# Digimatic Indicators

Bulletin No. 1824

## Digital indicators with Absolute encoders

Mitutoyo

# Mitutoyo Digimatic Indicators

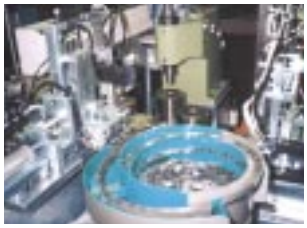
**The highest in accuracy, reliability and durability**

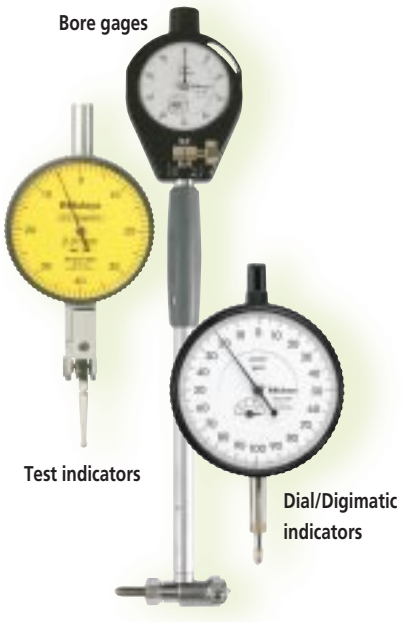
More than 11 million indicators have been produced since production began in 1959. Advanced indicator production lines have been integrated with fully automated assembly and inspection processes, yielding indicators used in every part of the world. The plant also produces and ships test indicators, bore 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$^2$

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

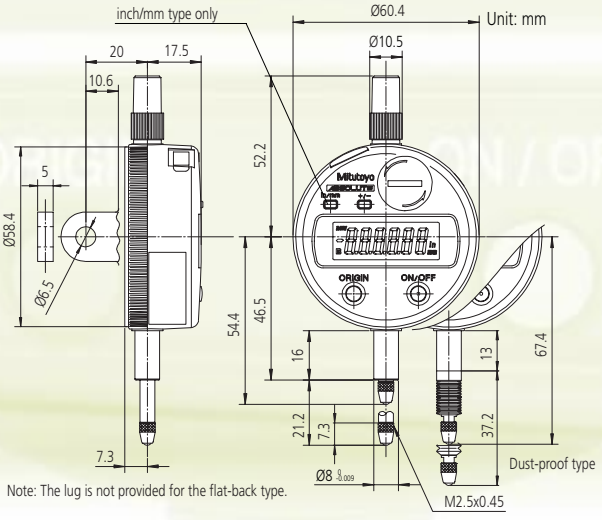
## .5"/12.7mm range model
## Simple key functions in an economical package

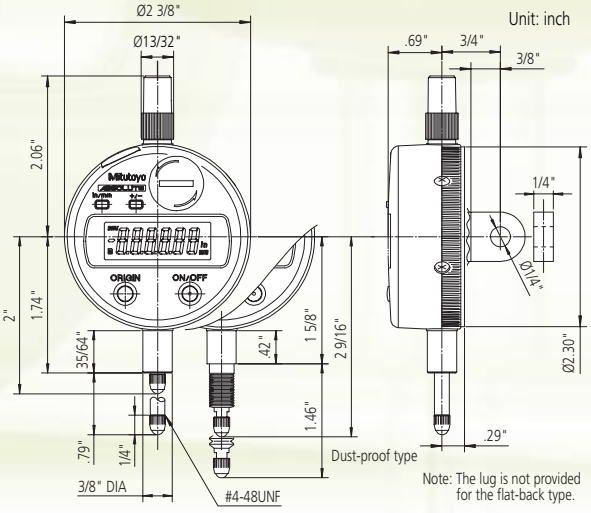
### Technical Data

- 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

### 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

### Specifications (ANSI/ADG 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

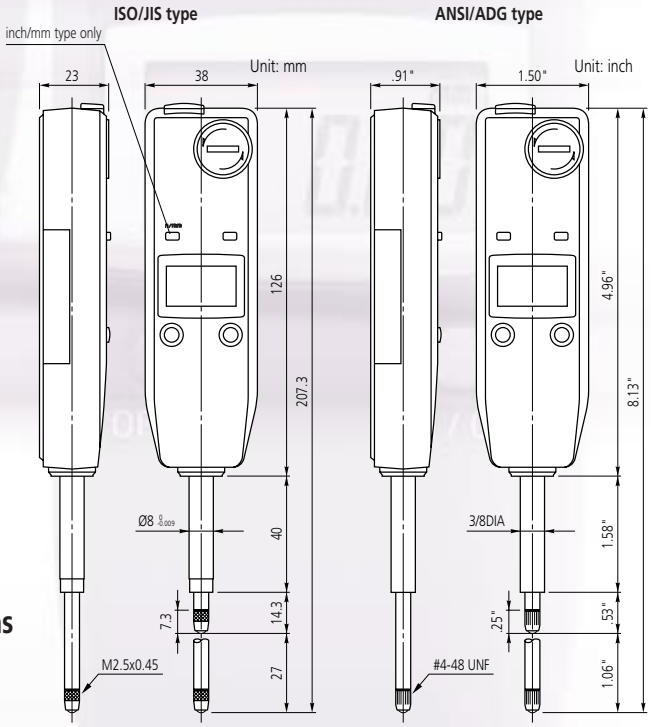
## 1”/25.4mm range mode with slim body design

### 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


**575-123**

### Dimensions




## 1”/25.4mm, 2”/50.8mm range models

### Multipurpose design


**543-558A**
2”/50.8mm range model

### 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 |

# ABSOLUTE IDF

## FEATURES

### Intuitive display

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

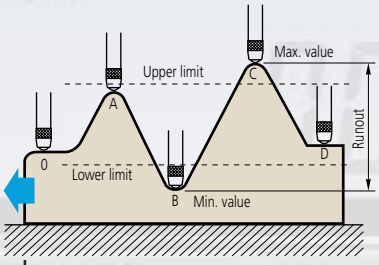
Green indication for GO judgment

Red indication for ±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.

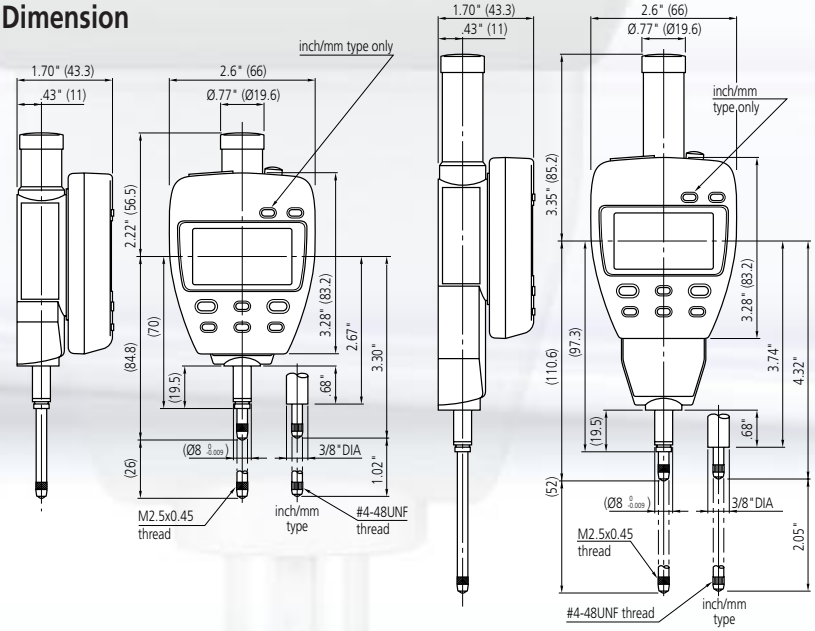
## Technical Data

- 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)


**543-552A**
1"/25.4mm range model

## Dimension

Unit: inch (mm)




## 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

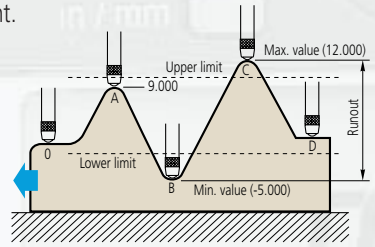
### FEATURES

**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 | 12.7mm |
| 543-261 | 543-261B | .00012" | .00005"/0.001mm | .5"/12.7mm |
| 543-262* | 543-262B* | .00012" | | |
| 543-263* | 543-263B* | .00012" | .0001"/0.001mm | .5"/12.7mm |

*ANSI/AGD type

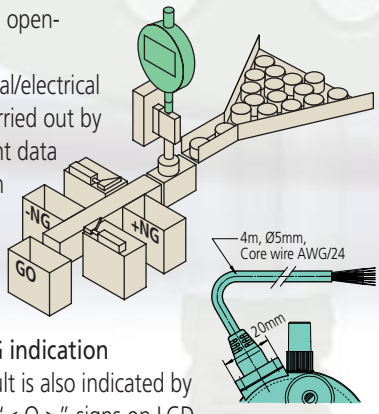
## Signal Output Type

### 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

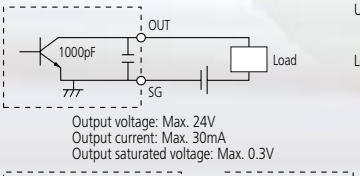
- Functions: Origin set (preset), Power on/off, Zero setting, Counting direction switching, GO/±NG judgment, max./min./runout value holding, inch/mm conversion (inch/mm type), Function lock
- Dust-water protection level: Conforms to IP54

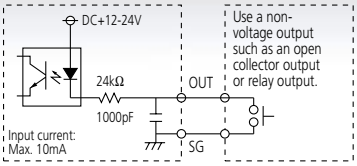
Note: Other specifications are the same as those of the standard type.

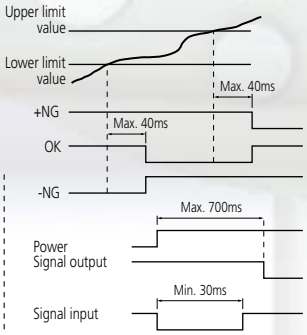
### Specifications

| Order No. | | Accuracy | Resolution | Range |
|---|---|---|---|---|
| Back w/lug | Flat-back | | | |
| 543-280 | 543-280B | 0.003mm | 0.001mm | 12.7mm |
| 543-281 | 543-281B | .00012" | .00005"/0.001mm | .5"/12.7mm |
| 543-282* | 543-282B* | .00012" | | |
| 543-283* | 543-283B* | .00012" | .0005"/0.01mm | .5"/12.7mm |

*ANSI/AGD type




### Signal output

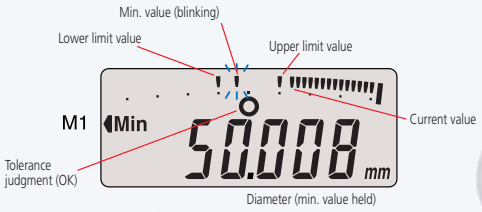
| Wire color | Signal | I/O | Description |
|---|---|---|---|
| Black | -V (GND) | – | Connected to minus (-) terminal |
| Red | +V (plus power voltage) | I | Supply power voltage (12VDC - 24VDC) |
| Orange | $\overline{\text{-NG}}$ | O | Tolerance judgment result output terminals (NPN open-collector output): Only the terminal corresponding to a judgment result is set to the low level. (See the output circuit diagram.) |
| Green | $\overline{\text{OK}}$ | O | |
| Brown | $\overline{\text{+NG}}$ | O | |
| Yellow | $\overline{\text{PRESET\_RECALL/ZERO}}$ | 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 | $\overline{\text{HOLD\_RESET}}$ | 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.




Detecting a minimum point for diameter

## 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)

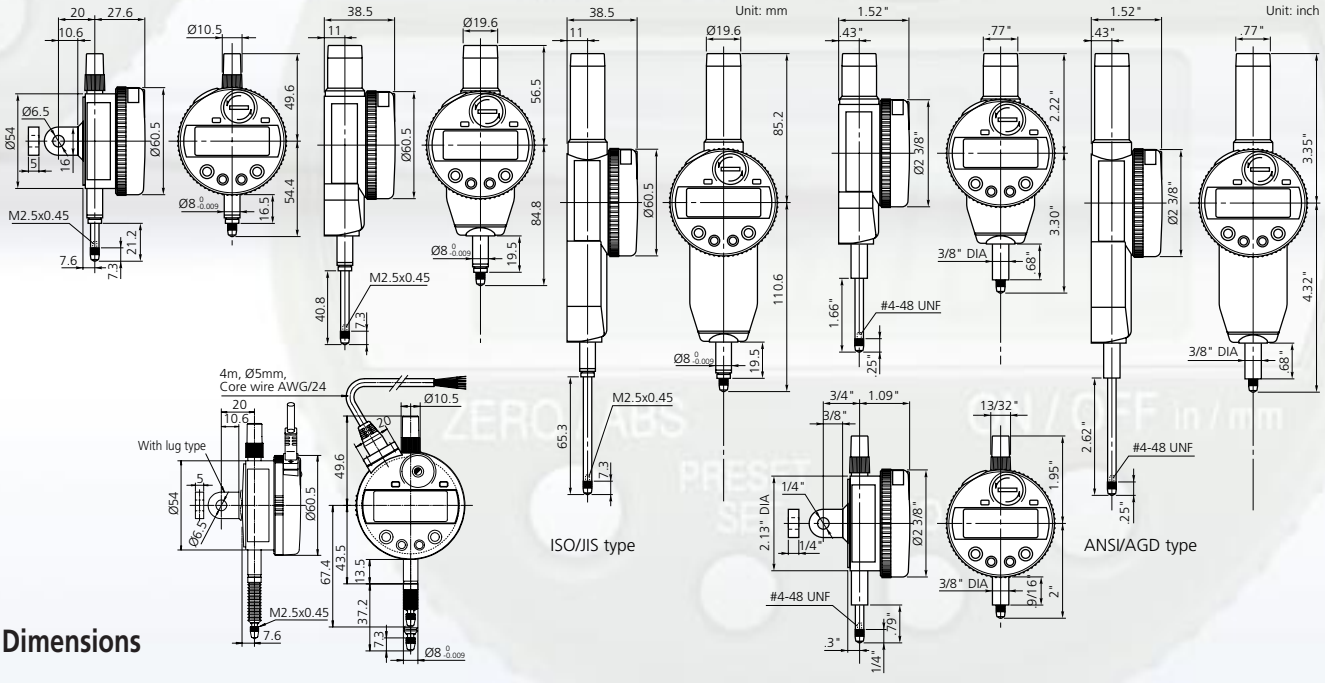
| Order No. | | Accuracy | Resolution | Range |
|---|---|---|---|---|
| Back w/lug | Flat-back | | | |
| – | 543-266B | 0.003mm | .00005"/0.001mm | 12.7mm |
| – | 543-267B | .00012" | .0001"/0.001mm | .5"/12.7mm |

## 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 |

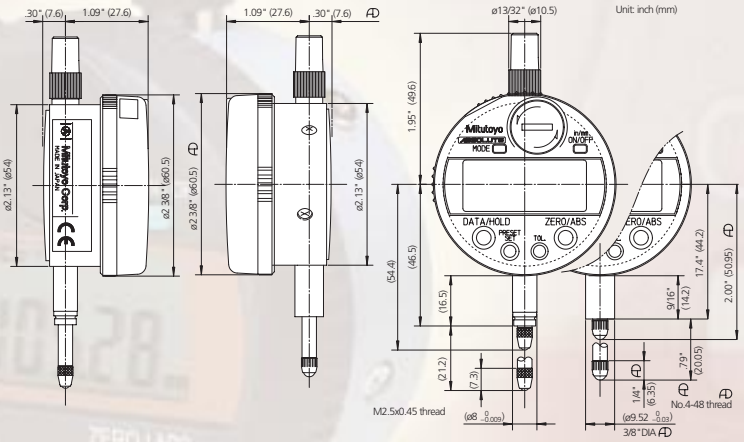
* Set No. with IDC 18-150mm: 511-905 .7"-6": 511-915

## Dimensions



# CALCULATION-TYPE DIGIMATIC INDICATOR


**The Calculation-Type Digimatic indicator incorporates an internal calculation function in place of spindle displacement. With fixtures, measurements such as inside diameter and radius of curvature measurement can easily be obtained without the trouble of conversion tables or equivalents.**




## Technical Data

- 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 diamter: 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

## Fixture example

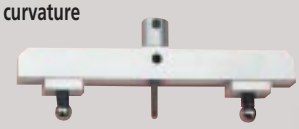
Hole diameter

Groove width

Chamfer hole diameter

Outside diameter

Radius of curvature



Inside diameter

## Specifications

| 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 .05"/1mm | .5"/12.7mm |
| 543-287B | | | |

All instruments in this series are of the flat-back type.

## 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

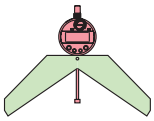
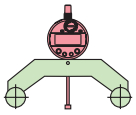
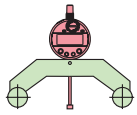
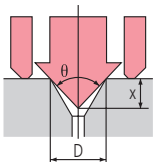
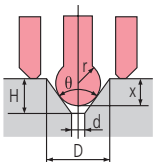
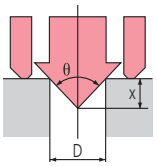
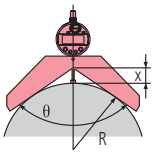
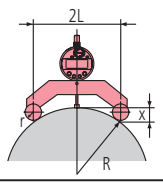
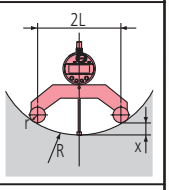
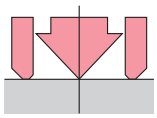
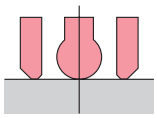
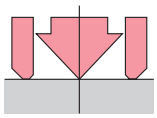
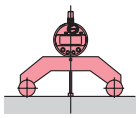
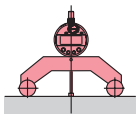
A large LCD makes it easy to read the settings of arithmetic coefficients, as well as tolerance judgments and other aspects of the measuring process.

## 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) | |  |  |  |  Contact point free |  |  |
| 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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