgment result is set to the low level.	
	Yellow	PRESET_RECALL ZERO	ı	External input terminal: If the relevant terminal is se	
	Blue	PEAK_START	Ī	to the low level, its signal becomes true.	
	Shield	FG	_	Connected to GND (Earth)	

Note: Measurement data cannot be output.

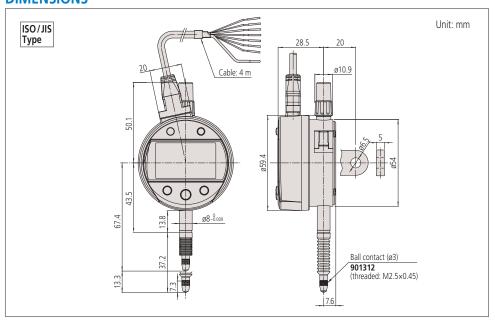


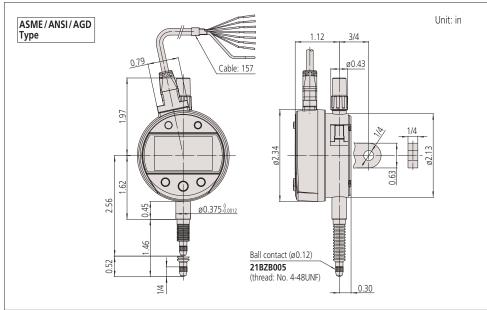
Input current: Max. 20 mA



F-17

DIMENSIONS







ABSOLUTE Digimatic Indicator ID-U SERIES 575 — Slim and Economical Design

- General-purpose slim indicator with a measuring range of 25.4 mm and a resolution of 0.01 mm.
- Cost-effective and user-friendly type with basic functions.
- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Battery life: approx. 20,000 hours in continuous use.
- Easy-to-read large LCD readout with a character height of 8 mm.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)
 - * Refer to "Origin Setting of Digimatic Indicators" on page F-25.



SPECIFICATIONS

Metric			ISO/JIS type ASME/ANSI/AGD tyl						
		Resolution (mm)	Maxim	Massuring force					
Order No.	Range (mm)		MPE _E *	Hysteresis MPEн	Repeatability MPE _R	Measuring force MPL (N)			
575-121	25.4	0.01	0.02	0.02	0.01	1.8 or less			

Inch/Metric															
			Max	Measuring force											
Order No.	Range	Resolution	MPE _E *	Hysteresis MPEн	Repeatability MPE _R	MPL (N)									
575-122	575-122 1 in/ 0.0005 in/ 575-123 25.4 mm 0.01 mm		±0.001 in/0.02 mm	0.001 in/	0.0005 in/	1.8 or less									
575-123			±0.001 III/ 0.02 IIIIII	0.02 mm	0.01 mm	1.0 01 1622									

F-19







Technical Data

- Display: 5-digit LCD, sign
- Battery: SR44 (1 pc.), 938882 for initial operational
- checks (standard accessory)

 Battery life: Approx. 20,000 hours of continuous use.
 Approx. 5 years under normal use.

 Note: It varies depending on use frequency and method. Please take the values as rough indications
- Lifting lever: **21EAA426** (standard accessory)

Function

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
 Error alarm display

Optional Accessories

- Spindle lifting cable (stroke: 10 mm): 21JZA295
 Contact points for Mitutoyo's digimatic indicators (Refer to pages F-57 to F-60 for details.)
- SPC Cable: 905338 (1 m) 905409 (2 m)
- USB Input Tool Direct (2 m): 06AFM380F

Note: Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument.
• Input Tool Series

IT-020U (USB Keyboard Signal Conversion Type):

IT-007R (RS-232C Communication Conversion Type):

264-007
• Connecting Cables for U-WAVE-T (160 mm): 02AZD790F

For foot switch: **02AZE140F**

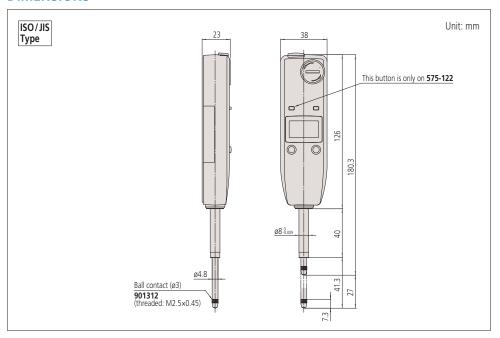
- Digimatic Mini-Processor DP-1VA LOGGER: 264-505
 Measuring stands

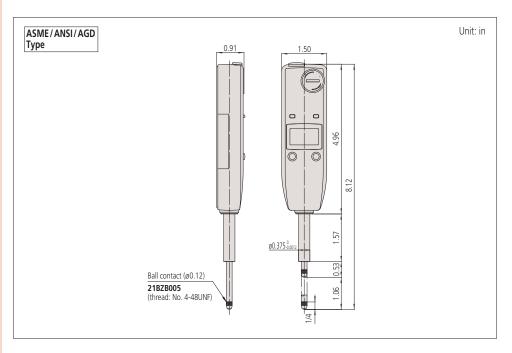
(Refer to pages F-84 to F-91 for details.)

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^{*} Error of indication for the total measuring range





F



Digimatic Indicator ID-H SERIES 543 — High Accuracy and High Functionality Type

- A top-level digital indicator that supports high accuracy and multi-functional measurement.
- Take advantage of its high accuracy backed up by 0.0005 mm/0.00002 inch inch resolution, remote control functionality via a handheld controller (or an RS-232C interface) and easy runout measurements with the well-established analog bar display.
- Functionality meets the needs of diverse measurement applications.

Tolerance judgment











Measuring maximum value, minimum value and runout (MAX - MIN)

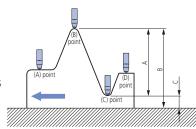
Maximum value/minimum value measurement







Example: Indicator traces between points <A> to <D> Difference (or Total Runout) is displayed as <A>. Dimensions (maximum value) and <C> (minimum value) can be retrieved from memory with a simple key sequence or using the remote control (optional).



- With the optional remote controller, operations such as zero-setting and presetting can be made without touching the indicator body, thereby avoiding disturbance to the set-up.
- An advanced, remote control system can be implemented with the built-in RS-232C interface and a PC.

• Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)



F-21



Remote controller (optional)

MeasurLink® ENABLED

Technical Data

- Display: 7-digit LCD, sign, and analog bar with 2-color backlight

 • Power supply: 5.9 V DC (via AC adapter) **06AGZ369***
- * To denote your AC power cable add the following suffixes to the order No.: JA for UL/CSA and PSE, D for CEE, DC for CCC, E for BS, K for KC, No suffix is required for JIS/100 V
- Positional detection method: Photoelectric-type reflection linear encoder
- Maximum response speed: 1000 mm/s
- Lifting lever: 21EAA426 (standard accessory)

Optional Accessories

- Remote controller: 21EZA099
- Lifting cable: 21JZA295 (stroke 30 mm) Lifting knob: 21EZA101
 • SPC Cable:
- 936937 (1 m)
- **965014** (2 m)
- USB Input Tool Direct (2 m): **06AFM380D** Input Tool Series IT-020U (USB Keyboard Signal Conversion Type): 264-020 IT-007R (RS-232C Communication Conversion Type):
- 264-007
 Connecting Cables for U-WAVE-T (160 mm): 02AZD790D
- For foot switch: **02AZE140D**
- RS-232C Connecting cable (2 m): 21EAA131
 Lug-on-center back:
- Lug-on-center back:
 101040 (ISO/JIS type)
 101306 (ASME/ANSI/AGD type)
 Contact points for Mitutoyo's digimatic indicators (Refer to pages F-57 to F-60 for details.)
 Digimatic Mini-Processor DP-1VA LOGGER: 264-505
- Granite comparator stands
- (Refer to page F-88 for details.)
 Comparator stands (Refer to page F-90 for details.)

Comparator stand





Lifting cable



Mitutoyo

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SPECIFICATIONS

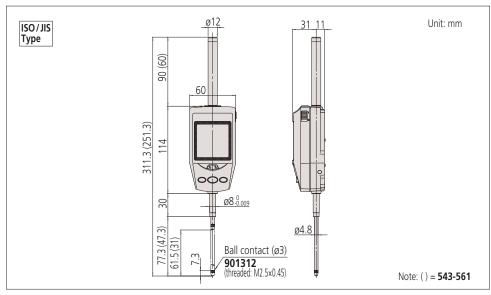
Metric

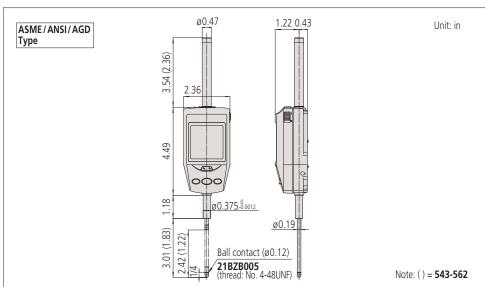
Metric							
	D	Resolution (mm)	Maximun	n permissible erroi	r (mm)	Manager faces	N=+
Order No.*1	Range (mm)		MPE _E *2	Hysteresis MPEн	Repeatability MPE _R	Measuring force MPL (N)	Net mass (g)
543-561	0.001		0.0015	0.0015		2.0 or less	290
543-563			0.0025	0.0025	0.001	2.5 or less	305

Inch/Metric					ISO/JIS ty	oe ASME/AI	NSI/AGD type
Order No.*1	Range	Resolution	Maxim MPE _E *2	ror Repeatability MPE _R	Measuring force MPL (N)	Net mass (g)	
543-562	43-562 1.2 in 0.00002/ 0.00005/ 0.0001 in,		±0.00006 in/ 0.0015 mm	0.00006 in/ 0.0015 mm	0.00004 in/	2.0 or less	300
543-564	2.4 in /60.9 mm	0.0005/ 0.001 mm (selectable)	±0.0001 in/ 0.0025 mm	0.0001 in/ 0.0025 mm	0.001 mm	2.5 or less	300

^{*1} To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, **No suffix** is required for JIS/100 V *2 Error of indication for the total measuring range

DIMENSIONS





Mitutoyo



Note 1: The indicator can output SPC (Digimatic) data consisting of up to 6 digits in full. If the data consists of 7 digits the first digit is not output (example: 123.4565 mm is output as 23.4565 mm).

Note 2: Regarding origin setting, refer to "Origin Setting of Digimatic Indicators" on page F-25.

Note 3: The orientation for use can be from vertical (contact point pointing downward) to horizontal (spindle in horizontal orientation).

High-performance ABS Digimatic Indicator ID-F SERIES 543 — with Back-lit LCD Screen

- Supports bidirectional communication between GO/±NG judgment function: If a judgment the ID-F and the computer, enabling data output to a computer and setting of various functions of **ID-F** from a computer.
- The face can be rotated 330° to maintain the ease of use and readability of the characters and the bar even when the ID-F is used horizontally or at an angle.



result shows an out of tolerance condition, the display backlighting changes from green to red.

Green indication for GO judgment Red indication for ±NG judgment





- An analog bar indicator has been integrated to make upper/lower limit and turnover point reading more comfortable.
- The ABS (absolute) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Easy-to-read large LCD readout with the height of the characters has been increased from 8.5 mm with the previous model to 11 mm (about 1.5 times as much).
- External power supply type: an AC adapter is a standard accessory. Does not require battery replacement.
- The maximum resolution is 0.5 μm (0.0005 mm). With a indication error corresponding to 0.0025 mm, this indicator can be used in high-precision applications.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page A-3)
- * Refer to "Origin Setting of Digimatic Indicators" on page

MeasurLink ENABLED





Technical Data

- Display: 7-digit LCD, sign, and analog bar with 2-color
- Dacklight
 Power supply: 5.9 V (via AC adapter) 06AGZ369*
 To denote your AC power cable add the following suffixes to the order No.: JA for UL/CSA and PSE, D for CEE, DC for CCC, E for BS, K for KC
- Lifting lever: 21EAA426 (standard accessory)

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX MIN)
 Renout range measurement (MAX MIN)
 Zero-setting (INC system)
 Presetting (ABS system)
 Measuring direction switching
 Tolerance judgment
 Resolution switching

- Resolution switching
- Simple calculation f(x) = Ax
- Analog resolution selection
 Data hold (when not connected to an external device)
- Function Lock
- Calibration schedule warningData output
- Display rotation (330°)
- Error alarm display

Optional Accessories

- Lifting knob
- 21EZA197 (25.4 mm/1 inch type)
- 21EZA200 (50.8 mm/2 inch type) Auxiliary spindle spring: 02ACA571 (25.4 mm/1 inch type)
- 02ACA773 (50.8 mm/2 inch type)
- 06AGL011 (1 m) 06AGL021 (2 m)
- USB Input Tool Direct (2 m): 06AGQ001F
- USB-ITPAK V3.0: 06AGR543
- Input Tool Series IT-020U (USB Keyboard Signal Conversion Type):
- IT-007R (RS-232C Communication Conversion Type):
- 264-007 Connecting Cables for U-WAVE-T (160 mm): 02AZG011
- For foot switch: **02AZG021**

- Contact points for Mitutoyo's digimatic indicators*
 Interchangeable backs for SERIES 2 models*
 Digimatic Mini-Processor **DP-1VA LOGGER**: **264-505**
- Measuring stands*3
 *1 Refer to pages F-57 to F-60 for details.
 *2 Refer to page F-61 for details.
- *3 Refer to pages F-84 to F-91 for details.

SPECIFICATIONS

Metric	-									
Order No.	Range (mm)	Resolution (mm)	Resolution switching (mm)	Maximum p	ermissible erro Hysteresis МРЕн	or MPE (mm) Repeatability MPE _R	Response speed	Measuring force MPL (N)	Power	Net mass (g)
543-851	25.4		0.0005/	0.0025 0.004	0.002	0.002	Unlimited	1.8 or less	AC	240
543-853	13-853 50.8	0.0005	0.001/					2.3 or less	adapter	330
543-857	50.8	1	0.01	0.003]			2.5 01 1855	(5.9 V)	330

Inch/Metric	L					ISO	/JIS type	ASME.	/ANSI/A	.GD type	
Order No.	Range	Resolution	Resolution switching	Maximun MPE _E *	n permissible Hysteresis MPE _H	Sheen I Islinniv					
543-852	1 in/ 25.4 mm		0.001 in	±0.0001 in/ 0.0025 mm	0.00008 in/ 0.002 mm	0.00008 in/ 0.002 mm		1.8 or less	AC adapter	240	
543-854	2 in/ 50.8 mm	0.00002 in/ 0.0005 mm		±0.00016 in/ 0.004 mm			Unlimited	2.3 or less		330	
543-858	2 in/ 50.8 mm		0.005/ 0.001/ 0.01 mm	±0.00012 in/ 0.003 mm				2.3 01 1622		330	

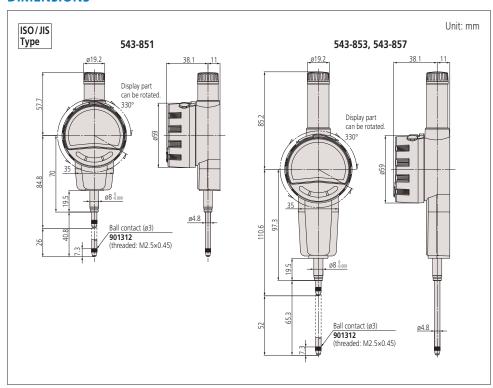
* Error of indication for the total measuring range (MPEE)

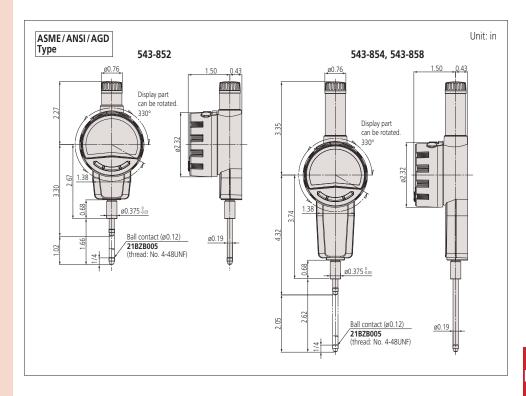
Note: Measures precisely Max., Min., and TIR (amplitude (Max - Min) values. (Peak detection speed: 500 times/s)



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DIMENSIONS







Supplemental information on Digimatic Indicators

Origin setting of Digimatic Indicators



Repeatability in the range of 0.2 mm from the lowest rest point is not guaranteed for Digimatic indicators. When setting the origin or presetting a specific value, be sure to lift the spindle at least 0.2 mm from the lowest rest

EC Counter SERIES 542 — Low-cost, Modular Type Display Unit

- –NG, OK and +NG tolerance judgment results can be displayed.
- Can be set to produce either tolerance judgment output or Digimatic output.
- Small size (96×48 mm) which conforms to DIN standards.



542-007

SPECIFICATIONS

Order No.		542-007*
Resolution () indicates max	ximum display range	0.01 mm (±9999.99)/0.0005 in (±99.9995 in)/0.001 in (±999.999 in) 0.001 mm (±9999.999)/0.00005 in (±9.99995 in)/0.0001 in (±99.999 in) [automatic setting by gage]
Tolerance judgme		LED display (3 steps: Amber, Green, Red)
External output	Tolerance judgment output	-NG, OK, +NG (open-collector)
(switching type)	Data output	Digimatic output
Control input		External PRESET, external HOLD
Operation temper	rature range	0 to 40 °C (RH 20 to 80%, no condensation)
Storage temperat	ure range	−10 to 50 °C (RH 20 to 80%, no condensation)
External dimension	ins	96 (W) ×48 (H) ×84.6 (D) mm
Power Supply		AC adapter: 12BAR954 AC cable: 12BAK729 (Japan), 12BAK730 (U.S.), 12BAK731 (EU), 12BAK734 (UK), 12BAK732 (China), 12BAK733 (Korea)
Standard Accesso	ries	AC adapter, AC cable, rubber feet
Mass		220 g

^{*} To denote your AC power cable add the following suffixes to the order No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, C and **No suffix** are required for PSE.

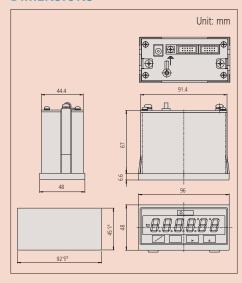
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Functions

- Preset Tolerance judgment (3 steps)

DIMENSIONS



Mitutoyo

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Feature icons

Icon	Feature description
90 0 10	Continuous scale
10 0 10	Balanced scale
?	Reverse reading type, Suitable for depth and step measurement.
n	One revolution type for easy and error-free reading
	Double scale spacing type, easy-on-the-eyes
3	Shockproof
63	Waterproof (IP63)
64	Waterproof (IP64)
5	With damper at top rest point
5	With damper at lowest rest point
	Jeweled bearing
STOP	Peak retaining
	Dustproof
	With coaxial revolution counter
T 90°	Back Plunger
	Adjustable hand

Note: Mitutoyo produces ASME-compatible products. Contact us for details.

E_F26_F66_DG_2022.indd 26

Dial Indicators

Mitutoyo's dial indicators have long been used by many of our customers. In full recognition of their needs, we have devoted ourselves to the research and development necessary to produce high-quality and high-accuracy dial indicators. Due to the recent re-acknowledgement of the importance of measurement technologies, the demands on dial indicators are many and varied: installation in measuring jigs, mounting in countless types of precision equipment, etc. We offer numerous models with various types of dial faces, measuring ranges, graduation styles and environmental resistance ratings. The stems, which ensure the fixture reliability, and the spindles, which are the basis of accuracy, have excellent resistance against harsh use thanks to the hardened stainless steel construction. 0.01 mm resolution dial indicators have a main gear made of stainless steel with high resistance to wear and deformation. 0.001 mm graduation dial indicators employ a sector gear made of a special alloy in order to further increase the resistance to wear. Many models employ an O-ring to ensure airtightness between the outer frame and the bezel in order to prevent water or oil penetration from the front.

Mitutoyo's dial indicators are manufactured and inspected according to JIS B 7503:2017. (Inspection orientation: vertical)

Important factors in choosing a dial indicator: the size (bezel diameter), resolution (graduation) and measuring range. Use the table on the right to help choose a suitable model for your application.



Parts of a dial indicator

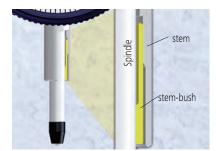


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FEATURES: A Series (SERIES 2, 3, 4)



- No through screw-holes on the frame for high oil- and dust-resistance. The bezel clamp (optional) can be attached either to the right or left side.
- Improved Impact- and oil-resistant materials are employed in the bezel. Easier reading is due to the improved shape of the crystal face



• Revolutionary stem-bush design for troublefree stem clamping (longer clamping range; maximum tightening torque at the clamping point with M5 screw: 150 N-cm).



The spindle lifting lever (optional: 21EZA198)
can be attached to either the right or left
side providing high operability and smooth
movement. This lever can be easily installed
and removed.



• Limit hand <optional> (1) can be moved without interfering with the bezel clamp <optional> (2).

• Application of anti-stain and anti-reflective coating improves scale visibility.



<Conventional model>



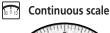
<New model>



SERIES 2 — Standard Type, 0.01 mm Graduation

- Standard 0.01 mm graduation dial gages having a bezel with an outside diameter of 57 mm.
- The bezel clamp and lifting lever (optional) can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- Watertight assembly of bezel and crystal as well as the use of an O-ring prevents water or oil penetration.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- The grand gear is made of stainless steel with high resistance to wear and deformation.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.







Graduation: 0.01 mm, Measuring range: 10 mm

With damper at top rest point

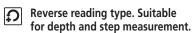
2046A-09 Shockproof





Graduation: 0.01 mm, Measuring range: 10 mm হিট্ট With damper at

top rest point





Graduation: 0.01 mm, Measuring range: 10 mm

2902A With damper at top rest point

Continuous scale



Graduation: 0.01 mm, Measuring range: 10 mm

With coaxial revolution counter

→ Jeweled bearing





Graduation: 0.01 mm, Measuring range: 5 mm

With damper at top rest point

2044A-09

With damper at top rest point

Shockproof





Graduation: 0.01 mm, Measuring range: 5 mm

With damper at top rest point

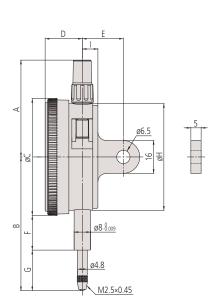
Mitutoyo

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DIMENSIONS

ISO/JIS Type



Order No.	А	В	С	D	Е	F	G	Н		Mas	ss (g)
Order No.	A	D		D	С	Г	l G	П		w/lug	Flat-back
2046A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2046A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2047A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2902A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2310A-10	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2044A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2044A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	147	138
2045A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136

Note: Refer to pages F-57 to F-60 for details of contact points.

Optional Accessories

• Limit hand (2 pcs.): 21AZB195





• Bezel clamp: 21AZB148



FEATURES

Metric		ı							
Orde	er No.	\$ 100 TO	10 10		5	(64)	(T)		
w/lug	Flat-back	90 0 10	10 0 10	+1	5				L
2046A	2046AB	1					~		
2046A-09	2046AB-09	1			~				
2047A	2047AB		~				~		
2902A	2902AB			~			~		
2310A-10	2310AB-10	~						~	~
2044A	2044AB	~					~		
2044A-09	2044AB-09	~			~				
2045A	2045AB		~				~		

SPECIFICATIONS

ISO/JIS type Metric Maximum permissible error (MPE) (μm) Order No. Range Measuring (range/rev) (mm) Indication error Repeatw/lug Hysteresis reading force (N) ability 1/10 Rev | 1/2 Rev | 1 Rev 2046A 2046AB 0.01 9 10 13 ±0-100 1.4 or less 2046A-09 2046AB-09 0.01 10 (1) 15 ±0-100 1.4 or less 10 2047A 2047AB 0.01 10 (1) 9 13 0-50-0 1.4 or less 10 2902A 2902AB 0.01 10 (1) 9 10 13 100-0 1.4 or less 15 2310A-10 2310AB-10 0.01 10 (1) 9 10 ±0-100 1.4 or less 2044A 2044AB 0.01 5 (1) 9 10 12 ±0-100 1.4 or less ±0-100 1.4 or less 0-50-0 1.4 or less 2044A-09 2044AB-09 5 (1) 9 12 0.01 10 5 (1) 9 12 2045AB 10 2045A

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

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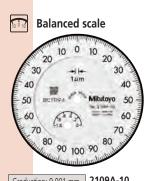
Mitutovo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice



SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation

- Standard 0.001 mm and 0.005 mm graduation dial indicators having a bezel with an outside diameter of 57 mm.
- The bezel clamp and lifting lever (optional) can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- Watertight assembly of bezel and crystal as well as the use of an O-ring prevents water or oil penetration.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- A special alloy is used for the sector gears to provide improved wear resistance.
- The indicator uses jeweled bearings, providing excellent indication sensitivity and
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



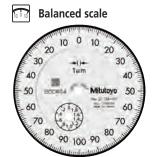






Graduation: 0.001 mm, **2110A-10** Measuring range: 1 mm Double scale spacing

Shockproof



Graduation: 0.001 mm, **2113A-10** Measuring range: 2 mm Shockproof **∅** Jeweled bearing

Continuous scale



Balanced scale

Graduation: 0.001 mm, Measuring range: 5 mm

2119A-10

Graduation: 0.005 mm, Measuring range: 5 mm

Graduation: 0.005 mm, Measuring range: 5 mm

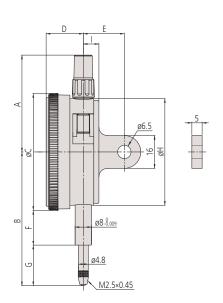
Continuous scale





DIMENSIONS

ISO/JIS Type



Order No.	А	В	С	D	E	F	G	Н	I	Mas w/lug	s (g) Flat-back
2109A-10	47.2	60.5	57	18.1	20	16.9	15.1	52	7.6	148	139
2110A-10	47.2	66.5	57	18.1	20	16.9	21.1	52	7.6	149	140
2113A-10	47.2	61	57	18.1	20	16.9	15.6	52	7.6	148	139
2118A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2119A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2124A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137

Optional Accessories

• Limit hand (2 pcs.): 21AZB195





• Bezel clamp: 21AZB148



FEATURES

Metric Order No. w/lug Flat-back 2109A-10 2109AB-10 2110A-10 2110AB-10 2113A-10 2113AB-10 2118A-10 2118AB-10 2119A-10 2119AB-10 2124A-10 2124AB-10

Note: Refer to pages F-57 to F-60 for details of contact points.

SPECIFICATIONS

Me	Metric ISO/JIS type												
	Orde	er No.	Caralination	Range		Maximum	permissil	ole error (I	MPE) (µm))	D:-I	Managaria	
14	//lug	Flat-back	Graduation (mm)	(range/rev)		Indication	on error		Hysteresis	Repeat-	Dial reading	Measuring force (N)	
VV	// lug	Hat-back	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	TOICE (IV)	
210	9A-10	2109AB-10	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	1.5 or less	
211	0A-10	2110AB-10	0.001	1 (0.1)	2	3	4	5	2	0.5	±0-100	1.8 or less	
211	3A-10	2113AB-10	0.001	2 (0.2)	2	4	5	7	2	0.5	0-100-0	1.5 or less	
211	8A-10	2118AB-10	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-100	1.5 or less	
211	9A-10	2119AB-10	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-0	1.5 or less	
212	4A-10	2124AB-10	0.005	5 (0.5)	5	8	9	12	3	3	±0-50	1.5 or less	

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Mitutoyo

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SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

- Water-proof type dial indicators having a bezel with an outside diameter of 57 mm.
- O-rings and rubber bellows are used to prevent water and oil penetration.
- The bezel clamp can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.







top rest point

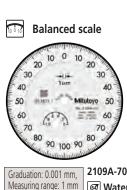


Graduation: 0.01 mm, Measuring range: 5 mm

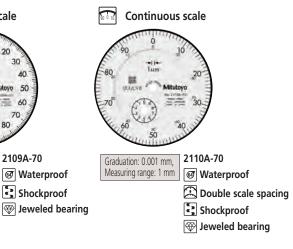
2044A-60 Waterproof

With damper at top rest point









Mitutoyo

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DIMENSIONS

Order No.	٨	D	_	D	Е	С	_	Ш	1	Mas	ss (g)
Order No.	А	D	C	U	С	Г	G G	П		w/lug	Flat-back
2046A-60	47.2	74.7	57	18.1	20	12.3	33.9	52	7.6	147	138
2044A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	147	138
2109A-70	47.2	65.3	57	18.1	20	12.3	24.5	52	7.6	149	140
2110A-70	47.2	67.5	57	18.1	20	12.3	26.7	52	7.6	150	141

M2.5×0.45

Note: Refer to pages F-57 to F-60 for details of contact points.

Optional Accessories

• Limit hand (2 pcs.): 21AZB195





• Bezel clamp: **21AZB148** (for metric type) **21RZA065** (for inch type)



21AZB148

FEATURES

Metric		ı						
Orde	r No.			E	(64)	(T)	\square	
w/lug	Flat-back	90 ⁰ 10	10 0 10	5	(m)			لضا
2046A-60	2046AB-60	~			~	~		
2044A-60	2044AB-60	~			~	~		
2109A-70	2109AB-70		~	~	~		~	
2110A-70	2110AB-70	~		~	~		~	~

SPECIFICATIONS

Metric											ISO/JIS type
Ord	er No.	C	Range		Maximum	permissil	ole error (I	MPE) (µm))	D:-I	Manageria
w/lug	Flat-back	Graduation (mm)	(range/rev)		Indicati	tion error		Hysteresis Repea		Dial reading	Measuring force (N)
wriug	Tiat-back	(11111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	10100 (14)
2046A-60	2046AB-60	0.01	10 (1)	5	9	10	13	3	3	±0-100	2.5 or less
2044A-60	2044AB-60	0.01	5 (1)	5	9	10	12	3	3	±0-100	2.5 or less
2109A-70	2109AB-70	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	2.0 or less
2110A-70	2110AB-70	0.001	1 (0.1)	2	3	4	5	2	0.5	±0-100	2.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.



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SERIES 2 — Standard Type, Inch Reading

SPECIFICATIONS

Inch								ANSI/AGD type
Orde	er No.	Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
2414A	2414AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
2415A	2415AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
2914A	2914AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	100-0	1.8 or less
2506A	2506AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	±0-50	1.8 or less
2507A	2507AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2514A	2514AB	0.0005	0.5 (0.05)	±0.0005/±0.0005/±0.0015	0.00016	±0.0001	±0-50	1.8 or less
2922A	2922AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2356A-10	2356AB-10	0.0001	0.25 (0.01)	±0.0002/±0.0002/±0.0003/±0.0004 (First 20rev)/±0.0005 (Over 20rev)	0.0001	±0.00003	0-10	2.0 or less
2358A-10	2358AB-10	0.0001	0.5 (0.01)	±0.0002/±0.0002/±0.0003/±0.0004 (First 20rev)/±0.0008 (Over 20rev)	0.00015	±0.00003	0-10	2.0 or less
2802A-10	2802AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	2.0 or less
2803A-10	2803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-5-0	2.0 or less
2804A-10	2804AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-10	2.0 or less
2805A-10	2805AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less
2905A-10	2905AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	10-0	2.0 or less
2923A-10	2923AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

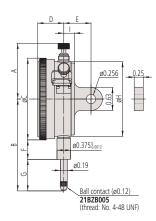
FEATURES

Inch							
Orde	er No.						ন্দো
w/lug	Flat-back	3	Ð		90 0 10	10 0 10	2
2414A	2414AB				~		~
2415A	2415AB					~	~
2914A	2914AB		~				~
2506A	2506AB				~		~
2507A	2507AB					~	~
2514A	2514AB				~		~
2922A	2922AB					~	~
2356A-10	2356AB-10			~	~		~
2358A-10	2358AB-10			~	~		~
2802A-10	2802AB-10	~		~	~		
2803A-10	2803AB-10	~		~		~	
2804A-10	2804AB-10	~		~	~		
2805A-10	2805AB-10	~		~		~	
2905A-10	2905AB-10	~	~	~			
2923A-10	2923AB-10	~		~		~	

Mitutoyo

DIMENSIONS

ANSI/AGD Type



Unit: in

Order No.	Α	В	С	D	E	F	G	н	1	Mas	ss (g)
Order No.	А	D	C	U		Г	U U	П		w/lug	Flat-back
2414A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2415A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2914A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2506A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2507A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2514A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2922A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2356A-10	1.86	2.25	2.24	0.71	3/4	0.54	0.59	2.05	0.30	163	138
2358A-10	1.53	2.50	2.24	0.71	3/4	0.54	0.85	2.05	0.30	164	139
2802A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2803A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2804A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2805A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2905A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139
2923A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139

F



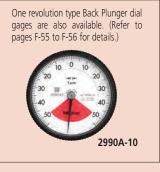


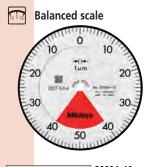
SERIES 2 — Standard One Revolution Type for Error-free Reading

- This series has been developed to eliminate the possibility of reading errors due to miscounting multiple revolutions.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused
- The bezel clamp and lifting lever (optional) can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The dead zone in red indicates "accuracy not guaranteed".







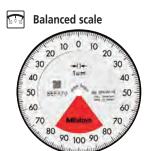






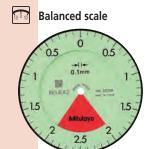


- One revolution
- **Shockproof → Jeweled bearing**
- 2900A-72 One revolution
- Shockproof
- Dustproof **→ Jeweled bearing**

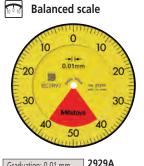




- One revolution
 - Shockproof
- **→ Jeweled bearing**







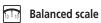






- One revolution Shockproof
- Dustproof

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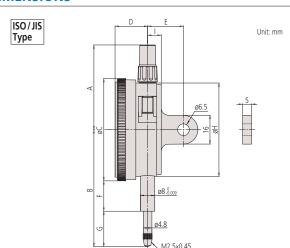


- 2959A One revolution
 - Shockproof

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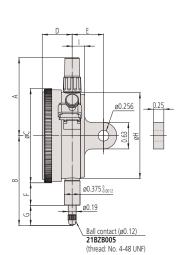
DIMENSIONS



Order No.	A	В	_	D	Е	F	G	Н	1	Mas	
Order No.	_ A	В	C	D	L	- 1	u	- 11		w/lug	Flat-back
2928A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A-62	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2959A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2900A-10	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2900A-72	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2901A-10	47.2	66.1	57	18.1	20	16.9	20.7	52	7.6	149	140

Note: Refer to pages F-57 to F-60 for details of contact points.

ANSI/AGD Type



Order No.	А	В	С	D	Е	F	G	Н	-1	Mas w/lug	s (g) Flat-back
2909A-62	1.86	2.04	2.24	0.71	3/4	0.54	0.39	2.05	0.30	163	138
2910A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	164	139

FEATURES

	Metric		l .					
	Orde	er No.	10 0 10		5	64		
	w/lug	Flat-back	To 0 10		<u> </u>	(m)		
2	928A	2928AB	~	~	/			
2	929A	2929AB	~	~	~			
2	929A-62	2929AB-62	~	~	~		~	
2	959A	2959AB	~	~	~			
2	900A-10	2900AB-10	~	~	~			~
2	900A-72	2900AB-72	~	~	~		~	~
2	901A-10	2901AB-10	~	~	1			~

Inch						
Ord	er No.			5		
w/lug	Flat-back	10 0 10		5		
2909A-62	2909AB-62	~	~	~	~	
2910A-10	2910AB-10	~	~	~		~

SPECIFICATIONS

SPECIFI	CATION	13									1100 / 110 /
Metric											IISO/JIS type
Orde	er No.	Graduation	Range	М	aximum	permis	sible error	(MPE) (µr	n)	Dial	Managurina
w/lug	w/lug Flat-back (mm) (range)				Indication	on error		Hysteresis	Repeat-	Dial reading	Measuring force (N)
wriug	Hat-back	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	TOTCC (IV)	
2928A	2928AB	0.1	4 (5)	20	_	_	40	20	20	2-0-2	1.4 or less
2929A	2929AB	0.01	0.8 (1)	5	_	_	8	3	3	40-0-40	1.4 or less
2929A-62	2929AB-62	0.01	0.8 (1)	5	_	_	8	3	3	40-0-40	2.0 or less
2959A	2959AB	0.01	1.6 (2)	5	_	_	10	3	3	80-0-80	1.4 or less
2900A-10	2900AB-10	0.001	0.08 (0.1)	2	_	_	3	2	0.5	40-0-40	1.5 or less
2900A-72	2900AB-72	0.001	0.08 (0.1)	2	_	_	3	2	0.5	40-0-40	2.0 or less
2901A-10	2901AB-10	0.001	0.16 (0.2)	2	_	_	4	2	0.5	80-0-80	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch

Order No.		Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
2909A-62	2909AB-62	0.0005	0.04/0.05	±0.0005/—/—	0.00016	±0.0001	20-0-20	2.5 or less
2910A-10	2910AB-10	0.0001	0.008/0.01	±0.0001/—/—	0.0001	±0.00003	4-0-4	1.8 or less
Note: Completed products inspection is performed in the vertical erion tation (contact point downward) and the stated accuracy is								

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Optional Accessories

• Limit hand (2 pcs.): 21AZB195





ANSI/AGD type

• Bezel clamp: **21AZB148** (for metric type) **21RZA065** (for inch type)



21AZB148

Mitutoyo

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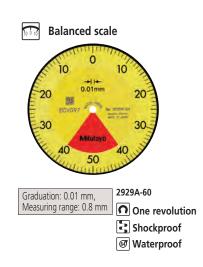




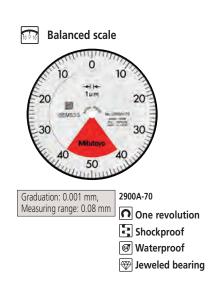
SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type

- This series has been developed to eliminate the possibility of reading errors due to miscounting multiple revolutions.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The bezel clamp and lifting lever (optional) can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The dead zone in red indicates "accuracy not guaranteed".









Mitutoyo

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DIMENSIONS

Type

D

E

Contact point a3

902.119 (29005-70)
(threaded: M2.5v0.45)

ANSI/AGD Type

D
E

00.256

0.25

00.375 \(\frac{3}{2} \)

21BZB005

(thread: No. 4-48 UNF)

Order No.	А	В	С	D	Е	F	G	Н	ı	Mas w/lug	Flat-
2929A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	146	137
2900A-70	47.2	67	57	18.1	20	12.3	26.2	52	7.6	150	141

Note: Refer to pages F-57 to F-60 for details of contact points.

 Order No.
 A
 B
 C
 D
 E
 F
 G
 H
 I
 Mass (g) w/lug back

 2910A-72
 1.86
 2.02
 2.24
 0.71
 3/4
 0.54
 0.36
 2.05
 0.30
 150
 141

Note: Refer to pages F-57 to F-60 for details of contact points.

FEATURES

Metric		ı					
Orde	Order No.			S		IIΛ	
w/lug	Flat-back	10 0 10		5			
2929A-60	2929AB-60	~	~	~	~		
2900A-70	2900AB-70	~	~	~	~		~

SPECIFICATIONS

Metric													
	Order No.		Craduation	Range	l l	/laximum	permissib	le error (MPE) (µm	1)	Dial	Manaurina	
	w/lug	Flat-back	Graduation (mm)	(range/rev)		Indicatio	dication error Hysteresis				Dial reading	Measuring force (N)	
	w/iug	I lat-back	(11111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiyateresis	ability	reading	TOTCC (IV)	
	2929A-60	2929AB-60	0.01	0.8 (1)	5	_	_	8	3	3	40-0-40	2.0 or less	
	2900A-70	2900AB-70	0.001	0.08 (0.1)	2	_	_	3	2	0.5	40-0-40	2.0 or less	

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch						
Ord	er No.			5	1971	
w/lug	Flat-back	10 0 10		5		
2910A-72	2910AB-72	~	~	~	~	V

Inch								ISI/AGD type
Orde	er No.	Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
2910A-72	2910AB-72	0.0001	0.008/0.01	±0.0001/—/—	0.0001	±0.00003	4-0-4	2.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Optional Accessories

• Limit hand (2 pcs.): 21AZB195





Bezel clamp: 21AZB148 (for metric type)
 21RZA065 (for inch type)



21AZB148

Mitutoyo

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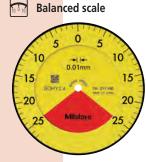
Mitutovo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice

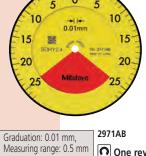


SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

- This series has been developed to eliminate the possibility of reading errors due to miscounting multiple revolutions.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- Lightweight type (70 g).
- The dead zone in red indicates "accuracy not guaranteed".



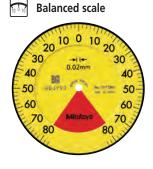






Balanced scale



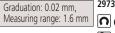




Dustproof







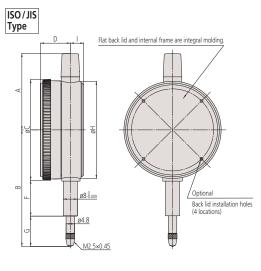


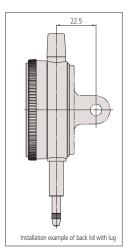
- Shockproof
- Dustproof

Dustproof

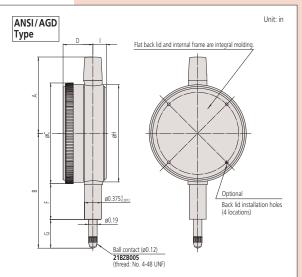


DIMENSIONS





Unit: mm



Note 1: When installing an optional back (refer to page F-61 for details) 4 retaining screws must also be obtained (**546666**: Self-tapping screw only for plastic). Do not apply a tightening torque of more than 20 N-cm in order to avoid stripping the screw threads.

Note 2: An optional lifting lever, release or bezel clamp cannot be installed.

Metric

Order No.	А	В	С	D	F	G	Н	I	Mass (g)
2971AB	43.2	65.6	57	16.9	20.3	16.8	55	7.6	
2972AB	43.2	66	57	16.9	20.3	17.2	55	7.6	70
2973AB	43.2	66.3	57	16.9	20.3	17.5	55	7.6	

Inch	ı								
Order No.	А	В	С	D	F	G	Н	I	Mass (g)
2976AB	1.70	2.55	2.24	0.67	0.80	0.63	2.17	0.30	
2977AB	1.70	2.56	2.24	0.67	0.80	0.64	2.17	0.30	70
2978AB	1.70	2.57	2.24	0.67	0.80	0.65	2.17	0.30	

Note: Refer to pages F-57 to F-60 for details of contact points.

FEATURES

Metric					
Orde	r No.				1000
w/lug	Flat-back	10 º 10		5	
_	2971AB	~	~	~	~
_	2972AB	1	~	~	~
_	2973AB	/	V	~	~

SPECIFICATIONS

į	Metric	CATION										ISO/JIS type
	Graduation Range						permis	sible error	(MPE) (µr	n)	-:-	Massaudas
Ī	w/lug Flat-back (mm) (range/rev)					Indication error Hysteresis Repeat-					Dial reading	Measuring force (N)
	wriug	Hat-back	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	TOICE (IV)
	_	2971AB	0.01	0.5 (0.7)	5	_	_	8	3	3	25-0-25	1.4 or less
	_	2972AB	0.01	1 (1.4)	5	_	_	8	3	3	50-0-50	1.4 or less
	_	2973AB	0.02	1.6 (2)	8	_	_	16	6	5	80-0-80	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch					
Orde	r No.				[:X]
w/lug	Flat-back	10 º 10		5	
_	2976AB	V	~	~	~
_	2977AB	1	~	~	~
_	2978AB	V	~	~	~

Inch							AI	NSI/AGD type
Orde	er No.	Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
_	2976AB	0.0005	0.02 (0.028)	±0.0005/—/—	0.00016	±0.0001	10-0-10	1.4 or less
_	2977AB	0.0005	0.04 (0.055)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
_	2978AB	0.001	0.06 (0.079)	±0.001/—/—	0.0002	±0.0002	30-0-30	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Optional Accessory

• Limit hand (2 pcs.): 21AZB195







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SERIES 2 — Long Stroke Type

- Long stroke dial indicators with a ø57 mm bezel.
- Watertight assembly of bezel and crystal as well as the use of an O-ring prevents water or oil penetration.
- The stem and the spindle are made of highstrength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is employed.
- The grand gear is made of stainless steel with high resistance to wear and deformation.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The bezel clamp and lifting lever* (optional) can be attached to either the right or left side. These parts can be easily installed and removed without any tools.
- * These cannot be used on water-proof models and models with a measuring range of 30 mm.







Graduation: 0.01 mm,

2050A

With damper at Measuring range: 20 mm lowest rest point

2050A-19

Shockproof

With damper at

→ Jeweled bearing

lowest rest point 2050A-60

Continuous scale



Graduation: 0.01 mm, Measuring range: 30 mm With damper at 2052A

lowest rest point 2052A-19

Shockproof

→ Jeweled bearing With damper at

lowest rest point

Continuous scale

Graduation: 0.01 mm, Measuring range: 30 mm

2330A-10 With coaxial revolution counter

With damper at lowest rest point

→ Jeweled bearing



E_F26_F66_DG_2022.indd 42

Continuous scale



Graduation: 0.01 mm, With coaxial Measuring range: 20 mm revolution

2320A-10

counter 🗓 With damper at lowest rest point **→ Jeweled bearing**

Reverse reading



Graduation: 0.01 mm, Measuring range: 30 mm With damper at

lowest rest point

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Mitutoyo

Optional Accessories

- Limit hand (2 pcs.): 21AZB195
 Bezel clamp: 21AZB148 (for metric type) 21RZA065 (for inch type) 21RZA067 (for 2424A(B)-19)

FEATURES

No.		$\overline{\mathbb{R}}$		5	a		$\overline{\mathbb{M}}$	
Flat-back	90 ⁰ 10	10 ⁰ 10	\	5	₩	2		•
2050AB	~					~		
2050AB-60	~				~			
2050AB-19	~			~		1	~	
2320AB-10	~					~	~	~
2052AB	~					~		
2052AB-19	~			~		~	~	
2330AB-10	~					~	~	~
2952AB			/			1		
	Flat-back 050AB 050AB-60 050AB-19 320AB-10 052AB 052AB-19 330AB-10	Flat-back 050AB 050AB-60 050AB-19 320AB-10 052AB 052AB-19 330AB-10	Flat-back 6 6 6 6 6 7 6 6 7 6 6 7 6 7 6 7 6 7 6	Flat-back 050AB 050AB-60 050AB-19 320AB-10 052AB 052AB-19 330AB-10	Flat-back	Flat-back 050AB 050AB-60 050AB-19 050AB-10 052AB 052AB-10 052AB-10 052AB-10 052AB-10 052AB-10 052AB-10 052AB-10 052AB-10	State Stat	Flat-back 050AB 050AB-60 050AB-19 050AB-10 052AB 052AB-19 052AB-10

SPECIFICATION	IS
Metric	
Order No	

Metric						ISO/JIS type					
Orde	er No.	Graduation	Range	l l	<i>M</i> aximum	permissi	ble error (MPE) (µm)	Dial	Massuring
w/lug	Flat-back	(mm)	(range/rev)		Indication			Hysteresis	Repeat-	reading	Measuring force (N)
writing	Tiat-back	` '	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiyateresis	ability	reading	TOTCC (IV)
2050A	2050AB	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2050A-60*	2050AB-60*	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.5 or less
2050A-19	2050AB-19	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2320A-10	2320AB-10	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2052A	2052AB	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2052A-19	2052AB-19	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2330A-10	2330AB-10	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2952A	2952AB	0.01	30 (1)	10	12	15	25	7	5	100-0	2.5 or less

* 2050A-60 and 2050AB-60 are water-proof types that use a rubber bellows to cover the spindle.

Note that the outer diameter of the bellows (ø9.5) is larger than that of the stem (ø8).

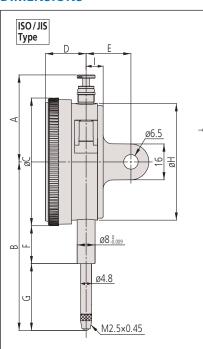
Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

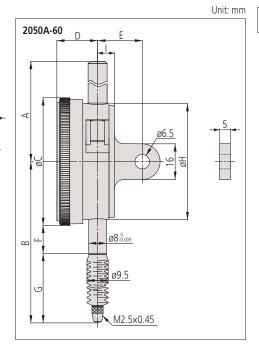
Inch -								
Orde	er No.			3	C.		T.	
w/lug	Flat-back	90 ⁰ 10	10 0 10	5	¥ /			
2416A	2416AB	~						
2416A-06	2416AB-06	~						
2416A-10	2416AB-10	~				~		
2417A	2417AB		~					
2424A-19	2424AB-19	~		~		~		~
2776A	2776AB	~						
2904A	2904AB				~			

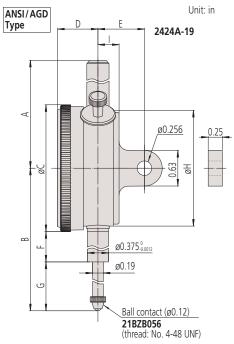
Inch							ANS	I/AGD type
Orde	er No.	Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
2416A	2416AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2416A-06	2416AB-06	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2416A-10	2416AB-10	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2417A	2417AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	0-50-0	1.8 or less
2424A-19	2424AB-19	0.001	2 (0.1)	±0.001/±0.001/±0.002/±0.003 (First 20 Rev)	0.00033	±0.0002	±0-100	2.5 or less
2776A	2776AB	0.0005	1 (0.05)	±0.0005/±0.0005/±0.0015/±0.002 (First 20 Rev)	0.0002	±0.0001	±0-50	2.5 or less
2904A	2904AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	100-0	1.8 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS







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Order No.	Α	В	_	D	F	F	G	Н		Mas	s (g)
Order No.	7	Ь		D	L	'	d	- ' '	<u> </u>	w/lug	Flat-back
2050A	38.8	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2050A-60	58.2	87.2	57	18.1	20	12.3	31.1	52	7.6	155	146
2050A-19	38.8	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2320A-10	38.8	75.2	57	18.1	20	16.9	29.8	52	7.6	150	141
2052A	38.8	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2052A-19	38.8	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2330A-10	38.8	88.7	57	18.1	20	16.9	43.3	52	7.6	153	144
2952A	38.8	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143

										VV/ IUG	TIGE DUCK
2416A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-06	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-10	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2417A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2424A-19	4.65	5.61	2.24	0.71	5/6	2.14	2.35	2.05	0.37	248	239
2776A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2904A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139

Note: Refer to pages F-57 to F-60 for details of contact points.

Order No. A B C D E F

Note: Refer to pages F-57 to F-60 for details of contact points.



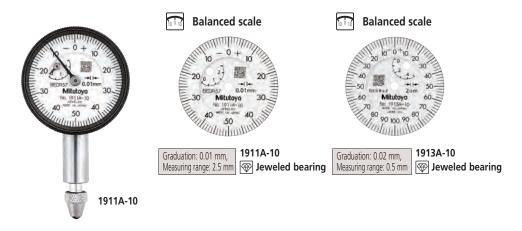
F-43

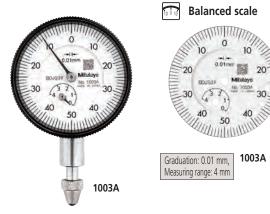
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SERIES 1 — Compact Type, Extra Small Diameter

• Compact dial indicators with bezel diameters of 31 or 36 mm for restricted-space applications in gaging jigs.



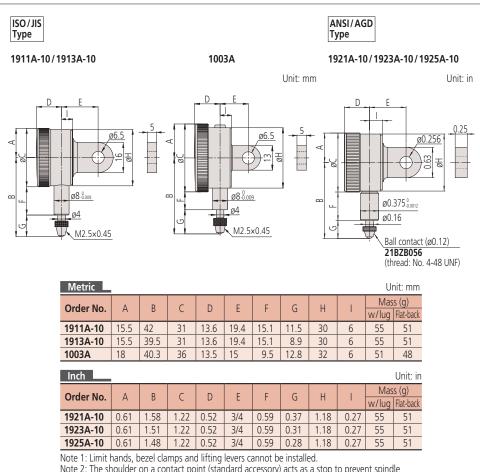


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DIMENSIONS



Note 2: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. For this reason, if you need to install an optional contact point with an outside diameter smaller than 7 mm, use a washer (with outside diameter of at least 7 mm, inside diameter of 3 mm, and thickness of approx. 0.5 mm) placed between the contact point and the spindle.

Note 3: Being fixed by only two retaining screws, the back cannot be rotated by 90° to change the orientation of the lug.

SPECIFICATIONS

	Metric ISO/JIS type														
	Order No.		Cuadinatian	Range	N	/Jaximum	permissib	ole error (N	ЛРЕ) (µm)		D:-I	Managina			
	w/lug	Flat-back	Graduation (mm)	(range/rev)		Indication	on error		Repeat-		Dial reading	Measuring force (N)			
	w/iug	FIGI-Dack	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	ability	reading	TOICE (IV)			
1	911A-10	1911AB-10	0.01	2.5 (1)	8	9	10	12	4	3	0-50-0	1.8 or less			
1	913A-10	1913AB-10	0.002	0.5 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.8 or less			
1	003A	1003AB	0.01	4 (1)	8	10	11	13	4	3	0-50-0	1.4 or less			

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

	Inch ANSI														
	Ord	er No.	Graduation	Range	Accuracy (in)		Repeat-	Dial	Measuring						
	w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)						
19	921A-10	1921AB-10	0.001	0.1 (0.04)	±0.001/±0.001/—	0.0002	±0.0002	0-20-0	1.8 or less						
19	923A-10	1923AB-10	0.0005	0.05 (0.02)	±0.0005/±0.005/—	0.00016	±0.0001	0-10-0	1.8 or less						
19	925A-10	1925AB-10	0.0001	0.025 (0.01)	±0.0002/±0.0002/—	0.0001	±0.00003	0-5-0	1.8 or less						

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

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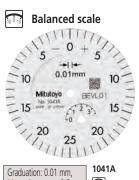
SERIES 1 — Compact Type, Small Diameter

- Compact dial indicators ideal for restricted-space applications in gaging jigs.
- Watertight assembly of bezel and crystal as well as the use of an O-ring prevents water or oil penetration.
- The stem and spindle are made of high-strength quench-hardened stainless steel suitable for heavy-duty use.
- A carbide contact point is used.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.

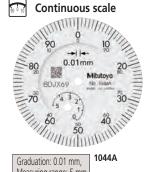








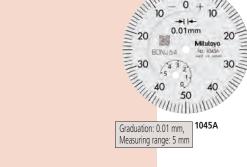


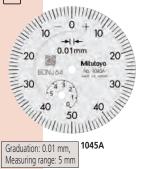


Measuring range: 5 mm 1044A-15

→ Jeweled bearing

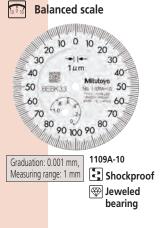












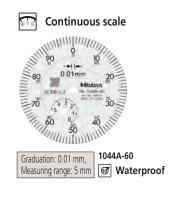




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Optional Accessories

• Limit hand (2 pcs.): 21AAB363



• Bezel clamp: 21RZA149

SPECIFICATIONS

Metric ISO/JIS type													
Orde	er No.	Craduation	Range	N	/laximum	permissib	le error (N	ЛРЕ) (µm)		Dial	Managuring		
w/lug	Flat-back	Graduation (mm)	(range/rev)		Indication				Repeat-	Dial reading	Measuring force (N)		
wriug	Tiat-back	(11111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	i iyateresia	ability	reading	10100 (11)		
1013A-10	1013AB-10	0.002	1 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.5 or less		
1040A	1040AB	0.01	3.5 (0.5)	8	10	11	13	4	3	±0-50	1.4 or less		
1041A	1041AB	0.01	3.5 (0.5)	8	10	11	13	4	3	0-25-0	1.4 or less		
1044A	1044AB	0.01	5 (1)	8	10	11	13	4	3	±0-100	1.4 or less		
1044A-15	1044AB-15	0.01	5 (1)	8	10	11	13	4	3	±0-100	0.4 or less*		
1044A-60	1044AB-60	0.01	5 (1)	8	10	11	13	4	3	±0-100	2.0 or less		
1045A	1045AB	0.01	5 (1)	8	10	11	13	4	3	0-50-0	1.4 or less		
1109A-10	1109AB-10	0.001	1 (0.2)	2.5	3.5	4.5	5	2	1	0-100-0	1.5 or less		
1124A	1124AB	0.005	3.5 (0.5)	6	9	10	12	3.5	3	±0-50	1.4 or less		

FEATURES

	Metric							
	Orde	er No.		10 0 10		3		63
	w/lug	Flat-back	90 0 10	10 0 10		<u> </u>		
ľ	1013A-10	1013AB-10		~		V	~	
	1040A	1040AB	V		~			
	1041A	1041AB		~	V			
	1044A	1044AB	~					
	1044A-15	1044AB-15	V				~	
	1044A-60	1044AB-60	~					~
	1045A	1045AB		~				
	1109A-10	1109AB-10		~		~	~	
	1124A	1124AB	~					

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

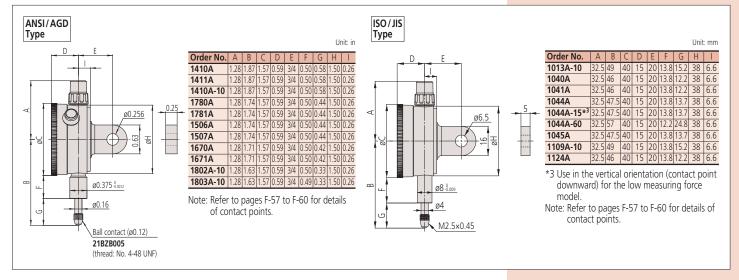
Inch ANSI/AGD ty														
	er No.	Graduation		Accuracy (in)		Repeat-	Dial	Measuring						
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)						
1410A	1410AB	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-100	1.4 or less						
1411A	1411AB	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-50-0	1.4 or less						
1410A-10	1410AB-10	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-100	1.4 or less						
1780A	1780AB	0.001	0.125 (0.05)	±0.001/±0.001/—	0.0002	±0.0002	0-50	1.4 or less						
1781A	1781AB	0.001	0.125 (0.05)	±0.001/±0.001/—	0.0002	±0.0002	0-25-0	1.4 or less						
1506A	1506AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-50	1.4 or less						
1507A	1507AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.4 or less						
1670A	1670AB	0.0005	0.1 (0.04)	±0.0005/±0.0005/—	0.00016	±0.0001	0-40	1.4 or less						
1671A	1671AB	0.0005	0.1 (0.04)	±0.0005/±0.0005/—	0.00016	±0.0001	0-20-0	1.4 or less						
1802A-10	1802AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	1.5 or less						
1803A-10	1803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-5-0	1.5 or less						

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Inch					
Orde	er No.	3			
w/lug	Flat-back	90 0 10	10 0 10		3
1410A	1410AB	V			
1411A	1411AB		~		
1410A-10	1410AB-10	~		/	
1780A	1780AB	~			
1781A	1781AB		~		
1506A	1506AB	~			
1507A	1507AB		~		
1670A	1670AB	~			
1671A	1671AB		~		
1802A-10	1802AB-10	~		/	1
1803A-10	1803AB-10		~	V	~

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS



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^{*} For low measuring force type, use in the vertical orientation.



One revolution type Back plunger dial

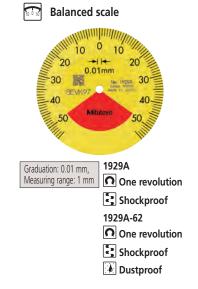
gages are also available. (Refer to pages F-55 to F-56 for details.)

2990A-10

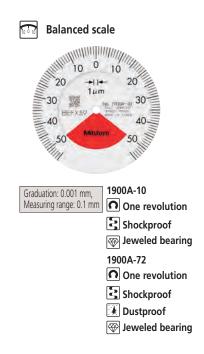
SERIES 1 — Compact One Revolution Type for Error-free Reading

- This series has been developed to eliminate the possibility of reading errors due to miscounting multiple revolutions.
- Compact dial indicators ideal for restrictedspace applications in gaging jigs.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The dead zone in red indicates "accuracy not guaranteed".
- One revolution type Back Plunger dial gages are also available. (Refer to pages F-55 to F-56 for details)









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FEATURES

Metric		ı				
Ord	er No.	10 0 10				E
w/lug	Flat-back	10 0 10				5
1929A	1929AB	~	~			~
1929A-62	1929AB-62	~	~		~	~
1900A-10	1900AB-10	~	~	~		~
1900A-72	1900AB-72	~	~	~	V	V

SPECIFICATIONS

Unit: in

Metric											ISO/JIS type
Ord	er No.	Cardination	Range		Maximum	permissil	ole error (I	MPE) (µm))	D:-I	Managemen
w/lug	Flat-back	Graduation (mm)	(range/rev)		Indication	on error		Hysteresis	Repeat-	Dial reading	Measuring force (N)
w/iug	Tiat-back	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	TOICE (IV)
1929A	1929AB	0.01	1 (1.4)	7	_	_	11	4	3	50-0-50	1.4 or less
1929A-62	1929AB-62	0.01	1 (1.4)	7	_	_	11	4	3	50-0-50	1.4 or less
1900A-10	1900AB-10	0.001	0.1 (0.14)	2.5	_	_	5	2	1	50-0-50	1.5 or less
1900A-72	1900AB-72	0.001	0.1 (0.14)	2.5	_	_	5	2	1	50-0-50	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

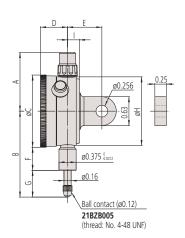
Inch						
Ord	er No.				1.7.	
w/lug	Flat-back	10 º 10				
1909A-62	1909AB-62	~	~		~	~
1910A-72	1910AB-72	~	~	/	~	~

Inch		ı						ISI/AGD type
Orde	er No.	Graduation	Range	Accuracy (in)	Accuracy (in) Repeat-		Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
1909A-62	1909AB-62	0.0005	0.04 (0.056)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
1910A-72	1910AB-72	0.0001	0.006 (0.008)	±0.0001/—/—	0.0001	±0.00003	3-0-3	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

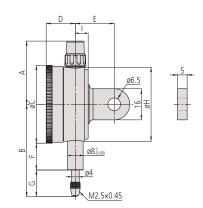




Order No.	А	В	С	D	Е	F	G	Н	1	Mas w/lug	el · l
1909A-62	1.28	1.64	1.57	0.59	0.75	0.50	0.35	1.50	0.26	90	70
1910A-72	1.28	1.61	1.57	0.59	0.75	0.50	0.31	1.50	0.26	90	70

Note: Refer to pages F-57 to F-60 for details of contact points.

ISO/JIS Type



Unit: mm

(Order No.	А	В	С	D	Е	F	G	Н	1	Mas w/lug	s (g) Flat-back
	1929A	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
	1929A-62	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
-	1900A-10	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75
-	1900A-72	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75

Note: Refer to pages F-57 to F-60 for details of contact points.

Optional Accessories

• Limit hand (2 pcs.): 21AAB363



• Bezel clamp: 21RZA149



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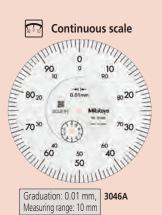
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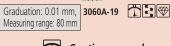
Optional Accessories

- Limit hand (2 pcs.): 21AZB195
 Bezel clamp: 21AZB148 (for metric type) 21RZA065 (for inch type)

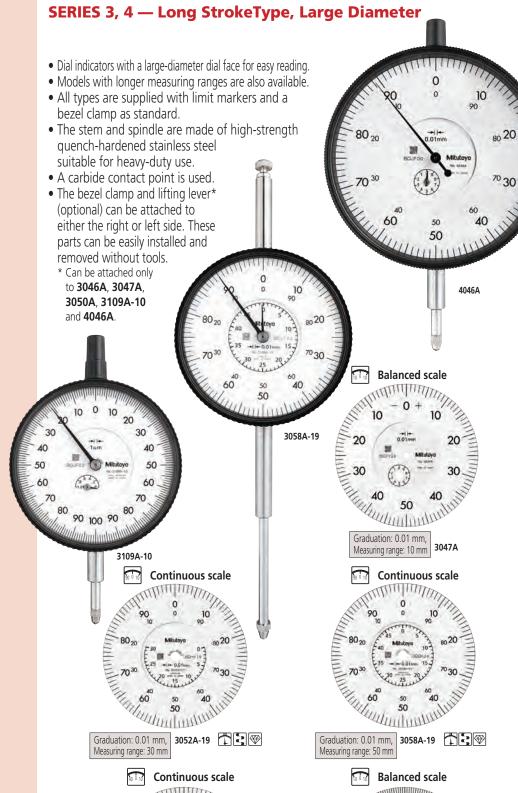












70³⁰ 40 50 3062A-19

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F-50

90 100 90

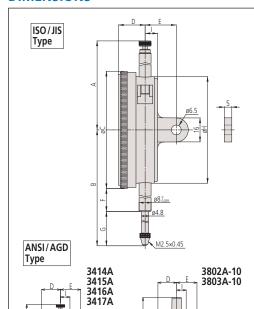
Graduation: 0.001 mm, **3109A-10**

50 60

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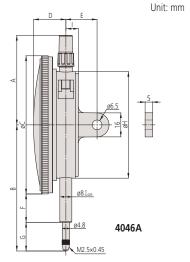
Graduation: 0.01 mm, Measuring range: 100 mm

DIMENSIONS



								Unit:	mn
Order No.	Α	В	С	D	Е	F	G	Н	-1
3046A	59.6	75.5	78	17.6	21	15.9	20.6	71	9
3047A	59.6	75.5	78	17.6	21	15.9	20.6	71	9
3050A	52.6	94	78	17.6	21	25.9	29.1	71	9
3052A-19*	72.9	104.3	78	17.6	21	25.9	39.4	71	9
3058A-19*	81.9	142.3	78	17.6	21	43.9	59.4	71	9
3060A-19*	120.9	202.3	78	17.6	21	73.9	89.4	71	9
3062A-19*	141.9	243.3	78	17.6	21	94.9	109.4	71	9
3109A-10	59.6	79	78	17.6	21	15.9	14.1	71	9
4046A	59.6	84	92	21.5	21	18.9	19.1	71	9

* The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. For this reason, if you need to install an optional contact point with an outside diameter smaller than 7 mm, use a washer (with outside diameter of at least 7 mm, inside diameter of 3 mm, and thickness of approx. 0.5 mm) placed between the contact point and the spindle. Note: Refer to pages F-57 to F-60 for details of contact points.



Unit: in

3424A-19 3426A-19 3428A-19	4887A-19
00.256 0.25 00.375 \(\frac{1}{2} \) 212B2B056 (thread: No. 4-48 UNIF	## ## ## ## ## ## ## ## ## ## ## ## ##

								U	111. 111
Order No.	Α	В	С	D	Е	F	G	Н	-
3414A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3415A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3416A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3417A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3424A-19*	3.31	5.88	3.07	0.70	3/4	1.99	2.35	2.80	0.35
3426A-19*	4.84	7.80	3.07	0.70	3/4	2.91	3.35	2.80	0.35
3428A-19*	5.67	9.63	3.07	0.70	3/4	3.74	4.35	2.80	0.35
3802A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
3803A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
4887A-19*	4.84	7.80	3.62	0.85	3/4	2.63	3.35	2.80	0.35

FEATURES

Metric		ı					
Orde							
w/lug	Flat-back	90 0 10	10 0 10	3	5		
3046A	3046AB	~					
3047A	3047AB		1				
3050A	3050AB	~			~		
3052A-19	3052AB-19	V		~		~	~
3058A-19	3058AB-19	~		~		~	~
3060A-19	3060AB-19	~		~		~	~
3062A-19	3062AB-19	~		~		~	~
3109A-10	3109AB-10		~	~		~	
4046A	4046AB	V					
		_					

Ball contact (Ø0.12) 21BZB005 (thread: No. 4-48 UNF)

CD	FC		CA	TI	R I	•
NP.	-(11-1	LΔ		IVI :	۹

Ball contact (ø0.12) 21BZB005 (thread: No. 4-48 UNF)

3047A 3047AB 0.01 10 (1) 5 9 10 15 3 3 0-50-0 1.4 or less 3050A 3050AB 0.01 20 (1) 8 10 15 20 5 4 ±0-100 2.0 or less 3052A-19 3052AB-19 0.01 30 (1) 10 12 15 25 7 5 ±0-100 2.5 or less 3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060AB-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	Metric											ISO/JIS type
w/lug Flat-back (mm) (range/rev) (mm) Indication error (mm) Hysteresis (mm) Repeatability reading ability force (N) 3046A 3046AB 0.01 10 (1) 5 9 10 15 3 3 ±0-100 1.4 or less 3050A 3050AB 0.01 20 (1) 8 10 15 20 5 4 ±0-100 2.0 or less 3052A-19 3052AB-19 0.01 30 (1) 10 12 15 25 7 5 ±0-100 2.5 or less 3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060A-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	Ord	ler No.	Craduation	Range	N	Maximum	permissi	ble error (MPE) (µm	1)	Dial	Massuring
3046A 3046AB 0.01 10 (1) 5 9 10 15 3 3 ±0-100 1.4 or less 3047A 3047AB 0.01 10 (1) 5 9 10 15 3 3 -50-0 1.4 or less 3050A 3050AB 0.01 20 (1) 8 10 15 20 5 4 ±0-100 2.0 or less 3052A-19 3052AB-19 0.01 30 (1) 10 12 15 25 7 5 ±0-100 2.5 or less 3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060A-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	w/lug	Flat-back		(range/rev)					Hysteresis		-	
3050A 3050AB 0.01 20 (1) 8 10 15 20 5 4 ±0-100 2.0 or less 3052A-19 3052AB-19 0.01 30 (1) 10 12 15 25 7 5 ±0-100 2.5 or less 3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060A-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	3046A	3046AB	0.01	10 (1)	5	9				3	±0-100	1.4 or less
3052A-19 3052AB-19 0.01 30 (1) 10 12 15 25 7 5 ±0-100 2.5 or less 3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060A-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	3047A	3047AB	0.01	10 (1)	5	9	10	15	3	3	0-50-0	1.4 or less
3058A-19 3058AB-19 0.01 50 (1) 10 12 15 30 8 5 ±0-100 3.0 or less 3060A-19*1 3060AB-19*1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	3050A	3050AB	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
3060A-19 *1 3060AB-19 *1 0.01 80 (1) 12 17 20 45 9 5 ±0-100 3.0 or less	3052A-19	3052AB-19	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
	3058A-19	3058AB-19	0.01	50 (1)	10	12	15	30	8	5	±0-100	3.0 or less
	3060A-19*	3060AB-19*1	0.01	80 (1)	12	17	20	45	9	5	±0-100	3.0 or less
3062A-19 *1 3062AB-19 *1 0.01 100 (1) 12 17 20 50 9 5 ±0-100 3.5 or less	3062A-19*	3062AB-19*1	0.01	100 (1)	12	17	20	50	9	5	±0-100	3.5 or less
3109A-10 3109AB-10 0.001 1 (0.2) 2 3.5 4 5 2 0.5 0-100-0 1.5 or less	3109A-10	3109AB-10	0.001	1 (0.2)	2	3.5	4	5	2	0.5	0-100-0	1.5 or less
4046A 4046AB 0.01 10 (1) 5 9 10 15 3 3 ±0-100 1.4 or less	4046A	4046AB	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

*1 Use in a vertical orientation (contact point downward) for the long stroke model.

*2 Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch						
Orde	er No.			E		
w/lug	Flat-back	90 0 10	10 0 10	3		L
3414A	3414AB	~				
3415A	3415AB		~			
3416A	3416AB	~				
3417A	3417AB		~			
3424A-19	3424AB-19	~		~	~	~
3426A-19	3426AB-19	~		~	~	~
3428A-19	3428AB-19	~		~	~	~
3802A-10	3802AB-10	~		~	~	
3803A-10	3803AB-10		~	~	~	
4887A-19	4887AB-19	~		~	~	V

Inch								ANS	I/AGD type
Ord	er No.	Graduation	Range	A	ccuracy* ² (in)		Repeat-	Dial	Measuring
w/lug	Flat-back	(in)	(range/rev) (in)	First 1 Rev/2	5 Rev/10 Rev	Retrace	ability (in)	reading	force (N)
3414A	3414AB	0.001	0.5 (0.1)	±0.001/±0.	001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
3415A	3415AB	0.001	0.5 (0.1)	±0.001/±0.	001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
3416A	3416AB	0.001	1 (0.1)	±0.001/±0.	001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
3417A	3417AB	0.001	1 (0.1)	±0.001/±0.	001/±0.002	0.0002	±0.0002	0-50-0	1.8 or less
3424A-19	3424AB-19	0.001	2 (0.1)		001/±0.002 (20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3426A-19*1	3426AB-19*1	0.001	3 (0.1)		/±0.002/±0.003 5 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3428A-19*1	3428AB-19*1	0.001	4 (0.1)		/±0.002/±0.003 5 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.5 or less
3802A-10	3802AB-10	0.0001	0.025 (0.01)	±0.0001/±	0.0001/—	0.0001	±0.00003	0-10	2.0 or less
3803A-10	3803AB-10	0.0001	0.025 (0.01)	±0.0001/±	0.0001/—	0.0001	0±.00003	0-5-0	2.0 or less
4887A-19*1	4887AB-19*1	0.001	3 (0.1)		/±0.002/±0.003 5 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
*1 Uco in a	vortical orienta	tion (contac	et point downwa	rd) for the long ctro	ka madal				

*1 Use in a vertical orientation (contact point downward) for the long stro<mark>ke model</mark>

Mitutoyo

Mitutovo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without not

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^{*2} Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.



ANSI/AGD Type Metric Dial Indicators with ø3/8 inch Stem and #4-48UNF-Thread Contact Point Compatible Type

SPECIFICATIONS

Metric		SERIES 1							ANSI/AGD type
Orde	r No.	Graduation	Range		Accuracy (µm)	Repeat-	Dial	Measuring	
w/lug	Flat-back	(mm)	(range/rev) (mm)	Firs	st 1 Rev/2.5 Rev/10 Rev	Retrace	ability (µm)	reading	force (N)
1230A-01	1230AB-01	0.01	2.5 (1)		±10/±10/—	3	±2	0-100	1.4 or less
1231A-01	1231AB-01	0.01	2.5 (1)		±10/±10/—	3	±2	0-50-0	1.4 or less
1044A-01	1044AB-01	0.01	5 (1)		±10/±10/±13	3	±3	±0-100	1.4 or less
1045A-01	1045AB-01	0.01	5 (1)		±10/±10/±13	3	±3	0-50-0	1.4 or less
1010A-11	1010AB-11	0.002	0.5 (0.2)		±2/±2/—	2	±1	0-20	1.5 or less
1011A-11	1011AB-11	0.002	0.5 (0.2)		±2/±2/—	2	±1	0-10-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated

Metric		SERIES 2				ANSI/AGD type			
Orde	r No.	Graduation	Range		Accuracy (µm)	Repeat-	Dial	Measuring	
w/lug	Flat-back	(mm)	(range/rev) (mm)	Fir	rst 1 Rev/2.5 Rev/10 Rev	Retrace	ability (µm)	reading	force (N)
2231A-01	2231AB-01	0.01	2.5 (1)	±10	0/±10/—	3	±3	0-50-0	1.4 or less
2046A-01	2046AB-01	0.01	10 (1)	±10	0/±10/±13	3	±3	±0-100	1.4 or less
2046A-11	2046AB-11	0.01	10 (1)	±10	0/±10/±13	3	±3	±0-100	1.4 or less
2047A-01	2047AB-01	0.01	10 (1)	±10	0/±10/±13	3	±3	0-50-0	1.4 or less
2047A-11	2047AB-11	0.01	10 (1)	±10	0/±10/±13	3	±3	0-50-0	1.4 or less
2902A-01	2902AB-01	0.01	10 (1)	±10	0/±10/±13	3	±3	100-0	1.4 or less
2050A-01	2050AB-01	0.01	20 (1)	±10	0/±10/±15/±20 (20 Rev)	4	±3	±0-100	2.0 or less
2056A-01	2056AB-01	0.01	25 (1)		0/±10/±15/±20 (20 Rev)/ 5 (Over 20 Rev)	4	±3	±0-100	2.5 or less
2109A-11	2109AB-11	0.001	1 (0.2)	±3,	±3/±3/±4		±0.3	0-10-0	1.5 or less
2119A-11	2119AB-11	0.001	5 (0.2)		/±7/±8/±10 (20 Rev)/ 0 (Over 20 Rev)	2.5	±0.3	0-10-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Metric		ı					
Ord	er No.				63	[:7:]	ها
w/lug	Flat-back	90 0 10	10 10		[69]		
1230A-01	1230AB-01						
1231A-01	1231AB-01						
1044A-01	1044AB-01						
1045A-01	1045AB-01						
1010A-11	1010AB-11			~			~
1011A-11	1011AB-11			V			~

Metric									
Orde	er No.					栗		·. ¼ ·	
w/lug	Flat-back	90 0 10	no 0 16	64		*	E	.	‡]
2231A-01	2231AB-01								
2046A-01	2046AB-01								
2046A-11	2046AB-11				~				
2047A-01	2047AB-01								
2047A-11	2047AB-11				~				
2902A-01	2902AB-01								~
2050A-01	2050AB-01								
2056A-01	2056AB-01								
2109A-11	2109AB-11				~		~		
2119A-11	2119AB-11				~				

Optional Accessories

- Backs (See page F-61)Contact points (See pages F-57 to F-60)

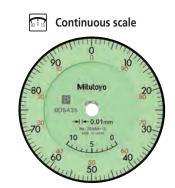


SERIES 2 — Special Dial Indicators

Adjustable hand dial indicator

• The hand position can be adjusted independently of the position of the spindle by rotating the top knob.





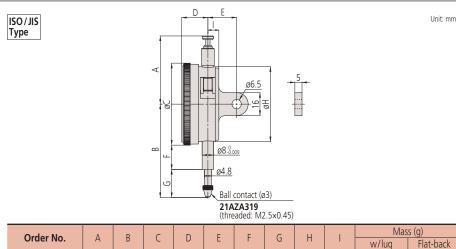
Graduation: 0.01 mm, Measuring range: 10 mm

With coaxial revolution counter

Adjustable hand

→ Jeweled bearing





2048A-10 47.4 64.9 18 1 20 16.9 19.5

Note 1: Contact points, other than dedicated types, cannot be installed.

Note 2: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. For this reason, if you need to install an optional contact point with an outside diameter smaller than 7 mm, use a washer (with outside diameter of at least 7 mm, inside diameter of 3 mm, and thickness of approx. 0.5 mm) placed between the contact point and the spindle.

SPECIFICATIONS

Metric											
Order No.			Range		Maximum	permissil	ole error (l	MPE) (µm))	Dial	Manaurina
w/lug Flat-back		Graduation (range/rev			Indication	on error		Hysteresis	Repeat-	reading	Measuring force (N)
wriug	Hat-back	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading	TOICE (IV)
2048A-10	2048AB-10	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Metric		ı				
	er No. Flat-back	90 0 10	T.	STOP	\bigcirc	西
w/lug			الخلف	رندن	٠	۰
2048A-10	2048AB-10	/	/		/	~



F-53



Optional Accessories

• Limit hand (2 pcs.): 21AZB195





• Bezel clamp: 21AZB148





Optional Accessories

• Limit hand (2 pcs.): 21AZB195



• Bezel clamp: 21AZB148



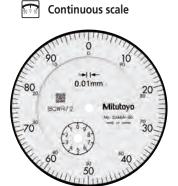
Dial Indicators

SERIES 2 — Special Dial Indicators

• A mechanism holds the pointer and the spindle at the position of maximum depression and hence displays the maximum value.

Note: Clearance of peak hold: Push the mechanism release in the direction of the arrow indicated in the dimensional drawing below.

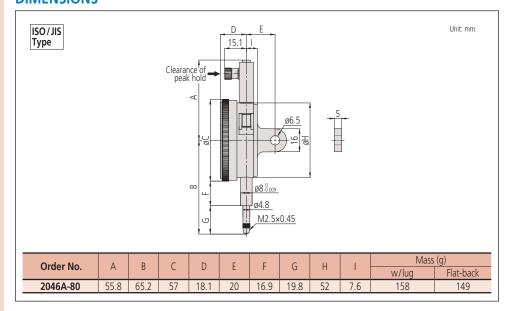




Graduation: 0.01 mm, Measuring range: 10 mm

2046A-80 **Peak retaining**

DIMENSIONS



FEATURES

Metric		ı			
Ord	er No.		(W)	(Q)	
w/lug	Flat-back	90 0 10		STOP	
20464-80	2046AB-80	~		~	

SPECIFICATIONS

	Metric											ISO/JIS type				
	Orde	Order No. Range				Maximum	permissil	ole error (I	MPE) (µm)	D: 1	Marin Serv				
	w/lug	Elat back	Graduation (mm)	(range/rev)		Indication	on error		Hysteresis Repeat-		Dial reading	Measuring force (N)				
		FIGI-DACK	FIGI-DACK	Flat-back	Flat-back	Flat-back	, Flat-back	(111111)	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	Tiysteresis	ability	reading
	2046A-80	2046AB-80	0.01	10 (1)	5	9	10	15	_	_	±0-100	5.0 or less				

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Mitutoyo

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Back Plunger Type Dial Indicators

- This series has been developed to eliminate the possibility of reading errors due to miscounting multiple revolutions.
- Back Plunger type dial indicators are suitable for mounting onto leveling machine tool tables or inspection jigs, and for use in small spaces where the graduations of standard dial indicators are difficult to see.
- Mitutoyo's proprietary shock-proofing mechanism provides excellent durability and shock resistance.
- Model **2990A-10** provides 0.001 mm graduation.



Holding bar (optional)

Order No.	øD (mm)	L (mm)
21AAA166	ø6	42
136567	ø6	81
124625	ø6.35	81
21AAA167	ø6.35	42
21AAA168	ø8	42
136568	ø8	81

Note: ØD and L: detail shown in drawing below.

Optional Accessory

• Limit hand (2 pcs.): 21AZB195

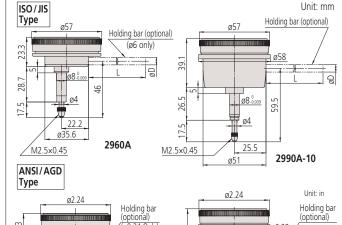


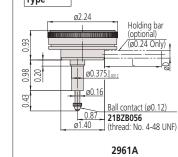


Balanced scale

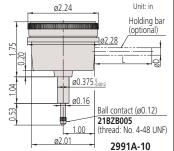
Graduation: 0.01 mm, Measuring range: 1 mm 2960A **O**ne revolution Shockproof **Back Plunger**





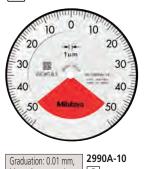


DIMENSIONS



Note 1: The shoulder on a contact point (standard accessory) for **2960A** and **2961A** acts as a stop to prevent spindle overrun that may otherwise damage the indicator. For this reason, if you need to install an optional contact point with an outside diameter smaller than 7 mm, use a washer (with outside diameter of at least 7 mm, inside diameter of 3 mm, and thickness of approx. 0.5 mm) placed between the contact point and the spindle. between the contact point and the spindle. Note 2: Refer to pages F-57 to F-60 for details of contact points.

2990A-10



Balanced scale

Graduation: 0.01 mm, Measuring range: 1 mm

- One revolution
- 🚼 Shockproof
- **Back Plunger**

→ Jeweled bearing

Metric	Metric ISO/JIS type												
Order No.	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (N		MPE) (µm) Hvsteresis	Repeat-	Dial reading	Measuring force (N)					
	(111111)	(lange/lev/(lillin)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	i iyateresia	ability	reading	TOICE (IV)			
2960A	0.01	1 (1.27)	8	_	_	14	4	3	50-0-50	1.4 or less			
2990A-10	0.001	0.1 (0.14)	2.5	_	_	5	2	1	50-0-50	1.5 or less			

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed. Note 2: The bezel clamp cannot be used.

Inch	ı					A	NSI/AGD type
Order No.	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeatbility (in)	Dial reading	Measuring force (N)
2961A	0.0005	0.04 (0.05)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
2991A-10	0.0001	0.008 (0.01)	±0.0002/—/—	0.0001	±0.00005	4-0-4	1.5 or less

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed. Note 2: The bezel clamp cannot be used.

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Inch	ı				
Order No.	10 0 10	C	3	₩	T 90°
2961A	V	V	V		~
2991A-10	1	/	/	~	~

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Holding bar (optional)

Order No.	øD (mm)	L (mm)
21AAA166	ø6	42
136567	ø6	81
124625	ø6.35	81
21AAA167	ø6.35	42
21AAA168	ø8	42
136568	ø8	81

Note: ØD and L: detail shown in drawing below.

Optional Accessory

• Limit hand (2 pcs.): 21AAB363

Back Plunger Type Dial Indicators

- Back Plunger type dial indicators are suitable for mounting onto leveling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Model **1960A** and **1961A**, which uses Mitutoyo's proprietary shock-proofing mechanism, has excellent durability and shock resistance.





Continuous scale





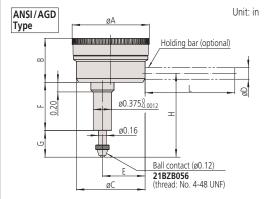
Reverse reading



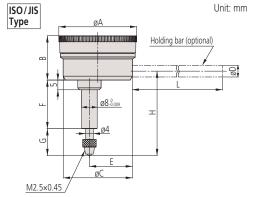
Graduation: 0.01 mm, **Back Plunger**



DIMENSIONS



Order No.	А	В	С	Е	F	G	Н	Mass (g) (Bar excluded)
1166A	1.57	0.89	1.40	7/8	0.98	0.43	1.67	80
1167A	1.57	0.89	1.40	7/8	0.98	0.43	1.67	80
		0.89						
1961A	1.57	0.89	1.40	7/8	0.98	0.43	1.59	80



Order No.	А	В	С	E	F	G	Н	Mass (g) (Bar excluded)
1160A	40	22.7	35.6	21.8	25	13.8	43.3	80
1162A	40	22.7	35.6	21.8	25	13.8	43.3	80
1960A	40	22.7	35.6	21.8	28.7	12.8	46	80

Note 1: Contact point (standard accessory) for all products in this page has a role as a top dead point stopper. For this reason, if you need to install an optional contact point with an outside diameter smaller than 7 mm, use a washer (with outside diameter of at least 7 mm, inside diameter of 3 mm, and thickness of approx. 0.5 mm) placed between the contact point and the spindle.

Note 2: Refer to pages F-57 to F-60 for details of contact points.

Balanced scale





One revolution

1960A

Shockproof **Back Plunger**

FEATURES

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Metric						
Order No.	90 0 10	10 0 10	U	3	Ð	1 90°
1960A		~	~	~		~
1160A	~					~
1162A					~	~

Inch						
Order No.	90 0 10	10 0 10	U	3	Ð	90°
1961A		~	~	~		~
1166A	~					~
1167A		~				~
1168A					~	~

CDECIFICATIONS

Metric L ISO/JIS type										
Order No.	Graduation (mm)	Range (range/rev)	1440.0	Maximum permissible error (M Indication error			MPE) (μm) Hysteresis	Repeat-	Dial reading	Measuring force (N)
	, ,	(mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range	,	ability	3	, ,
1960A	0.01	1 (1.27)	8	_	_	14	4	3	50-0-50	1.4 or less
1160A	0.01	5 (1)	8	12	14	16	4	3	±0-100	1.4 or less
1162A	0.01	5 (1)	8	12	14	16	4	3	100-0	1.4 or less

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is quaranteed. Note 2: The bezel clamp cannot be used.

	Inch	ı					A	NSI/AGD type
	Order No.		Range (range/rev)	Accuracy (in)		Repeatbility		Measuring
	Order No.	(in)	(in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	(in)	reading	force (N)
	1961A	0.001	0.04 (0.05)	±0.001/—/—	0.0002	±0.0002	20-0-20	1.4 or less
	1166A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	±0-50	1.4 or less
	1167A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	0-25-0	1.4 or less
Ī	1168A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	50-0	1.4 or less

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

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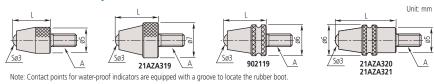
Note 2: The bezel clamp cannot be used.



Optional Accessories for Digimatic and Dial Indicators and Linear Gages

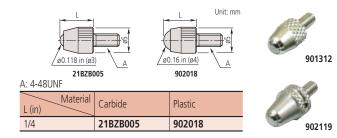
Contact points, extension rod

Standard contact point



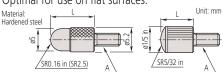
A: M2.5×0.45

Material	Car	bide	Ruby	Plastic	
L (mm)	Without groove	With groove (water-proof type)	Without groove	Without groove	
7.3	901312	_	120047	901994	
8.3	21AZA319	902119	_	_	
12.1	_	— 21AZA320		_	
14	21JAA225	_	_	_	
15	120049	_	120051	_	
17	21JAA224	_	_	_	
19.3	_	21AZA321	_	_	
20	137391	_	137392	_	
22	21JAA226	_	_	_	
25	120053	_	120055	_	
30	21AAA252	_	21AAA253	_	



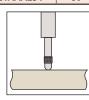
Shell Type Point

Contact point with a large radius. Optimal for use on flat surfaces.



A: M2.5×0.45

/ 1. IVIZ.3X0.73	/ \. \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					
Order No.	L (mm)					
101386	5					
101118	10					
137393	15					
101387	20					
101388	25					
21AAA254	30					





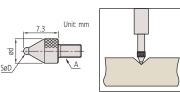
A: 4-48UNF

Order No.	L (in)
193697	3/32
101184	5/32
21AAA031	1/4
21AAA032	3/8
101185	1/2
21AAA033	5/8
101186	3/4
21AAA034	7/8
101187	1
21AAA035	1 1/4
21AAA036	1 1/2
21AAA037	1 3/4
21AAA038	2
21AAA039	2 1/4
21AAA040	2 1/2
21AAA041	2 3/4
21AAA042	3

F-57

Ball point

Optimal for workpieces with deep indentations.



A: M2.5×0.45

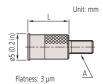
Order No.	SøD (mm)	ød (mm)
21AAA349	1, carbide	5
21AAA350	1.5, carbide	5
101122	1.8, steel	5
21AAA351	2.5, carbide	5
21AAA352	4, carbide	5





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Flat Point





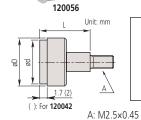
A: M2.5×0.45

11 111E151-01 15	
Order No.	L
131365	8
21AAA340	10



A: 4-48UNF

Order No.	L (in)
133017	5/16
21AAA043	1/2
21AAA044	3/4
21AAA045	1



Flat Point (Carbide)

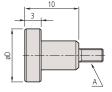
Flatness: 3 µm

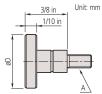


A: M2.5×0.45

Order No. 120056

131365





101117

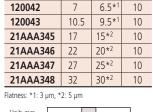
A: M2.5×0.45	
Order No.	øD
101117	10
21AAA341	15
21AAA342	20
21AAA343	25
21AAA344	30



Order No.	øD (in)
101188	1/2
101189	3/8





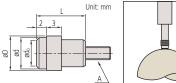


5.2

4.3*

5

Order No. 120041





120043

A: M2.5×0.45

Order No.	ød ₀	ød	øD	L
137255	3	6.4	7	10
137399	4.5	8	9	10

137255

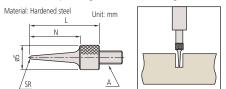
Needle Point (Carbide)

Flatness: 3 µm

Needle Point

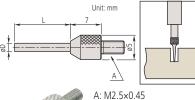
Flatness: 5 µm

Suitable for probing the bottom of a groove or hole.









137257

Order No.

120066	0.45	3
21AAA329	0.45	5
120065	1	3
21AAA330	1	5
21AAA331	1	8
21AAA332	1	10
21AAA333	1	20
21AAA334	1	40
21AAA335	1.5	5
21AAA336	1.5	10
120064	1.5	13
21AAA337	1.5	20
21AAA338	1.5	40
137257	2	8
21AAA257	2	18
21AAA258	2	28
21AAA339	2	40

øD



A: M2.5×0.45

Order No.	N	L	SR
101121	11	15	0.4
137413	13	17	0.2
21AAA255	21	25	0.4
21AAA256	31	35	0.4

A: 4-48UNF

71. 4 400111				
Order No.	L (in)	SR (in)		
21AAA030	0.6	0.016		
21AAA046	1	0.016		
21AAA047	1 1/2	0.016		
21AAA048	2	0.016		

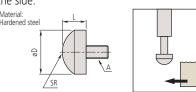
F-58

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Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Spherical Point

A large radius makes this contact point optimal for use where the workpiece needs to slide from the side.



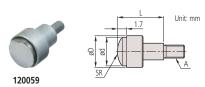
Δ· M2 5×0 45



71. 1012.370.43					
Order No.	D (mm)	L (mm)	SR (mm)		
111460	5.5	3	5		
125258	7.9	5	5		
101119	10	5	7		
A: 4-48UNF					

Order No.	D (in)	L (in)	SR (in)
101205	1/2	1/8	0.35
101204	3/8	3/32	0.28

Spherical Point (Carbide)



A: M2.5×0.45

Conical Point (Carbide)

120057

Order No.	øD	ød	L	SR
120058	5.2	4.3	5	5
120059	7.5	6.5	10	7
120060	10.5	9.5	10	10

Order No. 120057

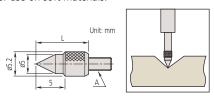
A: M2.5×0.45 **Order No.**

120068

Unit: mm

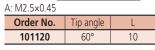
Conical Point

Used for positioning the measurement point. Since it can damage a workpiece easily, it is not suitable for use on soft materials.

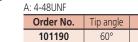




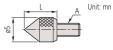
101120



L (in)







A: M2.5×0.45

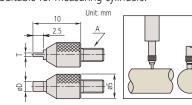
Order No.	Tip angle	L
101385	90°	5

۸.	4-481	INIE
Α.	4-400	וויוכ

Order No.	Tip angle	L (in)	
101191	90°	1/4	

Blade Point (Carbide)

Suitable for measuring cylinders.





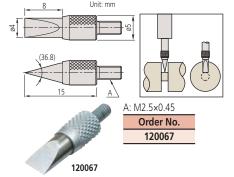
F-59

Order No.	T	øD
120061	0.4	2
120062	0.6	2
120063	1	4



Knife Edge Point (Carbide)

Suitable for measuring narrow groove diameter, etc.



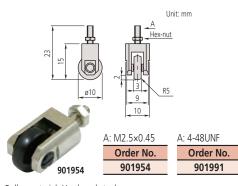
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Roller Point

Suitable for use on a moving workpiece surface, or where the workpiece needs to slide from the side.



Roller material: Hardened steel Roller runout: 10 µm or better

Note 1: For a different roller diameter, contact your local Mitutoyo sales office.

Note 2: High-accuracy roller with 5 µm runout is also available. (Special order item)

Interchangeable Contact Point Set

This set consists of six types of popular contact point for extending the use of an indicator to many applications.



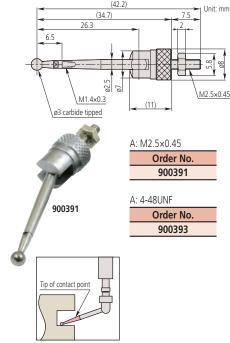
Set Order No. 7822

A: M2.5×0.45

Order No.	Contact points included	
131365	Flat Point (ø5 mm)	
101117	Flat Point (ø10 mm)	
101121	Needle Point	
101119	Spherical Point	
101118	Shell Type Point (R2.5×10)	
101387	Shell Type Point (R2.5×10)	

Lever Point

Suitable for use* on perpendicular faces, such as those within mold cavities. Lever can be adjusted to the required angle.



The tip of contact point is interchangeable. Interchangeable contact points (optional)

ø1 mm contact point: 102824 ø2 mm contact point: 102825

ø3 mm contact point: 102826 (provided as standard)

* Perform measurement in the same posture and conditions as for the reference setting so that variation due to lever deflection are reduced. Gently bring the contact point into touch with the workpiece. Use a dial indicator with as small a measuring force as possible.

Extension Rod

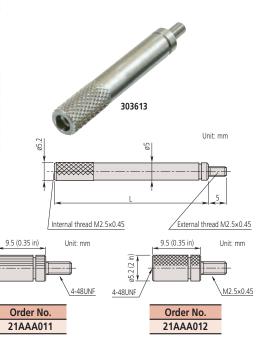
A: M2.5×0.45	
Order No.	L
303611	10
21AAA259A	15
303612	20
21AAA259B	25
303613	30
21AAA259C	35
21AAA259D	40
21AAA259E	45
21AAA259F	50
21AAA259G	55
304146	60
21AAA259H	65
21AAA259J	70
21AAA259L	75
21AAA259M	80
304147	90
303614	100

Δ · Λ_ΛΩΙ INIE

A. 4-40UNI	
Order No.	L(
139167	1
301655	
301657	
301659	
	€.

M2.5×0.45

F-60



Mitutoyo

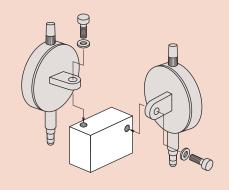
Interchangeable Backs Optional Accessory for Digimatic and Dial Indicators

SPECIFICATIONS

Description			Order No.	
		SERIES 1 (ø31, ø36, ø40 mm)	SERIES 2 (ø57 mm)	SERIES 3, 4 (ø78, 92 mm)
Lug-on-Center Back	Unit: mm	101210: metric type 101307: inch type 190561: for 1911A-10, 1913A-10 190139: 1921A-10, 1923A-10, 1925A-10 137905: for 1003A	101040: metric type 101306: inch type 21AZB230: for water-proof of A type (mm) 21BZB104: for water-proof of A type (inch)	100691 : metric type 100797 : inch type
Flat Back	Unit: mm	101211: a=2.2 136872: for water-proof type 191559: for 1911AB-10, 1913AB-10, 1921AB-10, 1923AB-10, 1925AB-10 137906: for 1003AB	101039: a=2.5 21AZB231: for water-proof of A type 192910: (F type water-proof model)	100836 : a=3.0
Magnetic Back	8 Unit: mm	Special order	900928	900929
Back with Offset Lug	06.5 Unit: mm 12.5 45° 45° 6.35	Special order	101167	100837
Back with Post	Unit: mm	193172 Custom made	101169	100839
Back with Screw Mount	M6x1 Unit: mm	193173 : M6x1, Custom made 193174 : #1/4-28UNF, Custom made	136023 : M6×1 101170 : #1/4-28UNF	136024 : M6×1 100840 : #1/4-28UNF
Adjustable Back	3.2 Unit: mm M6x1 5.3 (6.4) 5.3 (6.4) (1): Small type	136025 : M6×1 129721 : #1/4-20UNC	136026: M6×1 101168: #1/4-20UNC	136027 : M6×1 100838 : #1/4-20UNC
Back with Adjustable Bracket Main unit Rack	50.2 Unit: mm	_	901963	_

- A dial or Digimatic indicator may be held in position by clamping on either the stem or the lug on the back of the indicator. The back of the indicator may need to be interchanged with another type for special applications. A wide variety of backs is available for Mitutoyo Digimatic and dial indicators.
- Most lugged backs can be rotated by 90° because they have four retaining screws.
 However, 190561 and 137905 (for compact dial indicators) are only equipped with two retaining screws, therefore the lug orientation cannot be changed.

Typical application



Note 1: If back lids are replaced when using a water-proof or dust-proof model, the water resistance will not be guaranteed.

Note 2: When installing to **297XAB** Series, separately prepare 4 fixing screws (**546666** Self-tapping screw only for plastic).

Do not apply a tightening torque of more than 20 N-cm in order to avoid stripping the screw threads.

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Spindle Lifting Lever and Cable Optional Accessories for Digimatic and Dial Indicators

Spindle Lifting Lever (A type)

902100*1

Use for A type SERIES 1 dial indicators.



101171: Stop screw

902100*1

Use for S type SERIES 1 dial indicators.

Spindle Lifting Lever (S type)



21EZA198*2

Use for A type SERIES 2, 3, and 4 dial indicators (up to 10 mm/0.4 in).



21AZB149*2

Use for S type SERIES 2, 3, and 4 dial indicators (up to 10 mm/0.4 in).



21AZB150*2

Use for A type SERIES 2 and 3 dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).



21AZB150*2

Use for S type SERIES 2 and 3 dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).



Spindle Lifting Lever (for ID-SS, ID-SX, ID-CX, ID-CNX)

21EZA198*1*3



*1 Before use, replace the stop screw with the standard accessory.
*2 Use the stop screw already fixed to the dial indicator body.
*3 Stop screw is for mm model.



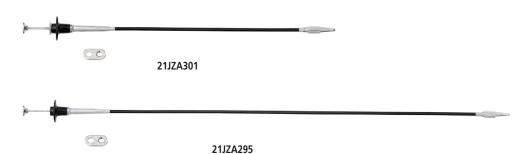
F-62

Spindle Lifting Cable

• The spindle can be moved up and down using the lifting lever or the release.

Lifting cable

Stroke: 10 mm



21JZA301: with auto-stop function (300 mm) **21JZA295**: without auto-stop function (500 mm)

Note: This accessory is not applicable to dial indicators with a range of 20 mm or more, special models (2048A(B)-10, 2046A(B)-80), certain models of 1 series (1911A(B)-10, 1913A(B)-10, 1921A(B)-10, 1923A(B)-10, 1925A(B)-10, 2971AB, 2972AB, 2973AB, 2976AB, 2977AB, 2978AB), back plunger type and water-proof type.

F-63

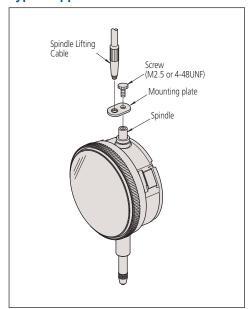
Spindle Lifting Lever

21EAA426

Suitable for 4.8 mm spindle diameter.



Typical application



ŀ



• Stuck onto the dial indicator's dial face or crystal, these stickers indicate the tolerance limits. They are available in three colors: red, green, and yellow.

They are available only for SERIES 2 dial indicators.



Red



136420 (10 sheets/set) Green



136421 (10 sheets/set) Yellow



136422 (10 sheets/set)

Color-coded Spindle Caps

• 9 color-coded spindle caps are available for dial indicators with a range of 10 mm or less.



Note: When attaching to small dial indicators, the measuring range height

Color	Order No.		
COIOI	Standard	Water-proof	
Black	21AAB675	21AAB676	
White	21AAB675W	21AAB676W	
Red	21AAB675R	21AAB676R	
Green	21AAB675G	21AAB676G	
Blue	21AAB675B	21AAB676B	
Yellow	21AAB675Y	21AAB676Y	
Orange	21AAB675D	21AAB676D	
Pink	21AAB675P	21AAB676P	
Navv	21AAB675S	21AAB676S	

Note: This accessory is not applicable to 1003A(B), 1911A(B)-10, 1913A(B)-10, 1921A(B)-10, 1923A(B)-10, 1925A(B)-10, 2971AB, 2972AB, 2973AB, 2976AB, 2977AB, and 2978AB

will be 8 mm taller.

Mitutoyo

Dial Indicator Repair Tool Kit



Set order No. 7823EU

Set Configuration

- (1) Spindle rest (**129730**) (2) Pin remover (**129732**)
- (3) Punch (129733)
- (4) Bearing adjuster (**129734**)
- (5) Pinion rest (129735)
- (6) Reamer (ø1: 1/50 taper) (129736)
- (7) Reamer (ø0.6: 1/50 taper) (**193702**)
- (8) Reamer for pointer (ø0.5: 1/20 taper) $(\mathbf{21JAA273})$
- (9) Pointer removing tool (126628)
- (10) Soft touch pliers (21JAA371)
- (11) Nippers (901179)
- (12) Pin rest (129731)
- (13) Hammer (901178)
- (14) Stick (21JAA314)
- (15) Brush (**901177**)
- (16) Bamboo brush (901176)
- (17) Pin-vise (**901175**) (18) Screwdriver (Phillips/flat blade) (901174)
- (19) Tweezers (129729)
- (20) Screwdriver (Phillips) (901173)
- (21) Pointer removing tip (Ø0.8) (**126630**) (22) Pointer removing tip (Ø0.5) (**126630B**)
- (23) Pointer removing tip (Ø1.6) (126630C)
- (24) Adjustable nut (100699)

Typical applications

Remove the long hand

Position the pointer removing tool (No. 9) on the hole diameter of the minute hand. Push the pivot with the pointer removing tool to remove the long hand

Remove the little hand

Remove the little hand with the nippers (No. 11).

Adjust a bearing

Press the steel or jeweled bearing into its housing using the bearing adjuster (No. 4).

Remove or replace a pin
Place the spindle on the groove of the spindle rest (No. 1).
Remove the pin with the pin remover (No. 2) and the hammer (No. 13). Tap the pin directly with the hammer (No. 13) to replace the pin.

Replace the long or little hand

Screw the pinion rest (No. 5) into the pin rest (No. 12). Support the pinion with the fixed pinion rest, and replace the hand with the punch (No. 3) and hammer (No. 13). Reaming is necessary when replacing with a new hand. Use reamers as follows:

• The hands of DG Series A-type and TLY Series*1 dial test indicators do not require reaming.

- Use the reamer for pointer (No. 8) (ø0.5: 1/20 taper) for S type and T type dial indicators*2
- Depending on the shaft diameter, use reamer (No. 6) (ø1: 1/50 taper) or reamer (No. 7) (ø0.6: 1/50 taper) for F type dial indicators and other than TI-X Series dial test indicators
- *1 Dial test indicator whose model No. ends in "X". *2 Dial indicator whose order No. includes an "S", "T" and "A".

Replacing bezels and graduation plates

A bezel and graduation plate must be swaged together so that the graduation plate always rotates with the bezel. Assemblies comprised of a swaged bezel and graduation plate are available for some models.

Order N	o. of dial indicators	Order No. of swaged assemblies
	2046A	21AZB650
	2109A-10	21AZB693



F-65

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SERIES 513 — Dial Test Indicator Features

- Designed to probe surfaces that cannot be reached with a normal dial gage. Useful both for alignment and for measurement purposes.
- Mitutoyo's proprietary new design permits smooth pointer operation.
- Strong frame provides excellent rigidity and durability.
- The pointer and carbide contact point are only slightly magnetizable*, and so they are hardly affected by a magnetic environment. are available. The ruby contact point also has several times the abrasion resistance of carbide contact point and is safely usable with an electric discharge machine thanks its • Metric Dial Test Indicator is inspected being a non-conductor.
- Clear and concise wide dial face allows excellent visibility.
- The surface of the crystal is hard-coated for excellent scratch resistance.
- * Magnetic material is used for some internal parts.

- Flat crystal makes graduations easy to read. Moreover, the O-ring sealing method used for the bezel prevents water or oil penetration. (Note that this type is NOT water-proof.)
- The main unit is equipped with three dovetails to which the stem with dovetail groove ø6 (standard accessory) can be attached. This greatly improves convenience as the attachment location can be adjusted
- In addition, models with a ruby contact point Five types are available: horizontal, horizontal (20° tilted face), vertical, parallel, and universal, allowing users to select according to their needs.
 - according to JIS B 7533:2015. Horizontal, horizontal (20° tilted face), and vertical types are inspected with the dial face in the upward orientation, while the parallel type is inspected with the dial face in the vertical orientation to guarantee their accuracy.



Feature icons

Icon	Feature description
H	High accuracy
	With revolution counter
1-1	Long contact point
5	Standard
	Double scale spacing
\$	Compact (Small face diameter)
	Carbide contact point
‡ \ ‡	Ruby contact point (Non-conductive and abrasion resistant)

Improved visibility

Multi-layer coatings on the crystal

Improved contact point bearing gives smoother tracking

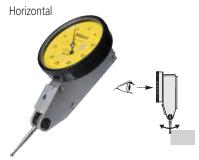
No deterioration in contact point sensitivity and trackability

Excellent dial readability

No dust or oil penetration

Integrated bezel and crystal structure

No bezel detachment





Horizontal (20° Tilted face)









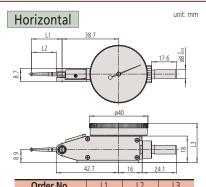
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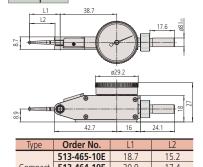
PROPRIETARY SINSPECTION CERTIFICATE

DIMENSIONS



Order No.	L1	L2	L3
513-401-10E	117	44.2	
513-471-10E	14.7	11.2	27
513-405-10E/A/T			27
513-475-10E	18.7	15.2	
513-425-10E/A			28
513-404-10E/A/T	20.9	17.4	
513-474-10E	20.3	17.4	27
513-424-10E/A/T			
513-426-10E/A	22.2	18.7	28
513-478-10E			
513-414-10E/A/T	37.4	33.9	27
513-415-10E/A/T	44 5	41.0	21
513-477-10E	44.5	41.0	

Compact



Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

513-466-10E

Special Set: 513-908-10E (Metric)

513-404-10E: Dial test indicator 7014-10: Mini magnetic stand

513-907-10E (inch) 513-402-10E: Dial test indicator



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Dial Test Indicator SERIES 513 — Horizontal Type









Note: **513-4XX-10** is indicated on the dial face. But the Order No. for the Special Set provided with the stem etc. has a suffix (E or A or T) at the end.



Graduation: 0.01 mm Range: 0.8 mm

513-404-10E/10A/10T S Standard

Carbide contact point



Graduation: 0.01 mm Range: 0.5 mm

513-414-10E/10A/10T[1-1] Long contact point

Carbide contact point
Double scale spacing

20 0 20 Millutoyo 40

60 2um 60 80 80 80

Graduation: 0.002 mm Range: 0.2 mm

513-405-10E/10A/10T Standard

Carbide contact point



Graduation: 0.002 mm Range: 0.2 mm

513-465-10E Compact

Carbide contact point



Graduation: 0.0005 in Range: 0.03 in

513-402-10E/10T **S**tandard

(Carbide contact point



Graduation: 0.01 mm Range: 0.5 mm

513-424-10E/10A/10T

Standard

Double scale spacing

Carbide contact point



Graduation: 0.01 mm Range: 1.0 mm



Graduation: 0.002 mm Range: 0.6 mm

513-425-10E/10A
With revolution counter

Carbide contact point



Graduation: 0.001 mm Range: 0.14 mm

513-401-10E High accuracy

Carbide contact point



Graduation: 0.0001 in Range: 0.008 in

513-403-10E/10T Standard

Carbide contact point

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SPECIFICATIONS

Metric																				
	Order No.					Maxim	um perm	nissible (error (MP	E)* (µm)				ter					_	
Basic set	Plus set	Full set	Graduation (mm)	Range (mm)	Dial reading	Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	H High accuracy	With revolution counter	Long contact point	S Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
513-424-10	E 513-424-10A	513-424-10T									45					~	~		/	
513-478-10	Е –	-		0.5		6			4		45	0.3 or less				~	1			~
513-466-10	Е –	-		0.5	0-25-0		_				41						~	~	~	
513-414-10	E 513-414-10A	513-414-10T				10			5			0.2 or less			~		~		~	
513-426-10	E 513-426-10A	-	1	1.5	1	16	10	5	כן	3	45	0.4 or less		~			~		~	
513-404-10	E 513-404-10A	513-404-10T	0.01					1 5		3	45					~			~	
513-474-10	Е –	-	1	0.8	0-40-0	9			4			0.3 or less				~				~
513-464-10	Е –	-									41							~	~	
513-415-10	E 513-415-10A	513-415-10T	1	4.0	0.50.0	40			_			0.2			~				~	
513-477-10	Е –	-		1.0	0-50-0	10	_		5		45	0.2 or less			~					~
513-405-10	E 513-405-10A	513-405-10T									45					~			~	
513-475-10	Е –	-	0.000	0.2		4			3			0.3 or less				~				~
513-465-10	Е –	-	0.002		0-100-0						41							~	~	
513-425-10	E 513-425-10A	-		0.6		7	5	2	4	1		0.4 or less		~					~	
513-401-10	Е –	-	0.004	0.44	0.70.0			1	_		45	0.2	~						~	
513_471_10	F _		0.001	0.14	0-70-0	4	-		3			0.3 or less	./							1

Inch

C	rder No	0.				Maximum pe	rmissible erro	r (MPE)* (in)				ter					±.	
Basic set	Plus set		Graduation (in)	Range (in)	Dial reading	One rev.	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	H High accuracy	With revolution counter	T Long contact point	S Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
513-402-10E	-	513-402-10T								0.2 04 loss				~			~	
513-472-10E	-	-							45	0.3 or less				~				~
513-412-10E	-	513-412-10T	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002		0.2 04 loss			~				~	
513-479-10E	-	-								0.2 or less			~					~
513-462-10E	-	-	1						41							~	~	
513-407-10E	-	513-407-10T	0.00005														~	
513-403-10E	-	513-403-10T		0.000	0.40	. 0. 0001	0.0001	. 0 00004	45	0.3 or less				~			~	
513-473-10E	-	-	0.0001	0.008	0-4-0	±0.0001	0.0001	±0.00004						~				~
513-463-10E	-	-							41							1	~	

Metric/Inch

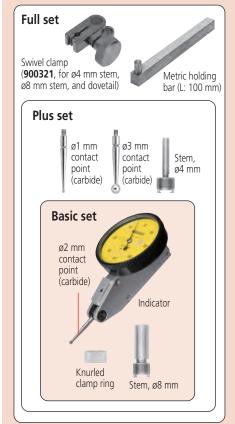
Wie Gie/ii	icii .																		
Or	der N	0.				Maximum	permissi	ble error (N	/IPE)* (µm)				counter					Ħ	
Basic set	Plus set	Full set	Graduation	Range	Dial reading	Measuring range	10 scale divisions	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution cour	[1] Long contact point	Standard	Double scale spacing	Compac	(a) Carbide contact point	Ruby contact point
513-409-10E	-	513-409-10T	0.002 mm /0.0001 in	0.2 mm /0.0076 in	0-10-0 /0-38-0	4	2	3	1	45	0.3 or less							~	

Inch / Metric

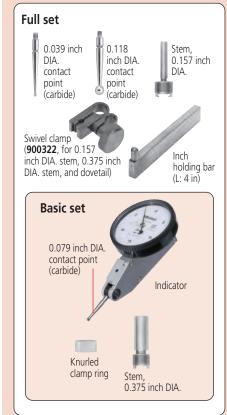
mcn/ we	uic _		1															
0	rder No	D.				Maximum p	ermissible eri	or (MPE)* (in)		Measuring	,	on counter	point		spacing		act point	point
Basic set	Plus set	Full set	Graduation	Range	Dial reading	One rev.	Hysteresis	Repeatability	Mass (g)	force (N)	H High accuracy	Vith revolution	[1] Long contact	S Standard	Double scale	Compac		Ruby contact point
513-406-10E	ı	513-406-10T	0.0005 in /0.01 mm	0.03 in /0.7 mm	0-15-0 /0-35-0	±0.0005	0.0002	±0.0002	45	0.3 or less							~	

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Set Configuration: Metric and Metric/Inch



Set Configuration: Inch and Inch/Metric



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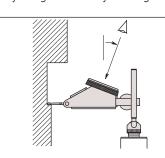
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^{*} We guarantee the accuracy of completed products by inspecting them with the dial face facing upward. Note: Stem with dovetail groove is not included in the mass.

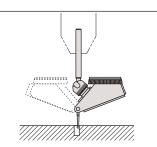


Dial Test Indicator SERIES 513 — Horizontal (20° Tilted Face), Vertical, and Parallel Types

• Specially designed for easy viewing of dial.

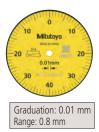


• The dial face obliquely faces upward, allowing users to read the graduations from the user's side. It is convenient when probing on the side of a large workpiece and the workbench is high.



• Using the universal holder allows easy hole centering. The dial face always faces upward when the indicator is rotated, which makes reading easy.





Carbide contact point





Graduation: 0.0005 in Range: 0.03 in

Carbide contact point





Range: 1.6 mm

With revolution counter

Carbide contact point



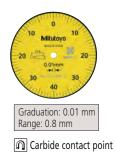
Graduation: 0.002 mm Range: 0.4 mm

With revolution counter

Carbide contact point



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Carbide contact point

Note: **513-4XX-10** is indicated on the dial face. But the Order No. for the set provided with the stem etc. has a suffix (E or A or T) at the end.

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SPECIFICATIONS

	Metric			HONZON	di (ZU	tiiteu ia	ice) type	2									
		Order No.		Graduation	Rango	Dial	Maximu	m pern	nissible e	error (M	PE)* (μm)	Macc	Measuring				
	Basic set	Plus set	Full set	(mm)	(mm)	reading	Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability	(g)	force (N)	arra de la companya d	i.l	M	Remarks
ĺ	513-444-10E	513-444-10A	513-444-10T	0.01	1.6	0-40-0	16	10	5	5	3	10	0.3 or less	~		~	
ĺ	513-445-10E	513-445-10A	513-445-10T	0.002	0.4	0-100-0	6	5	2	4	1	40	0.5 01 1655	~		/	
j	Inch			Horizont	al (20°	tilted fa	ce) type	5									

Inch _			, Horizon	tal (20°	tilted 1	face) typ	е								
	Order No		Graduation	Dango	Dial	Maximu	m permiss	ble error (I	MPE)* (in)	Macc	Moscurina	A 31	(Tank)		
Basic set	Plus set	Full set	(in)		reading	One rev.	First 2.5 rev.	Hysteresis	MPE)* (in) Repeatability	(g)	force (N)	<u>arrive</u>		ា	Remarks
_	513-442-10A	513-442-10T									0.3 or less	~		~	
_	513-442-16A	513-442-16T	0.0005	0.06	Λ 1E Λ	. 0 000E	. 0 000	0 0002	±0.0002		0.3 or less	~		~	Black dial
_	513-446-10A	513-446-10T	0.0003	0.00	0-13-0	±0.0005	±0.0005	0.0002	±0.0002	48	0.2 or less	~	~	~	
_	513-446-16A	513-446-16T								48	0.2 or less	~	~	~	Black dial
_	513-443-10A	513-443-10T	0.0001	0.016	0.40	. 0 0002	.0.0002	0.0001	±0.00004		0.3 or less	~		~	
_	513-443-16A	513-443-16T	0.0001	0.016	0-4-0	±0.0002	±0.0002	0.0001	±0.00004		0.3 or less	~		~	Black dial

Metric			, Vertical	type												
	Order No.		Graduation	Range	Dial	Maximu	m perr	nissible e	rror (M	PE)* (µm)	Mass	Measuring				
Basic set	Plus set	Full set	(mm)	(mm)	reading	Measuring range	one	10 scale divisions	Hysteresis	Repeatability		force (N)	R. R. P.	••!	M	Remarks
513-456-10E	_	_	0.01	0.5	0-25-0	6	—		1	2					~	
513-454-10E	513-454-10A	513-454-10T	0.01	0.8	0-40-0	9	_	ا ا	4	3	46	0.3 or less			~	
513-455-10E	513-455-10A	513-455-10T	0.002	0.2	0-100-0	4	—	2	3	1					~	

Inch			Vertical	type											
	Order No.		Graduation	Range	Dial	Maximum	permissible	e error (M	PE)* (in)	Macc	Measuring		(T=1)		
Basic set	Plus set	Full set	(in)	" "		One rev.	First 2.5 rev.	Hysteresis	Repeatability	(g)	force (N)	arria reta	ÎÎ	ា	Remarks
513-452-10E	_	513-452-10T	0.0005	0.03	0-15-0	±0.0005	<u> </u>	0.0002	±0.0002	46	0.3 or less			~	
513-453-10E	_	513-453-10T	0.0001	0.008	0-4-0	±0.0001	_	0.0001	±0.00004	40	0.3 or less			~	

Metric			Parallel 1	уре												
	Order No.		Graduation	Range	Dial	Maximu	m perr	nissible e	rror (MI	PE)* (µm)	Mass	Measuring		(TeX)		
Basic set	Plus set	Full set	(mm)	(mm)	reading	Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability	(g)	force (N)	R. R. P.	••!		Remarks
513-486-10E	_	_	0.01	0.5	0-25-0	6	_	_	1	2					~	
513-484-10E	513-484-10A	513-484-10T	0.01	0.8	0-40-0	9	_	ا ا	4	2	53	0.3 or less			~	
513-485-10E	_	_	0.002	0.2	0-100-0	4	_	2	3	1					1	

Inch			Parallel 1	Гуре											
	Order No.		Graduation	Range	Dial	Maximum	permiss	ible error (MPE)* (in)	Macc	Measuring		(Lie V)		
Basic set	Plus set	Full set	(in)	J		One rev.	First 2.5 rev.	Hysteresis		(g)	force (N)	a.r.b.r.r.	•••	M	Remarks
	513-482-10A	513-482-10T	0.0005	0.03	0-15-0	±0.0005		0.0002	±0.0002	53	0.3 or less			~	

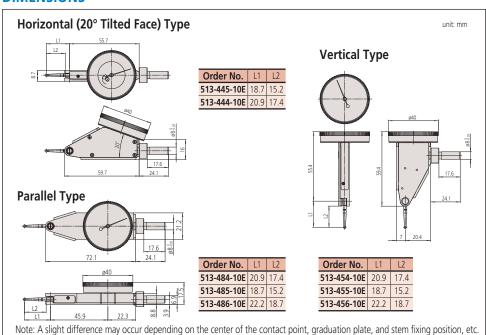
^{*} Horizontal (20° Tilted Face) Type, Vertical Type:

We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.

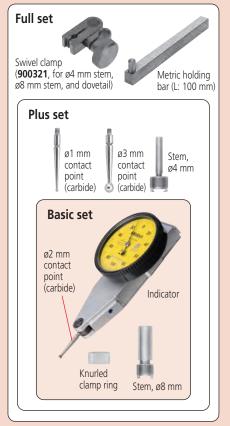
Parallel Type: We guarantee the accuracy of completed products by inspecting them with the dial face vertical.

Note: **513-4XX-10** is indicated on the dial face. But the Order No. for the set provided with the stem etc. has a suffix (E or A or T) at the end.

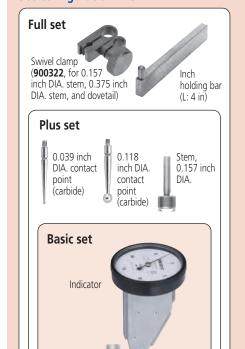
DIMENSIONS



Set Configuration: Metric



Set Configuration: Inch



0.375 inch DIA.

0.079

inch DIA.

(carbide)

contact point

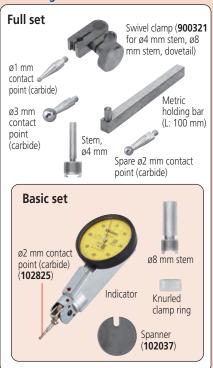
F-71

Knurled

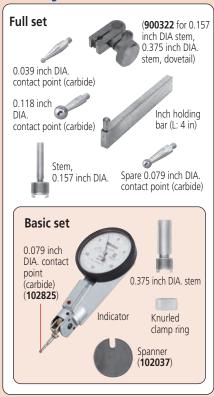
clamp ring

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Set Configuration: Metric



Set Configuration: Inch

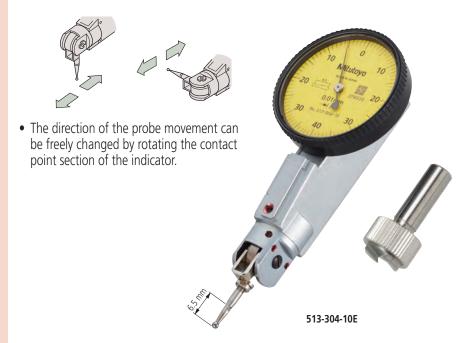


Optional Accessories

- Swivel clamps (See page F-75)
- Holding bars (See page F-75)
- Stems (See page F-75) 102824: Ø1 mm contact point (carbide) 102825: Ø2 mm contact point (carbide)

102826: ø3 mm contact point (carbide)

Dial Test Indicator SERIES 513 — Universal Type



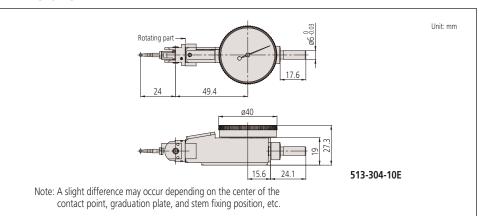
SPECIFICATIONS

Metri		CATIOI																		
C	Orde	r No.				Maximu	ım perm	issible e	error (MP	E)* (µm)		Managina	\chi_	on counter	t point		spacing		ntact point	t point
Basic s	set	Full set	Graduation (mm)		Dial reading	Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability	(a)	Measuring force (N)	High accuracy	With revolution	[1] Long contact	Standard Standard	Double scale	Compact Compact	Carbide cor	Ruby contact
513-304	-10E	513-304-10T	0.01	0.8	0-40-0	9	_	5	4	3	71	0.3 or less							/	

Inch																	
Orde	r No.					m permissi (MPE)* (in)			Managina		on counter	t point	spacing			tact point	t point
Basic set	Full set	Graduation (in)	Range (in)	Dial reading	One rev.	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution	[1] Long contact	Double	Compact	Dust	Carbide con	Ruby contact
513-302-10E	513-302-10T	0.0005	0.03	0-15-0	±0.0005	0.0003	±0.0003	71	0.3 or less							/	

* The accuracy is guaranteed when used with the dial face facing upward and the contact point oriented as shown in the figure. Note: 513-3XX-10 is indicated on the dial face. But the Order No. for the set provided with the stem etc. has a suffix (E or T) at the end.

DIMENSIONS

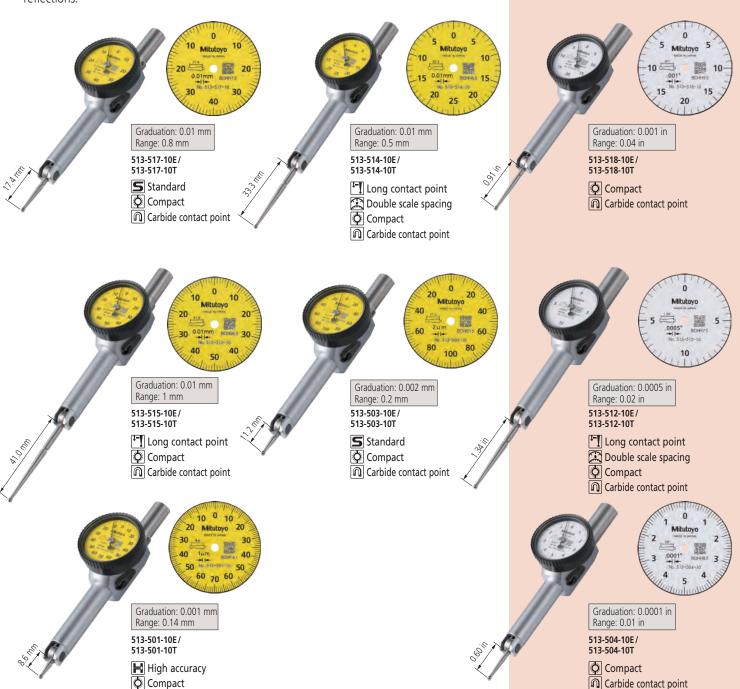


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Pocket Type Dial Test Indicator SERIES 513

- Slim design is suited for measurement in deep holes.
- Visibility of the dial face has been greatly improved thanks to a universal font, the selected color of the dial face, and improved balance between the pointer and the thickness of scale lines. The length of the contact point is shown in the illustration on the dial face.
- The crystal surface is flat to reduce glare and is coated to prevent scratches, dirt, and reflections.
- Bonding the bezel and crystal together leaves no gap for cutting fluid or oil to penetrate through to the dial face. (Note that this type is NOT water-proof.)
- Clutch type (with a clutch lever)
- With ø2 mm Carbide contact point
- Metric Dial Test Indicator is inspected according to JIS B 7533:2015. We guarantee accuracy by inspecting with the dial face facing upward.



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Carbide contact point

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SPECIFICATIONS

- NA	etric
- 1	CUIL

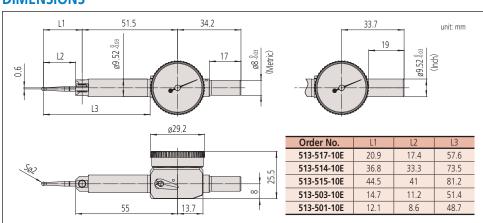
Orde	r No.				Maximu	m per	missible	error (N	PE)* (μm)				ıter					Ħ	
Basic set	Full set	Graduation (mm)	Range (mm)	Dial reading	Measuring range	One rev.	10 scale divisions		Repetability	Mass	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
513-517-10E	513-517-10T	0.01	0.8	0-40-0	9	-	5	4	3	50	0.3 or less				~		~	~	
513-514-10E	513-514-10T	0.01	0.5	0-25-0	10	-	5	5	3	51	0.3 or less			~		~	~	<	
513-515-10E	513-515-10T	0.01	1	0-50-0	10	-	5	5	3	51	0.3 or less			~			~	~	
513-503-10E	513-503-10T	0.002	0.2	0-100-0	4	-	2	3	1	50	0.4 or less				~		~	~	
513-501-10E	513-501-10T	0.001	0.14	0-70-0	4	-	2	3	1	50	0.5 or less	~					~	~	

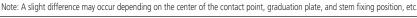
Inch

	Orde	r No.				Maximun	permiss	ible error	(MPE)* (in)				ıter			-		ı,	
В	Basic set	Full set	Graduation (in)	Range (in)	Dial reading	One rev.	First 2.5 rev.	Hysteresis	Repetability	Mass (g)	Measuring force (N)	H High accuracy	With revolution counter	T Long contact point	Standard	Double scale spacing	Compact	ি Carbide contact point	Ruby contact point
513	3-518-10E	513-518-10T	0.001	0.04	0-20-0	±0.001	-	0.0002	±0.0004	50	0.3 or less						~	~	
513	3-512-10E	513-512-10T	0.0005	0.02	0-10-0	±0.0005	-	0.0002	±0.0002	51	0.3 or less			~		~	1	~	
513	3-504-10E	513-504-10T	0.0001	0.01	0-5-0	±0.0002	-	0.0001	±0.00004	50	0.3 or less						~	~	

We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.

DIMENSIONS



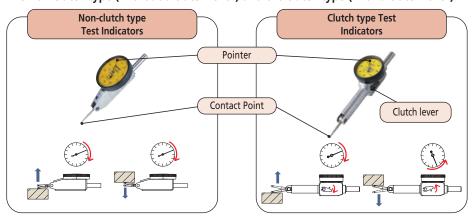


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Pocket type can be fixed at the body (at ø9.52)

The slim body allows measurements in shallow space.

There are two types of Mitutoyo Dial Test Indicator: The non-clutch type (without a clutch lever) and the clutch type (with a clutch lever)



In the non-clutch type, although the contact point may move either in the upward or downward direction, the pointer always rotates clockwise

In the clutch type, if the clutch lever is set in one position the contact point moves in the upward direction and the pointer rotates clockwise. Conversely, if the lever is set in the other position the contact point moves in the downward direction and the pointer rotates counterclockwise.



Note 1: Be sure to perform calibration with reference gage, etc. after exchanging the contact point. The inside parts may be damaged when the contact point is exchanged due to the breakage. In the case the of the significant deterioration in the operation, repair is required.

Note 2: Stem is not included in the mass.

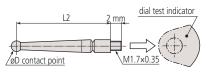
Note 3: 513-5XX-10 is indicated on the dial face. But the Order No. for the Special Set provided with the stem etc. has a suffix (E or T) at the end.

Dial Test Indicators

Contact points, Stems and Holders Optional Accessories for Dial Test Indicators

Contact point (for Metric Models Only*)

* Except for universal type dial test indicator (513-304-10).



ø0.5 mm contact point ø0.7 mm contact point (Steel) (Steel)



190548 (L2=11.2 mm) **21CAB110** (L2=15.2 mm) **190550** (L2=17.4 mm) **190653** (L2=18.7 mm) **21CAB112** (L2=33.9 mm) 190655 (L2=41.0 mm)

ø1 mm contact point (Carbide)

ø2 mm contact point (Carbide)

103017 (L2=11.2 mm)	
131314 (L2=15.2 mm)	
103013 (L2=17.4 mm)	
137558 (L2=18.7 mm)	
131316 (L2=33.9 mm)	
136235 (L2=41.0 mm)	

103010 (L2=11.2 mm) **103011** (L2=15.2 mm) 103006 (L2=17.4 mm) 137557 (L2=18.7 mm) 131324 (L2=33.9 mm) 136013 (L2=41.0 mm)

ø2 mm contact point (Ruby)



21CZA209 (L2=11.2 mm) 21CZB068 (L2=15.2 mm) 21CZA201 (L2=17.4 mm) 21CZA210 (L2=18.7 mm) **21CZA211** (L2=41.0 mm)

ø3 mm contact point (Carbide)



131317 (L2=33.9 mm) **136236** (L2=41.0 mm)

Spanner



Holding Bars



ø8 mm (0.315 inch DIA) 900211 (Length: 115 mm/4.528 in)



0.25 in×0.5 in

953639 (Length: 2 in) 900306 (Length: 4 in)

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Swivel Clamps

For ø6 mm stem, ø8 mm stem, and dovetail

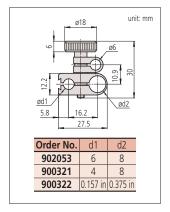


For ø4 mm stem. ø8 mm stem, and dovetail



For 0.157 inch DIA. stem, 0.375 inch DIA. stem, and dovetail





Stems with Knurled Clamp Ring



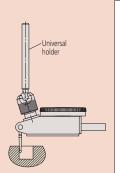
Stem DIA. ød	Stem with dovetail (Individual item)	Nut (Individual item)	Full set (Stem with dovetail+Nut)							
øu		Order No.								
ø4	21CAB106	190322	21CZB131							
ø6	21CAB103	190322	21CZB128							
ø8	21CAB104	190322	21CZB129							
ø0.375 in	21CAB105	190322	21CZB130							

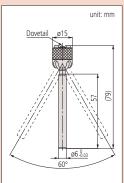
Universal Holder (dovetail clamp)

• A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram below.) It also gives some protection against accidental impacts on the indicator.



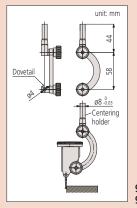
21CZA233 (ø8 mm stem) **21CZA231** (0.25 inch DIA. stem) 21CZA229 (ø6 mm stem)





Centering Holder

• Allows large diameter cylinders or holes to be centered on a machine tool.



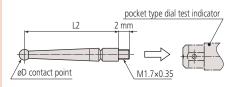


901959 (ø8 mm stem) 901997 (0.25 inch DIA.

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Optional Accessories for Pocket Type Dial Test Indicators

Contact point (for Metric Models Only)



ø0.5 mm contact point Ø0.7 mm contact point (Steel)

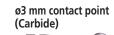


ø1 mm contact point (Carbide)

ø2 mm contact point (Carbide)



136235 (L2=41.0 mm) ø2 mm contact point (Ruby)



136013 (L2=41.0 mm)





Swivel Clamps

For ø6 mm stem, ø8 mm stem, and dovetail

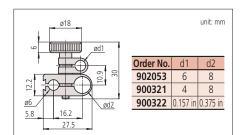


For ø4 mm stem and ø8 mm stem, and dovetail



For 0.157 inch DIA. stem and 0.375 inch DIA. stem, and dovetail





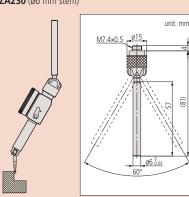
Universal Holder (screw clamp)

• A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram below.) It also gives some protection against accidental impacts on the indicator.



21CZA234 (ø8 mm stem) **21CZA232** (0.25 inch DIA. stem) 21CZA230 (ø6 mm stem)

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Stems

ø4 mm ø8 mm (0.157 inch DIA.) (0.315 inch DIA.) 0.375 inch DIA.









Holding Bars





Note: Suitable for height gages with a scriber section of 12.7×6.35 mm.





Indicator Calibration

i-Checker IC2000 **SERIES 170**

- Indication accuracy of (0.1 + 0.4L/100) µm, the highest level in the world, is achieved. (When inspected in the vertical orientation.)
- Can directly inspect indicators with a stroke of up to 100 mm. Moreover, a wide variety of optional accessories enable the inspection and calibration of many types of gage including dial indicators, lever-type dial indicators, dial test indicators, cylinder gages, Digimatic indicators, linear gages and electronic micrometers that use various stem diameters and
- The pointer of the analog indicator is positioned just before the measuring point automatically in the semi-automatic mode.
- Digital indicators equipped with a data output function are checked very efficiently due to spindle positioning at the inspection points and recording of measurement results being under fully automatic control.



Typical application for Dial Test Indicator Accessory Set



Typical application using dial test indicator attachment set (**02ASK000**)

SPECIFICATIONS

support systems.

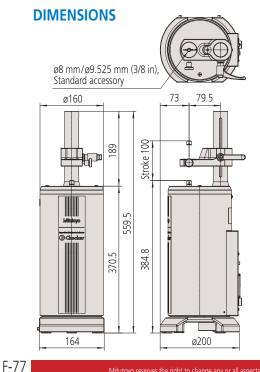
Order No.		170-402	170-403						
Remarks		with 8 mm bush with 3/8 in bush							
Measuring F	Range	100	mm						
Resolution		0.01	0.01 µm						
Accuracy	vertical orientation		.=Arbitrary length (mm)						
(20 °C)	lateral orientation	$(0.15 + 0.6L/100) \mu m$ L=Arbitrary length (mm)							
Feed speed			10 mm/s						
Drive metho	od	Motor drive (semi-automatic/fully-automatic)							
Measuring U	Jnit	Separate type Linear Encoder							
Moscuromo	nt mathad		c measurement						
Measurement method		Fully automatic measurement (only when using an	indicator equipped with data output function)*1*2						
Mass		20 kg							
Operating tem	perature range	20 °C±0.5 °C							

^{*1} Automatic measurement requires the indicator's connecting cable. Additionally some form of indicator, along with the normally connected accessory (the optional accessory for the indicator such as a Digimatic power-supply unit in an EF

^{*2} The indicator measured via RS-232C has the capability to receive data from the main unit and output the counter value.



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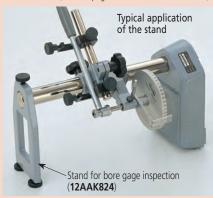


Refer to the i-Checker Brochure (E12015) for more details.



Optional accessory

Stand for bore gage inspection (12AAK824)
Note: Can be used for the inspection of bore gages 511
SERIES standard type and with micrometer head up to
400 mm. (Refer to pages C-35 and C-42 for details.)



Indicator Calibration

SERIES 170 — UDT-2 Dial Indicator Tester

• **UDT-2** is the accuracy tester for 0.01 mm resolution/graduation dial indicators, dial test indicators and bore gages.

• Stem mounting hole: ø6, ø8 mm (Metric) ø1/4 in, ø3/8 in (Inch)



SPECIFICATIONS

ı	Metric				
		Microme ⁻	ter head	Accuracy	(µm)
	Order No.	Graduation	Range	Feed accuracy	Hyctorocic
		(mm)	(mm)	(25 mm stroke)	Hysteresis
	170-102-12	0.001	0 - 25	±2	0.5
		-			

Į	Inch							
Ī		Microme	ter head	Accuracy (in)				
	Order No.	Graduation (in)		Feed accuracy (25 mm stroke)	Hysteresis			
ĺ	170-101-10	0.0001	0 - 1	±0.0001	0.00002			

SERIES 521 — Calibration Tester

 Can also be used to inspect dial indicators and dial test indicators with 0.001 mm graduations, or to adjust the sensitivity of electronic micrometers. • The mounting bracket, which can move in any direction, accepts a wide range of indicator stem sizes (ø4 mm to ø10 mm).





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SPECIFICATIONS

Metric	ı				
	Microme ⁻	ter head	Accuracy (µm)		
Order No.	Graduation	Range	Indication	Hysteresis	
	(mm)	(mm)	accuracy		
521-103	0.0002	0 - 1	±0.2	0.2	
521-105	0.0002	0 - 5	±0.8	0.8	

Inch	ı						
	Microme	ter head	Accuracy (in)				
Order No.	Graduation	Range	Indication	Hysteresi			
	(in)	(in)	accuracy	nysteresi			
521-104	0.00001	0 - 0.05	±0.00001	0.00001			
521-106	0.00001	0 - 0.2	±0.00003	0.00003			

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Thickness Gages SERIES 547, 7

- With a single touch, the dial thickness gage can quickly measure the thickness of small parts, paper, felt, etc.
- For models using a ceramic contact and anvil, there is no need to worry about rust.
- Watertight assembly of bezel and crystal dial indicator.

prevents water or oil from penetrating the

Standard Type (Resolution: 0.01 mm)







High Accuracy Type (Resolution: 0.0005 mm)



Standard Type (Graduation: 0.01 mm)

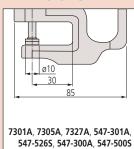


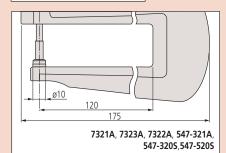


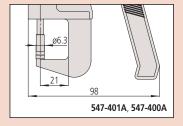
MeasurLink® ENABLED

DIMENSIONS

Unit: mm









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- Display: 6-digit LCD, sign (7-digit for models with 0.0005 mm resolution)
 Battery: CR2032 (1 pc.), for initial operational checks (standard pressure). (standard accessory)
- Battery life: Approx. 2.5 years under normal use
 Approx. 2,700 hours of continuous use
- Maximum response speed: Not restricted (except for scanning measurement)
 • Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
 Resolution switching (For 547-401A and 547-400A)
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

• SPC Cable:

06AGL011 (1 m)

- 02AGL021 (2 m)
 USB Input Tool Direct (2 m): 06AGQ001F
 Note: A 06AGQ001F is necessary for each ID.
- Measurement Data Management USB-ITPAK V3.0: 06AGR543

• Input Tool Series IT-020U (USB Keyboard Signal Conversion Type): 264-020

IT-007R (RS-232C Communication Conversion Type): 264-007

Connecting Cables for **U-WAVE-T** (160 mm): 02AZG011

For foot switch: 02AZG021

• Digimatic Mini-Processor DP-1VA LOGGER: 264-505

Lens thickness measurement

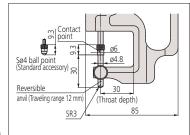
- Thickness of concave-convex lenses and surfaces can be measured. (Contact point, Anvil: hardened steel)
- Anvils and contact points are interchangeable to enable concave surfaces to be measured.



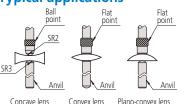
• Provided with a ball point as standard.

DIMENSIONS

Unit: mm



Typical applications



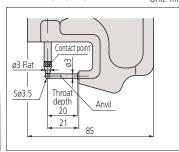
Pipe gage measurement

• Pipe wall thickness, thickness of curved boards can be measured. (Contact point, Anvil: hardened steel)



DIMENSIONS

Unit: mm



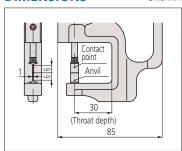
Blade thickness measurement

- Ideal for measuring narrow grooves on round The measuring faces of the contact point objects.
 - and anvil are in the shape of a 1 mm-thick blade.



DIMENSIONS

Unit: mm



Mitutoyo

Thickness Gages SERIES 547, 7

SPECIFICATIONS

	Metric	ı								
	Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
Ī	547-401A	0.0005 (0.001/0.01 selectable)	0 - 12	21	ø6.3 Flat (Carbide)	3	±3	3.5 or less	275	High accuracy, carbide point anvil
	547-301A	0.01	0 - 10	30	ø10 Flat	10	±20	1.5 or less	245	Standard, ceramic point/anvil
Ī	547-321A	0.01	0 - 10	120	ø10 Flat	10	±20	1.5 or less	385	Deep throat, ceramic point/anvil
I	547-313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	10	±20	1.5 or less	265	Lens thickness
	547-315A	0.01	0 - 10	30	t=1 Blade	10	±20	1.5 or less	260	Blade thickness
Ī	547-360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)	_	±20	1.5 or less	230	Pipe gage

	Inch/Metric									
	Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil	Accuracy	Measuring force (N)	Mass (g)	Remarks
	547-400A	0.00002/0.00005/ 0.0001/0.0005 in 0.0005/0.001/ 0.01 mm (selectable)	0 - 0.47	21 mm (0.83 in)	ø6.3 mm (ø0.25 in) Flat	0.0001 in/0.003 mm	±0.00012 in/±3 μm	3.5 or less	275	High accuracy, carbide point anvil
	547-526S*	0.0001 in/0.001 mm	0 - 0.47*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.0002 in/0.005 mm	±0.0002 in/±5 μm	1.5 or less	225	Standard, ceramic point/anvil
	547-300A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm	±0.001 in/±20 µm	1.5 or less	245	Standard, ceramic point/anvil
	547-500S*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm	±0.001 in/±20 μm	1.5 or less	225	Standard, ceramic point/anvil
	547-320A	0.0005 in/0.01 mm	0 - 0.4	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm	±0.001 in/±20 μm	1.5 or less	385	Deep throat, ceramic point/anvil
	547-520S*	0.0005 in/0.01 mm	0 - 0.47*	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm	±0.001 in/±20 μm	1.5 or less	380	Deep throat, ceramic point/anvil
	547-312A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm	±0.001 in/±20 μm	1.5 or less	265	Lens thickness
	547-512A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm	±0.001 in/±20 μm	1.5 or less	240	Lens thickness
	547-316A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm	±0.001 in/±20 µm	1.5 or less	260	Blade thickness
Ī	547-516A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm	±0.001 in/±20 µm	1.5 or less	240	Blade thickness
	547-361A	0.0005 in/0.01 mm	0 - 0.4	20 mm (0.79 in)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)	_	±0.001 in/±20 μm	1.5 or less	230	Pipe gage
	547-5615	0.0005 in/0.01 mm	0 - 0.47*	20 mm (0.79 in)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)	_	±0.001 in/±20 μm	1.5 or less	215	Pipe gage

^{*} Using ID-SX Digimatic indicator.

Metric ———									
Order No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
7327A	0.001	0 - 1	30	ø10 Flat	5	±5	1.5 or less	225	Fine dial reading, ceramic point/anvil
7301A	0.01	0 - 10	30	ø10 Flat	5	±15	1.4 or less	205	Standard, ceramic point/anvil
7305A	0.01	0 - 20	30	ø10 Flat	5	±20	2.0 or less	220	Standard, ceramic point/anvil
7321A	0.01	0 - 10	120	ø10 Flat	5	±15	1.4 or less	370	Deep throat, ceramic point/anvil
7323A	0.01	0 - 20	120	ø10 Flat	5	±22	2.0 or less	370	Deep throat, ceramic point/anvil
7313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	5	±15	1.4 or less	210	Lens thickness
7315A	0.01	0 - 10	30	t=1 Blade	5	±15	1.4 or less	220	Blade thickness
7360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)	_	±15	1.4 or less	200	Pipe gage

Inch	Inch								
Order No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7326A	0.0001	0 - 0.05	1.18	ø0.39 Flat	0.0002	±0.0002	2.0 or less	205	Fine dial reading, ceramic point/anvil
7300A	0.001	0 - 0.5	1.18	ø0.39 Flat	0.0005	±0.001	1.8 or less	205	Standard, ceramic point/anvil
7304A	0.001	0 - 1	1.18	ø0.39 Flat	0.0005	±0.002	1.8 or less	220	Standard, ceramic point/anvil
7322A	0.001	0 - 1	4.72	ø0.39 Flat	0.0005	±0.002	1.8 or less	370	Deep throat, ceramic point/anvil
7312A	0.001	0 - 0.5	1.18	ø0.24 Flat (Contact point) ø0.19 Flat (Anvil)	0.0005	±0.001	1.8 or less	215	Lens thickness
7316A	0.001	0 - 0.5	1.18	t=0.04 Blade	0.0005	±0.001	1.8 or less	220	Blade thickness
7361A	0.001	0 - 0.5	0.8	ø0.12 Flat (Contact point) ø0.14 Ball (Anvil)	_	±0.001	1.8 or less	200	Pipe gage

Note: The dial indicator needs to be reset when a contact point is replaced.



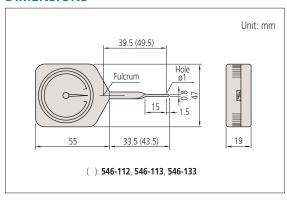
Measuring contact force on a relay



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

mN-scale models

ĺ	Order No.	Graduation (mN)	Range (mN)	Accuracy (graduation)
	546-112	2	6 - 50	
Ī	546-113	5	10 - 100	±0.5
ĺ	546-114	10	30 - 300	

Peak hold						
Order No.	Graduation (mN)	Range (mN)	Accuracy (graduation)			
_	_	_	_			
546-133	5	10 - 100	±0.5			
546-134	10	30 - 300	±0.5			

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

N-scale models

Standard

Order No.	Graduation (N)	Range (N)	Accuracy (graduation)
546-115	0.02	0.06 - 0.5	
546-116	0.05	0.1 - 1	
546-117	0.05	0.15 - 1.5	±0.5
546-118	0.1	0.3 - 3	
546-119	0.2	0.6 - 5	

Pea	ak hold	ı		
Or	der No.	Graduation (N)	Range (N)	Accuracy (graduation)
5	46-135	0.02	0.06 - 0.5	
5	46-136	0.05	0.1 - 1	
5	46-137	0.05	0.15 - 1.5	±0.5
5	46-138	0.1	0.3 - 3	
5	46-139	0.2	0.6 - 5	

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

Mitutoyo

Dial Snap Gage SERIES 201

- Enables single-handed comparison measurement of cylinder diameters, etc. even during machining.
- Measuring faces: Carbide.
- The anvil gage head can be moved up to 25 mm by turning the adjustment nut.
- The anvil gage head position can be fixed by turning the clamp.
- The gage head on the dial indicator side can be moved up to 2 mm.
- Equipped with workpiece support.
- Flatness of measuring face: 1 µm
- Repeatability of indication: 2 µm or better (repeatability of indicators is not included)
- The dial indicator and dial protection cover are optional. Also, some dial indicators and dial protection covers cannot be used with the dial snap gage. Consult Mitutoyo if intending to use dial indicators which are not recommended.



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

Optional accessories

Dial protection cover: 21DZA000

Recommended dial indicators/ **Digimatic indicators (optional)**

 Metric models:
 2046AB: Dial indicator (Graduation: 0.01 mm)
 2109AB-10: Dial indicator (Graduation: 0.001 mm)
 543-700B: Digimatic Indicator (Resolution: 0.0005/0.001/0.01 mm)

• Inch models: 2414AB: Dial indicator (Graduation: 0.001 in) **2805AB-10**: Dial indicator (Graduation: 0.0001 in) **543-702B**: Digimatic Indicator (Resolution: 0.00002/0.00005/0.0001/0.0005 in (0.0005/0.001/0.01 mm))

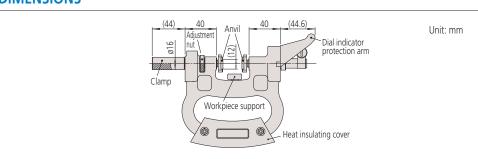
SPECIFICATIONS

Metric	ı		
Order No.	Range (mm)	Parallelism (µm)	Measuring force* (N)
201-101	0 - 25		
201-102	25 - 50		
201-103	50 - 75		
201-104	75 - 100		
201-105	100 - 125		
201-106	125 - 150	5	15±3
201-107	150 - 175]	13±3
201-108	175 - 200		
201-109	200 - 225		
201-110	225 - 250		
201-111	250 - 275		
201-112	275 - 300		

Inch	l.		
Order No.	Range (in)	Parallelism (in)	Measuring force* (N)
201-151	0 - 1		
201-152	1 - 2		
201-153	2 - 3		
201-154	3 - 4		
201-155	4 - 5		
201-156	5 - 6	0.00025	15±3
201-157	6 - 7	0.00025	13±3
201-158	7 - 8		
201-159	8 - 9		
201-160	9 - 10		
201-161	10 - 11		
201-162	11 - 12		

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

DIMENSIONS



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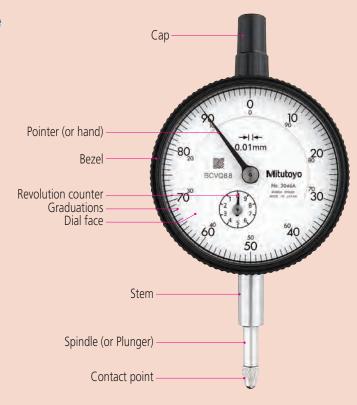
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Quick Guide to Precision Measuring Instruments



Dial Gages and Digital Indicators

Nomenclature

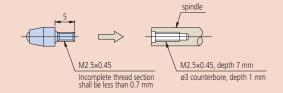


Mounting a Dial gage

Stem mounting	Method	Clamping the stem directly with a screw	Clamping the stem by split-clamp fastening
	Note	 Mounting hole tolerance: ø8 G7 (+0.005 to 0.02) Clamping screw: M4 to M6 Clamping position: 8 mm or more from the lower edge of the stem Maximum clamping torque: 150 N·cm when clamping with a single M5 screw Note that excessive clamping torque may adversely affect spindle movement. 	• Mounting hole tolerance: ø8 G7 (+0.005 to 0.02)
Lug mounting	Method	M6 scre Plain wa	_
	Note	 Lugs can be changed 90° in orientation according to the application. (The lug i Lugs of some SERIES 1 models (1911A-10, 1913A-10 and 1003A), however, To avoid cosine-effect error, ensure that any type of gage or indicator is mount. 	cannot be altered to horizontal.

Contact point

- Screw thread is standardized on M2.5×0.45 (Length: 5 mm).
- Incomplete thread section at the root of the screw shall be less than 0.7 mm when fabricating a contact point.





	Orientation	Remarks
Vertical (contact point downward)	Ground ///	_
Lateral (spindle horizontal)	Ground //////	If measurement is performed in the lateral orientation, or upside-down
Upside-down (contact point upward)	Ground ///,	If measurement is performed in the lateral orientation, or upside-down orientation, the measuring force is less than in the vertical orientation. In this case be sure to check the operation and repeatability of the indicator. For guaranteed-operation specifications according to the operating orientation refer to the specific product descriptions in the catalog.

Setting the origin of a Digimatic indicator



The accuracy specification in the range of 0.2 mm from the end of the stroke is not guaranteed for Digimatic indicators. When setting the zero point or presetting a specific value, be sure to lift the spindle at least 0.2 mm from the end of the stroke.

Notes on using a dial indicator or Digimatic indicator

- 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, confirm if the spindle moves upward and downward smoothly, and stability of the zero point.

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Dial Indicator Standard JIS B 7503: 2017 (Extract from JIS/Japanese Industrial Standards)

Diai ii	idicator s	stanuaru J	13 b /303. 201/ (EXITACL I	rom Jis/Japanese Industriai Stani	uarus)
	Item	Model	Measuring method (zero-point fixed)	Evaluation method (performance evaluation by moving the zero point)	Measurement examples
	Indication error over the entire measuring range	One-revolution dial indicator and	Set the dial indicator on the supporting stand, and read the indication error*1 of the next point while gradually retracting the spindle.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in both retract and extend directions.	
Indication	1/10 revolution indication error	multi-revolution dial indicator	- Every 1/10 revolution for the first two revolutions* ² - Every half revolution from two to five	During the first two revolutions in both retract and extend directions, obtain the maximum difference of the indication error among the adjacent measurement points per 1/10 revolutions* ³ .	Dial indicator
error	1/2 revolution indication error	Multi-revolution dial indicator	revolutions - Every revolution from five to ten revolutions - Every five revolutions from 10 to 50 revolutions	During the first five revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per 1/2 revolutions.	Supporting stand Micrometer head or other length measuring unit
	1 revolution indication error		Every ten revolutions after 50 revolutions Next, after retracting the spindle for more than three graduations of the long hand,	During the first ten revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per one revolution.	length measuring unit
Retrace e	rror	One-revolution dial indicator and multi-revolution dial indicator	extend the spindle gradually and read the indication error at the same measurement point in the retract direction.	Obtain the maximum difference of all the measuring points in reference to the indication error at the same measuring point in both forward and backward directions.	
Repeatab	peatability		Set the dial indicator on the supporting stand, retract the spindle at a desired position within the measuring range. Then, extend the spindle quickly and slowly five times and read each value.	Obtain the maximum difference among five indication values.	Dial indicator Supporting stand Measuring stage (Gauge block)
Measuring force		One-revolution dial indicator and multi-revolution dial indicator	Set the dial indicator on the supporting stand, retract and extend the spindle continuously and gradually, and read the measuring force at the zero and end points.	Obtain the maximum measuring force, the minimum measuring force, and the difference of the measuring force in both retract and extend directions at the same measurement point.	Dial indicator Supporting stand Top pan type spring scale or force gage

*1 For how to read the indication error, either read the input quantity of the measuring instrument aligning the long hand to the graduation, or read the indication value of the dial indicator according to the moving amount of the measuring instrument.

*2 With the one-revolution dial indicator, read the indication error per 10 graduations.

*3 With the one-revolution dial indicator, obtain the maximum difference of the indication error in the interval of adjacent 10 graduations.

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		Maximum permissible error (MPE) by measurement characteristics - dial indicators with bezel dia. 50 mm or larger											Maximum permissible error (MPE) by measurement characteristics - dial indicators with bezel dia. 50 mm or smaller and Back Plunger type dial indicators							
Gra	duation (mm)	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 10 and up to 20					1 or less	Over 1 and up to 2	Over 2 and up to 5	1 or less		Over 3 and up to 5		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

Note 1: The maximum permissible error (MPE) for one-revolution dial indicators does not specify the indication error of an arbitrary 1/2 and 1 revolution. Note 2: The MPE represents the value at 20 °C, which JIS B 0680 defines as the standard temperature.

Note 3: 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.

Mitutoyo's Response to Dial Indicator Standard JIS B 7503: 2017

- 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 calibration results for horizontal or opposite posture if required.
 It is said that, for evaluation of the compatibility to the specifications, JIS B 0641-1 or the criteria where the internationally-recognized specification range and the OK range are equal shall be applied. Also, it is said that the uncertainty is preferred to be evaluated based on ISO 14253-2 and ISO/IEC Guide 98-3. Therefore, we perform shipping inspection of dial indicators inclusive of the uncertainty of calibration as in the past.

Dial Test Indicator (Lever Type) Standard JIS B 7533: 2015 (Extract from JIS / Japanese Industrial Standards)

No	. Item.	Measuring method	Measuring point	Evaluation method	Diagram		
1	Error of indication over a range of Measuring range	Holding the dial test indicator (lever type), define the reference point at near the contact point resting point where the indication and error of indication is set zero.	Per 10 graduations in the forward and backward direction from the reference point to the end point.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in the forward direction.	Dial test indicator (lever type)		
2	over a range of			In the forward direction from the reference point to the end point, obtain the maximum difference of the indication error among the adjacent measurement points per 10 graduations.	Supporting		
3		measuring range, move the contact point in the backward direction and read the error of		In the forward direction from the reference point to the end point, obtain the maximum difference of the maximum and the minimum indication errors to be read by the zero-point fixed method over the measuring range per 1 revolution.			
4	Hysteresis	the measuring force to the contact point of the lever-operated dial indicator; the backward direction is the measuring force applied direction.)		Obtain the maximum difference in reference to the indication error at the same measuring point in both forward and backward directions among all the measurement points.	Micrometer head or length measuring unit		
5	Repeatability	Holding the dial test indicator (lever type) with its contact point parallel with the top face of the measuring stage, move the contact point quickly and slowly five times at a desired position within the measuring range and read the indication at each point.	At arbitrary points within the measuring range	Obtain the maximum difference of the five measured values.	Dial test indicator (lever type) Supporting stand		
6		Holding the dial test indicator (lever type), move the contact point in the forward and backward directions continuously and gradually, and read the measuring force in the measuring range.	Reference point and end point within the measuring range	Obtain the maximum and the minimum values in reference to the measuring force.	Dial test indicator (lever type) Top pan type spring scale		

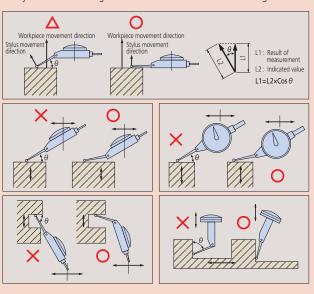


• Maximum permissible error and permissible limits

Graduation (mm)			0.001/0.002		0.01				
Revolution		1 revolution	Multi-re	volution		Multi-revolution			
Measuring range (m	m)	0.3 or less	Over 0.3, up to 0.5	Over 0.5, up to 0.6	0.5 or less	Over 0.5,	Over 1.0,		
	,					L1 ≤ 35	35 < L1	up to 1.6	
Error of indication	Measuring range (µm)	4	6	7	6	9	10	16	
over a range of	One revolution (µm)	_	5	5	_	_	_	10	
	10 scale divisions (µm)	2	2	2	5	5	5	5	
Hysteresis (µm)		3	4	4	4	4	5	5	
Repeatability (µm)		1	1	1	3	3	3	3	
Measuring force (N)	Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
ivieasuring force (N)	Min.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	

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 × compensation value

Compensating for a non-zero angle

Angle	Compensation value					
10°	0.98					
20°	0.94					
30°	0.87					
40°	0.77					
50°	0.64					
60°	0.50					

Examples

If a 0.002 mm measurement is indicated on the dial at various values of θ , the result of measurements are: For θ =10°, 0.002 mm×0.98=0.00196 mm For θ =20°, 0.002 mm×0.94=0.00188 mm For θ =30°, 0.002 mm×0.87=0.00174 mm

Mitutoyo's Response to Dial Test Indicator (Lever Type) Standard JIS B 7533: 2015

- In the finished product inspection, the accuracy is guaranteed using the horizontal, tilted, vertical type dial indicator with its dial face facing upward; the parallel type with its dial face set in the vertical orientation. Standard-attached inspection certificate includes inspection data.
- The calibration result for other than the above postures is available for a fee.
- It is said that, for evaluation of the compatibility to the specifications, the criteria based on JIS B 0641-1 or ISO/TR14253-6 shall be applied. Also, it is said that the uncertainty is preferred to be evaluated based on ISO 14253-2 and ISO/IEC Guide 98-3. Therefore, we perform shipping inspection of dial indicators inclusive of the uncertainty of calibration as in the past.

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