

# Digimatic Indicators

Bulletin No. 1824



Digital indicators with Absolute encoders

**Mitutoyo**

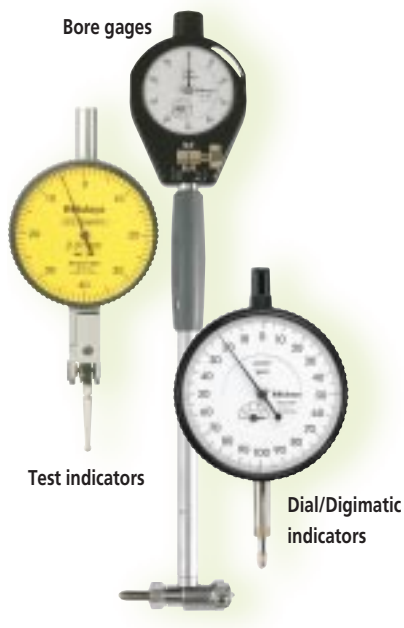
# Mitutoyo Digimatic Indicators

## The highest in accuracy, reliability and durability

More than 11 million indicators have been produced since production began in 1959. Advanced indicator production lines have been integrated with fully automated assembly and inspection processes, yielding indicators used in every part of the world. The plant also produces and ships test indicators, bore gages, etc. Moreover, we are increasing the production of Digimatic indicators to meet the ever increasing demand for digital gaging in manufacturing.



Nakatsugawa Plant  
Site area: 46,800m<sup>2</sup>  
Date of establishment: July, 1997



## *ABSOLUTE*

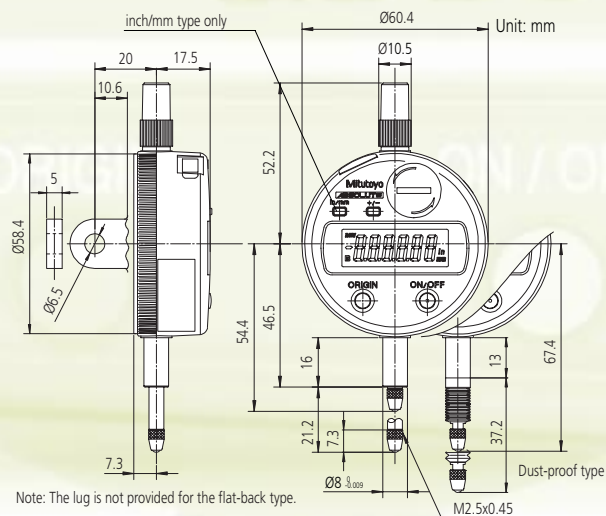
Mitutoyo's leading-edge ABSOLUTE encoder never forgets its absolute origin throughout the entire battery life, unless it is otherwise preset for a different setup. It immediately indicates the absolute position of the spindle at power-on, ready to begin measuring. This technology also eliminates spindle over-speed error, a phenomenon that usually happens with incremental type indicators.

# ABSOLUTE IDS



543-692

## Dimensions



## Specifications (ISO/JIS type)

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-690	543-690B	0.003mm	0.001mm	12.7mm
543-694*	543-694B*	0.003mm		12.7mm
543-681	543-681B	0.02mm	0.01mm	12.7mm
513-691	513-691B	.00012"	.00005"/0.001mm	.5"/12.7mm
543-695*	543-695B*	.00012"		
543-682	543-682B	.0008"	.0005"/0.01mm	.5"/12.7mm

\* Dust-proof type with rubber boot

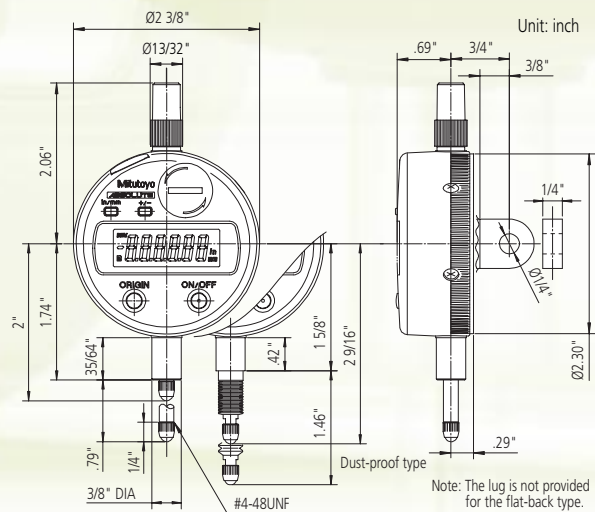
## .5"/12.7mm range model

Simple key functions in an economical package

## Technical Data

- Display: LCD
- Functions: Origin setting, power on/off, counting direction switching, inch/mm conversion (inch/mm type), SPC data output
- Battery: SR44 (1pc.) (938882)
- Battery life: 20,000 hours in continuous use
- Stem diameter: 3/8" (ANSI/AGD type) or 8mm (ISO/JIS type)
- Contact point: Carbide ball (ISO/JIS type) or steel ball (ANSI/AGD type)
- Measuring force: 2.0N or less  
2.5N or less (Dust-proof type with rubber boot)
- Dust-water protection level: Conforming to IP42  
Conforming to IP53 (Dust-proof type with rubber boot)
- Alarm: Low battery voltage, scale contaminations, ABS data Composition error
- Operating temperature: 0°F to 104°F (0°C to 40°C)
- Mass: .33 lbs./150g (.26 lbs./120g)\*

\* 0.01mm (.005"/0.01mm) resolution type



## Specifications (ANSI/AGD type)

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-692	543-692B	.00012"	.00005"/0.001mm	.5"/12.7mm
543-696*	543-696B*	.00012"		
543-693	543-693B	.00012"	.0001"/0.001mm	.5"/12.7mm
543-683	543-683B	.0008"	.0005"/0.01mm	.5"/12.7mm

\* Dust-proof type with rubber boot

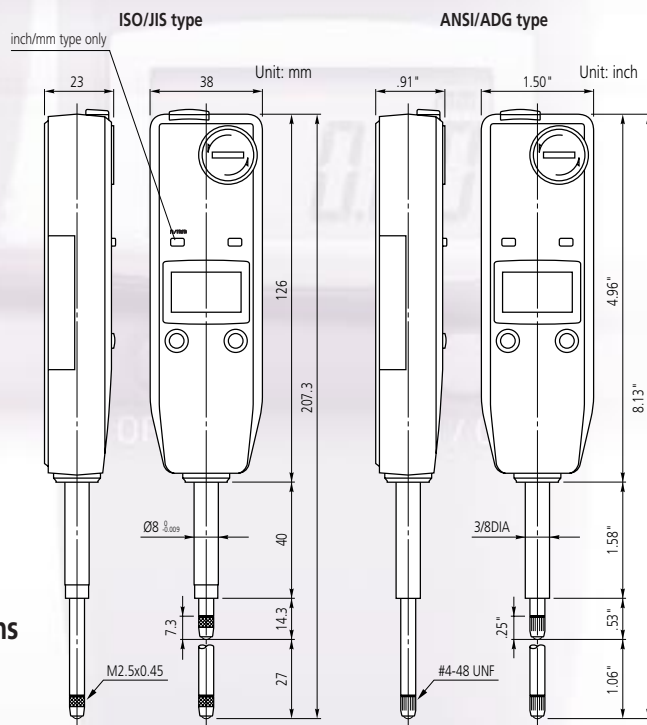


575-123

### 1"/25.4mm range mode with slim body design

#### Technical Data

- Display: LCD
- Functions: Origin setting, Power on/off, inch/mm conversion (inch/mm type), Counting direction switching, SPC data output
- Battery: SR44 (1pc.) (938882)
- Battery life: 20,000 hours in continuous use
- Stem diameter: 3/8" (ANSI/AGD type) or 8mm (ISO/JIS type)
- Contact point: Carbide ball (ISO/JIS type) or steel ball (ANSI/AGD type)
- Measuring force: 1.8N or less
- Dust-water protection level: Conforming to IP42
- Alarm: Low battery voltage, Scale contaminations
- Operating temperature: 0°F to 104°F (0°C to 40°C)
- Mass: .31 lbs./140g



Dimensions

#### Specifications (ISO/JIS type)

Order No.	Accuracy	Resolution	Range
575-121	0.02mm	0.01mm	25.4mm
575-122	.0008"	.0005"/0.01mm	1"/25.4mm

#### Specifications (ANSI/ADG type)

Order No.	Accuracy	Resolution	Range
575-123	.0008"	.0005"/0.01mm	1"/25.4mm

### 1"/25.4mm, 2"/50.8mm range models Multipurpose design



543-558A

2"/50.8mm range model



# ABSOLUTE IDF

## FEATURES

### Intuitive display

- Large LCD with backlighting
- Numerical/analog bar indication
- Changing of green/red backlight color for easy Go/NG reading



Green indication for GO judgment

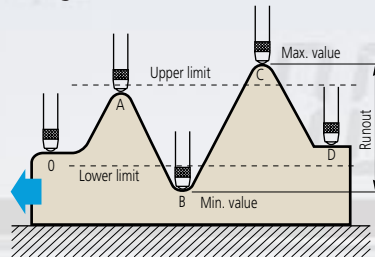


Red indication for  $\pm$ NG judgment

- The resolution can be switched between .001"/.0005"/.0001"/.00005" (or 0.001mm/0.01mm).
- The display range of the analog bar can be changed.

### Peak hold/runout measurement

- Displays the maximum or minimum value during measurement.
- Displays a runout (max. – min. value) during TIR measurement.



### Backup memory

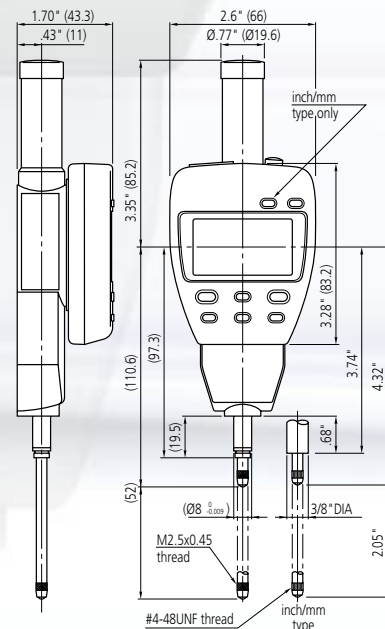
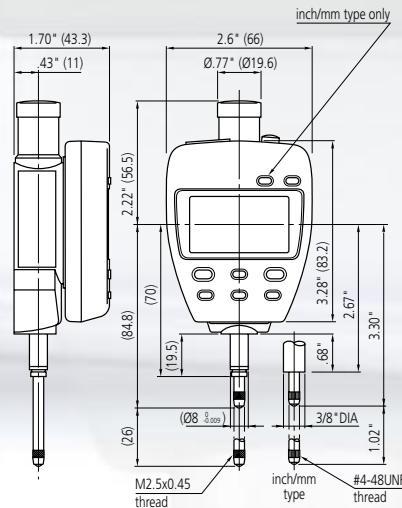
- Retains the setup conditions (peak hold, tolerance judgment) even if the power has been turned off. Measurement can be continued as soon as the power is turned back on.

## Technical Data

- Display: LCD
- Functions: Resolution switching, Origin-set (presetting), Power on/off, Zero-set, MAX/MIN value hold, Runout measurement, inch/mm conversion (inch/mm type), Counting direction switching, SPC data output, Function lock, Measurement condition memory
- Power supply: 9V DC (via AC adaptor), 500mA
- Stem diameter: 3/8" (inch/mm type) or 8mm (mm type)
- Contact point: Carbide ball (mm type) or steel ball (inch/mm type)
- Measuring force: 1.8N or less (1"/25.4mm range type) 2.3N or less (2"/50.8mm range type)
- Dust-water protection level: Conforming to IP30
- Alarm: Over flow error, Tolerance limit setting error, Scale contaminations
- Operating temperature: 0°F to 104°F (0°C to 40°C)
- Mass: .53 lbs./240g (1"/25.4mm range type) .73 lbs./330g (2"/50.8mm range type)

Unit: inch (mm)

## Dimension



**543-552A**

1"/25.4mm range model

## Specifications (ISO/JIS type)

Order No.	Accuracy	Resolution	Range
543-551A	0.003mm	0.001mm	25.4mm
543-557A	0.003mm	0.001mm	50.8mm

## Specifications (ANSI/ADG type)

Order No.	Accuracy	Resolution	Range
543-552A	.00012"	.00005"/0.001mm	1"/25.4mm
543-558A	.00012"	.00005"/0.001mm	2"/50.8mm

# ABSOLUTE IDC

Standard .5"/12.7mm, 1"/25.4mm, 2"/50.8mm range models  
Various designs for a wide range of applications

Peak Holding Type  
543-260



Standard Type  
543-250



Dust-proof Type  
543-259



Signal Output Type  
543-282



Designed for Bore Gage  
543-264B



## Standard Type

### FEATURES

Tolerance judgment

- GO/±NG judgment can be performed by setting upper and lower tolerance limits. The judgment result (GO/±NG) can be displayed in full-size characters.

### Technical Data

- Display: LCD (indicator face: 330° rotation)
- Functions: Origin set (preset), Power on/off, Zero setting, Counting direction switching, GO/±NG judgment, inch/mm conversion (inch/mm type), SPC data output
- Battery: SR44 (1pc.) (938882)
- Battery life: 5,000 hours in continuous use
- Stem diameter: 3/8" (ANSI/AGD type) or 8mm (ISO/JIS type)
- Contact point: Carbide ball (ISO/JIS type) or steel ball (ANSI/AGD type)
- Measuring force: 1.5N/0.9N\* or less (.5"/12.7mm range models), 1.8N or less (1"/25.4mm range models), 2.3N or less (2"/50.8mm range models)
- \*543-270/543-270B/543-271/543-271B/543-272/543-272B
- Dust-water protection level: Conforming to IP42
- Alarm: Low battery voltage, Scale contaminations, Over flow error, Tolerance limit setting error
- Operating temperature: 0°F to 104°F (0°C to 40°C)
- Mass: .35 lbs./160g (.5"/12.7mm range models), .42 lbs./190g (1"/25.4mm range models), .62 lbs./280g (2"/50.8mm range models)

### Specifications (ISO/JIS type)

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-250	543-250B	0.003mm	0.001mm	12.7mm
–	543-450B	0.003mm		25.4mm
–	543-460B	0.006mm		50.8mm
543-290	543-290B	0.005mm	0.01mm	12.7mm
543-270	543-270B	0.02mm		
–	543-457B	0.005mm		25.4mm
–	543-454B	0.03mm		
–	543-464B	0.04mm		50.8mm
543-251	543-251B	.00012"	.00005"/0.001mm	.5"/12.7mm
–	543-451B	.00012"		1"/25.4mm
–	543-461B	.00025"		2"/50.8mm
543-291	543-291B	.0002"	.0005"/0.01mm	.5"/12.7mm
543-271	543-271B	.0008"		
–	543-458B	.0002"		1"/25.4mm
–	543-455B	.0012"		
–	543-465B	.0016"		2"/50.8mm

### Specifications (ANSI/AGD type)

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-252	543-252B	.00012"	.00005"/0.001mm	.5"/12.7mm
—	543-452B	.00012"		1"/25.4mm
—	543-462B	.00025"		2"/50.8mm
543-253	543-253B	.00012"	.0001"/0.001mm	.5"/12.7mm
—	543-453B	.00012"		1"/25.4mm
—	543-463B	.00025"		2"/50.8mm
543-292	543-292B	.0002"	.0005"/0.01mm	.5"/12.7mm
543-272	543-272B	.0008"		
—	543-459B	.0002"		1"/25.4mm
—	543-456B	.0012"		
—	543-466B	.0016"		2"/50.8mm

## Low measuring force type

### FEATURES

Low measuring force of 0.4N - 0.7N

- The low measuring force type is specially designed for elastic workpieces such as plastic parts.

### Technical Data

- Measuring force: 0.4N to 0.7N

Note: Other specifications are same as those of the above standard type.

### Specifications

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-254	543-254B	0.003mm	0.001mm	12.7mm
543-274	543-274B	0.02mm	0.01mm	12.7mm
543-255	543-255B	.00012"	.00005"/0.001mm	.5"/12.7mm
543-256*	543-256B*	.00012"		
543-275	543-275B	.0008"	.0005"/0.01mm	.5"/12.7mm
543-276*	543-276B*	.0008"		

\*ANSI/AGD type

## Dust-proof type

### FEATURES

IP53 dust/water protection level

- The IP53 protection level structure of the dust-proof type allows the indicator to resist dust and contaminants for safe operation in harsh machine shop environments.

### Technical Data

- Measuring force: 2.0N or less
- Dust/Water protection level: Conforming to IP53

Note: Other specifications are same as those of above standard type.

### Specifications

Order No.		Accuracy	Resolution	Range
Back w/lug	Flat-back			
543-257	543-257B	0.003mm	0.001mm	12.7mm
543-277	543-277B	0.02mm	0.01mm	12.7mm
543-258	543-258B	.00012"	.00005"/0.001mm	.5"/12.7mm
543-259*	543-259B*	.00012"		
543-278	543-278B	.0008"	.0005"/0.01mm	.5"/12.7mm
543-279*	543-279B*	.0008"		

\*ANSI/AGD type

## Peak Holding Type

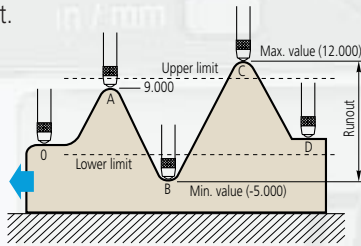
### FEATURES

#### Tolerance judgment

- GO/±NG judgment is performed by setting the upper and lower tolerances for maximum, minimum and runout values.
- High-speed sampling ratio of 50 times per second.

#### Peak hold function

- The maximum, minimum, or runout value can be displayed during measurement.



Spindle position	0	-	A	-	B	-	C	-	D
Normal mode	0.000	↗	5.000	↘	-5.000	↗	10.000	↘	0.000
Max. mode	0.000	↗	5.000	→	5.000	↗	10.000	→	10.000
Min. mode	0.000	→	0.000	↘	-5.000	→	-5.000	→	-5.000
TIR mode	0.000	↗	5.000	↗	10.000	↗	15.000	→	15.000

### Technical Data

- Functions: Origin set (preset), Power on/off, Zero setting, Counting direction switching, GO/±NG judgment, max./min./runout value holding
- inch/mm conversion (inch/mm type), SPC data output, Function lock

Note: Other specifications are the same as those of the standard type.

### Specifications

Order No.	Accuracy	Resolution	Range
Back w/lug	Flat-back		
543-260	543-260B	0.003mm	0.001mm
543-261	543-261B	.00012"	.00005"/0.001mm
543-262*	543-262B*	.00012"	
543-263*	543-263B*	.00012"	.0001"/0.001mm

\*ANSI/AGD type

## Signal Output Type

### FEATURES

#### GO/±NG signal output

- With the max./min. value holding function, this indicator can output the signal of the GO/±NG judgment result against the peak values set to an external device like a sequencer through the NPN open-collector.

Substitute for the mechanical/electrical contact, the judgment is carried out by calculating the measurement data obtained. This provides high reliability with no deterioration of the contact point and volume adjustment.

#### Green/red LED for GO/±NG indication

- The GO/±NG judgment result is also indicated by the green/red LED and the "<,O,>" signs on LCD.

#### IP54 dust/water protection level

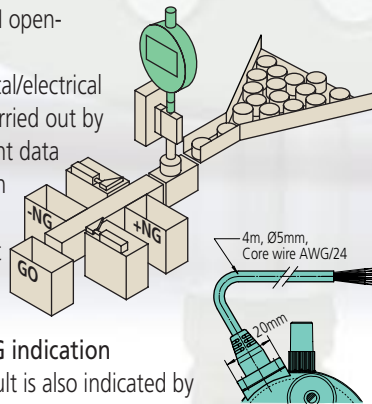
- This indicator achieves IP54 protection level to resist dust and contaminants for safe operation in harsh shop environments.

### Technical Data

- Functions: Origin set (preset), Power on/off, Zero setting, Counting direction switching, GO/±NG judgment, max./min./runout value holding, inch/mm conversion (inch/mm type), Function lock

- Dust-water protection level: Conforms to IP54

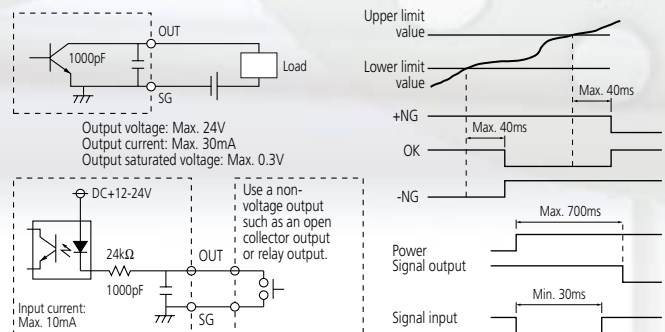
Note: Other specifications are the same as those of the standard type.



### Specifications

Order No.	Accuracy	Resolution	Range
Back w/lug	Flat-back		
543-280	543-280B	0.003mm	0.001mm
543-281	543-281B	.00012"	.00005"/0.001mm
543-282*	543-282B*	.00012"	
543-283*	543-283B*	.00012"	.0005"/0.01mm

\*ANSI/AGD type



### Signal output

Wire color	Signal	I/O	Description
Black	-V (GND)	-	Connected to minus (-) terminal
Red	+V (plus power voltage)	I	Supply power voltage (12VDC - 24VDC)
Orange	-NG	O	Tolerance judgment result output terminals (NPN open-collector output): Only the terminal corresponding to a judgment result is set to the low level. (See the output circuit diagram.)
Green	OK	O	
Brown	+NG	O	
Yellow	PRESET_RECALL/ZERO	I	External input terminals (no-voltage input): If the relevant terminal is set to the low level, its signal becomes true. (See the input circuit diagram.)
Blue	HOLD_RESET	I	
Shield	FG (Frame Ground)	-	Connected to the ground.



## Designed for Bore Gage

### FEATURES

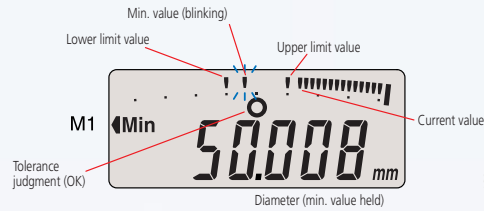
#### Exclusive design for bore gage use

- The minimum value holding function provides simple, accurate and stable ID measurement.
- Up to three sets of reference diameter and upper/lower tolerance values can be stored to simplify the start-up key operation in the repeatable hole inspection of mixed diameter sizes.
- An analog bar indication is integrated to enhance readability.

### Technical Data

- Functions: Origin set (preset), Power on/off, Data hold, GO/±NG judgment, min. value holding, inch/mm conversion (inch/mm type), SPC data output, function lock

Note: Other specifications are same as those of the standard type.



### Specifications

Order No.	Accuracy	Resolution	Range
Back w/lug	Flat-back		
- 543-264B	0.003mm	0.001mm	12.7mm
- 543-265B	.00012"	.00005"/0.001mm	.5"/12.7mm

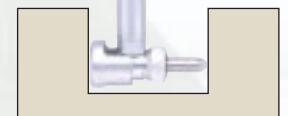
### Specifications (ANSI/AGD type)

Order No.	Accuracy	Resolution	Range
Back w/lug	Flat-back		
- 543-266B	0.003mm	.00005"/0.001mm	12.7mm
- 543-267B	.00012"	.0001"/0.001mm	.5"/12.7mm

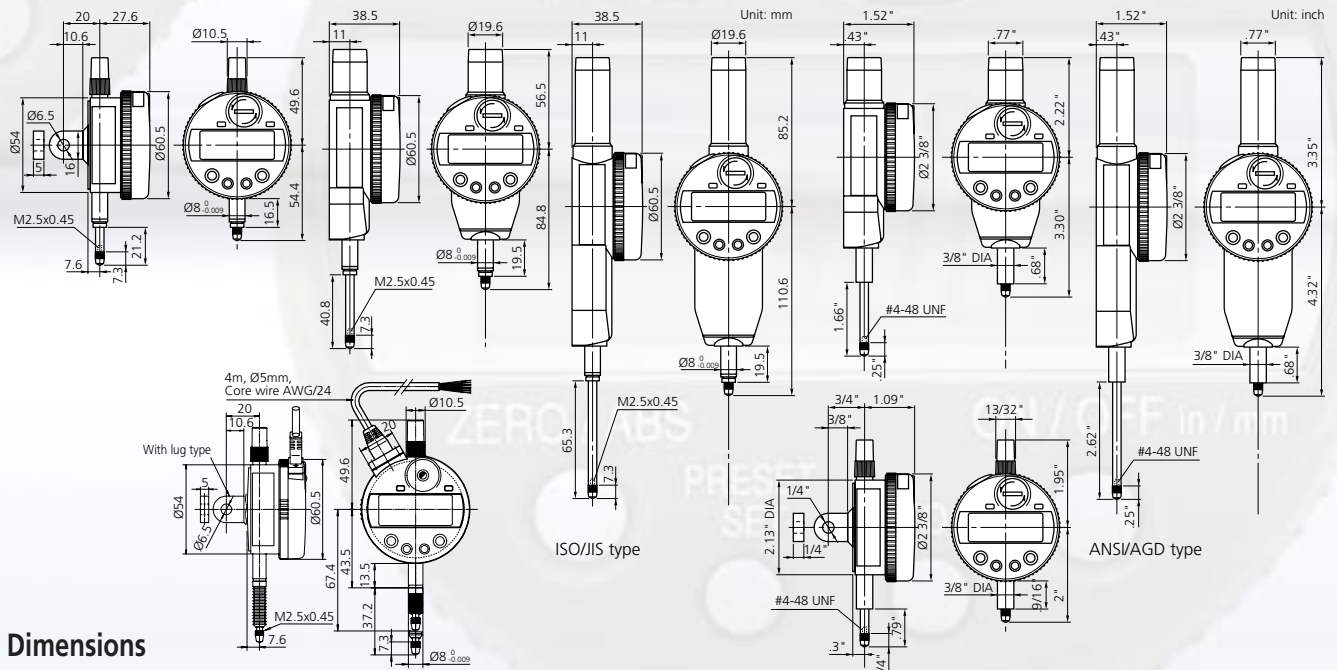
### Optional bore gage

Order No.	Range
526-170	0.95 - 1.55mm
526-160	1.5 - 4.0mm
526-150	3.7 - 7.3mm
526-101	7.0 - 10.0mm
526-102	10 - 18mm
511-126	18 - 35mm
511-127	35 - 60mm
511-132	50 - 150mm

\* Set No. with IDC 18-150mm:  
511-905 .7"-6" : 511-915



Detecting a minimum point for diameter



### Dimensions

A Mitutoyo Absolute digital depth gauge. The device has a black plastic body with a stainless steel rod and a black tip. The LCD screen displays the formula  $Ax+B+Cx^2$  and the value 5.00 mm. The screen is framed in red. Above the screen, there is a 'MODE' button and a 'ON/OFF' button. Below the screen, there are four buttons: 'DATA/HOLD' (blue), 'PRESET SET' (grey), 'TOL' (grey), and 'ZERO/ABS' (yellow). The brand name 'Mitutoyo' and 'ABSOLUTE' are printed on the top left of the device.

Technical drawing of the Mitutoyo Model 100C digital depth gauge. The drawing includes three side views (left, front, and right) and a top view. Dimensions are given in inches and millimeters. Key features include a digital display, a zero/ABS button, and a data/hold button. The gauge is made of stainless steel and has a 3/8 inch diameter base.

Unit: inch (mm)

Dimensions (inches / millimeters):

- Top View:
  - Overall Width: 1.95" (49.6)
  - Overall Height: 2.00" (50.95)
  - Display Area: 1.16" (29.5)
  - Button Area: 0.91" (23.1)
  - Base Diameter: 3/8" DIA (9.52)
- Side View (Left):
  - Overall Length: 6.13" (156.4)
  - Display Area: 0.28" (7.1)
  - Base Diameter: 3/8" DIA (9.52)
- Side View (Right):
  - Overall Length: 6.13" (156.4)
  - Display Area: 0.28" (7.1)
  - Base Diameter: 3/8" DIA (9.52)

Labels on the gauge:

- Mitutoyo
- Model 100C
- DATA/HOLD
- ZERO/ABS
- 0.0004" (0.01mm)

Thread: M2.5x0.45 thread

- Display: LCD
- Functions: Calculation, Zero set, Presetting, Tolerance judgment, Hold button, Output and Switching ABS/INC conversion
- Battery: SR44 x 1pc.
- Battery life: 120months under normal use
- Stem diameter: 3/8" DIA or ø8mm (ø9.525mm)
- Contact point: Carbide ball (ISO/JIS type) or steel ball (ANSI/AGD type)
- Measuring force: 1.5N or less
- Dust/Water protection level: Conforming to IP42
- Alarm: Low battery voltage, Scale contaminations, Tolerance limit setting error, ABS data composition error, Over flow error
- Operating temperature: 0°F to 104°F (0°C to 40°C)
- Mass: .35lbs / 160g

Order No.	Accuracy	Resolution	Range
543-285B	0.003mm (0.00012") or less	0.002mm to 1mm	12.7mm
543-286B	0.003mm (0.00012") or less	.00001"/0.003mm to	.5"/12.7mm
543-287B		.05"/1mm	



## Calculation function

The Absolute Digimatic indicator performs internal calculations using the formula  $Ax+B+Cx^{-1}$  (assuming spindle displacement as  $x$ ) while the specified coefficients  $A$ ,  $B$  and,  $C$  can be set with respect to the purpose of measurement or dimensions of the fixtures. This unique feature allows you to read your measurements directly, without making conversions.

## Data output

The Absolute Digimatic indicator can output data to a data processor. This allows the recording of measuring results and the configuration of a system that includes process control via the data processor. Additionally, arithmetic coefficients can be set from a connected personal computer rather than the indicator itself.

## Tolerance judgment

Setting the upper/lower limits produces a display of tolerance judgments, thus making it easy to calculate for extreme accuracy.

## Large display LCD

A large LCD makes it easy to read the settings of arithmetic coefficients, as well as tolerance judgments and other aspects of the measuring process.




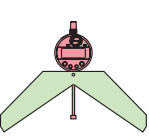
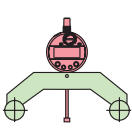
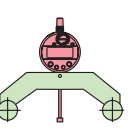
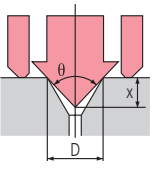
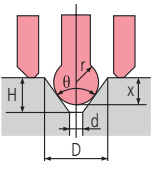
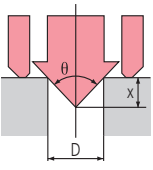
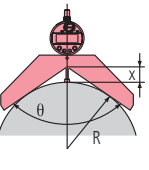
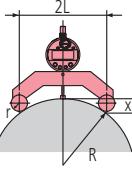
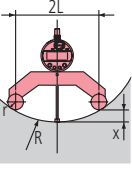
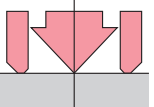
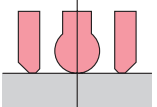
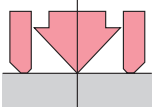

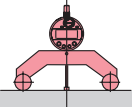
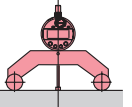
## Display hold

The Display Hold function is useful when LCD viewing is difficult during measurement.

Maximum value and minimum value can be held, as well.

## Calculation examples of arithmetic coefficients

(Calculate arithmetic coefficients  $A$ ,  $B$ , and  $C$  with a scientific calculator and then set the value you've determined. For details, refer to the table below.)

Fixture						
Contact point	Cone	Ball	Cone	—	—	—
Dimension X: Spindle displacement						
Measurement item	D= Diameter/Feeler/ Groove width H= Countersink depth	D= Diameter/Feeler/ Groove width H= Countersink depth	D= Hole diameter/ Feeler/ Groove width	2R=Outside diameter	2R=Outside diameter	2R=Inside diameter
Calculation formula	$D=Ax$	$D=Ax+B$ $H=Ax+B$	$D=Ax$	$R=Ax$	$R=Ax+B+Cx^{-1}$	$R=Ax+B+Cx^{-1}$
Arithmetic Coefficient	A	$-2\tan \frac{\theta}{2}$	$-2\tan \frac{\theta}{2}$ $-1$	$-2\tan \frac{\theta}{2}$	$-\frac{\sin \frac{\theta}{2}}{1-\sin \frac{\theta}{2}}$	$\frac{1}{2}$ $-\frac{1}{2}$
	B	0	$2r \left( \frac{1}{\cos \frac{\theta}{2}} - \tan \frac{\theta}{2} \right)$ $r \left( \frac{1}{\sin \frac{\theta}{2}} - 1 \right) - \frac{d}{2\tan \frac{\theta}{2}}$	0	0	$-r$ $r$
	C	0	0	0	0	$\frac{L^2}{2}$ $-\frac{L^2}{2}$
Origin setting position (the position when $x=0$ )						
Indicated value when origin setting (indicated value when $x=0$ )	0	Value for coefficient B	0	0	(Overflow)	(Overflow)

Various fixtures suited for individual workpieces can be prepared.  
Measuring accuracy is subject to fixture accuracy.



**Note:**

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