



# CITIZEN

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# CITIZEN

# P R E C I S I O N

# M E A S U R I N G

**Precision Measuring Instruments**

**General Catalog**

# I N S T R U M E N T S

**CITIZEN FINEDEVICE CO., LTD.**

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2018-10-2000

No.E08

# Grind, Measure and Assemble

Our mastery of the basics of craftsmanship is the proof of reliability



Through manufacturing watches that require absolute precision, CITIZEN has continued to refine its technologies to "grind," "measure" and "assemble."

These three technologies are the basics of craftsmanship.

It is no exaggeration to say that CITIZEN is the only manufacturer of measuring instruments that possesses all three of these technologies.

Our technical abilities, which have been proving their worth in measurements of watch components requiring high precision in micron units, have become the proof of reliability,

and they now contribute to measurements in various fields

including bearings, auto components and electronic components.



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| Displacement Sensor                                              |      |
| Digital Gauge<br>SA series                                       | 13   |
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page 13

Displacement Sensors

Digital Gauges

# SA Series

## Robust

The W-bearing structure enables the product to withstand 200 million sliding operations under a durability test in which load is applied in the vertical, horizontal, and oblique directions.

## Accurate

Adoption of the absolute method significantly reduces counting errors compared to conventional digital gauges.

## Wide product lineup

### ■ Air purge specification

Usable under environments in which the product is exposed to cutting fluid.

### ■ Pneumatic drive specification

Facilitates simplification of system design.

### ■ Abundant lineup of long-stroke products

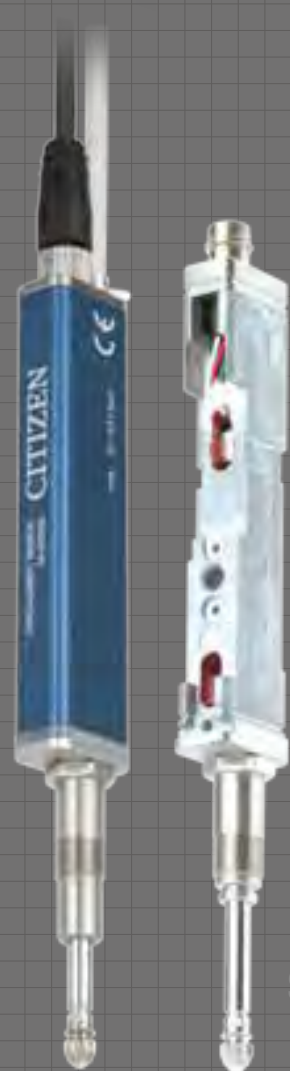
Models with 10-mm, 32-mm, 50-mm sensor heads are available.

## Controllers adapted to applications

One-channel type for desktop placement

Connectable type to accommodate up to 16 units

Multi-channel type focused on data output



SA series

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Electric Micrometers

## ELEMETRON

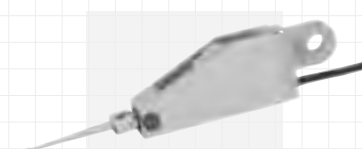
### Can measure in units of 0.1 $\mu\text{m}$

The best choice for high-precision measurement.

### Low-measuring-force type available

Can measure soft and fragile objects.

### Long-selling products that use differential transformers



Electric Micrometer



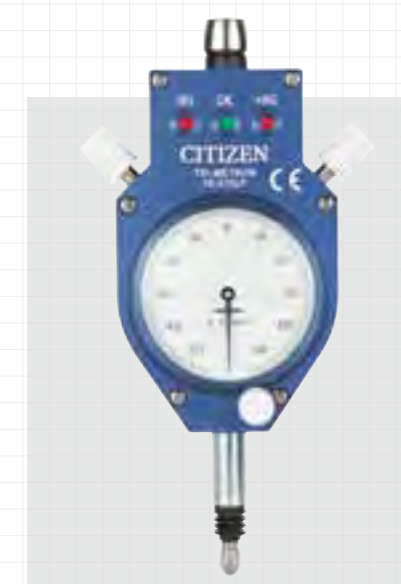
Measuring Stand

## Measuring Stands page 37

This lineup of horizontal stands facilitates measurement of product outer and inner diameters.

Measure with minimal error by attaching the SA series or Mu-METRON.

Measure unusually shaped workpieces or grooves by using special contact points.



Signal Indicators

## TRI-METRON page 33

Micro indicators

## Mu-METRON

### Simple structure, no amplifier needed

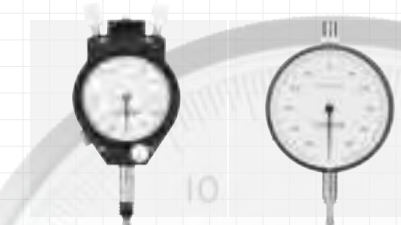
The most cost-efficient option for simple pass/fail measurement.

### High-precision micro indicators

Achieves high precision by adopting the mechanical structure of a watch.

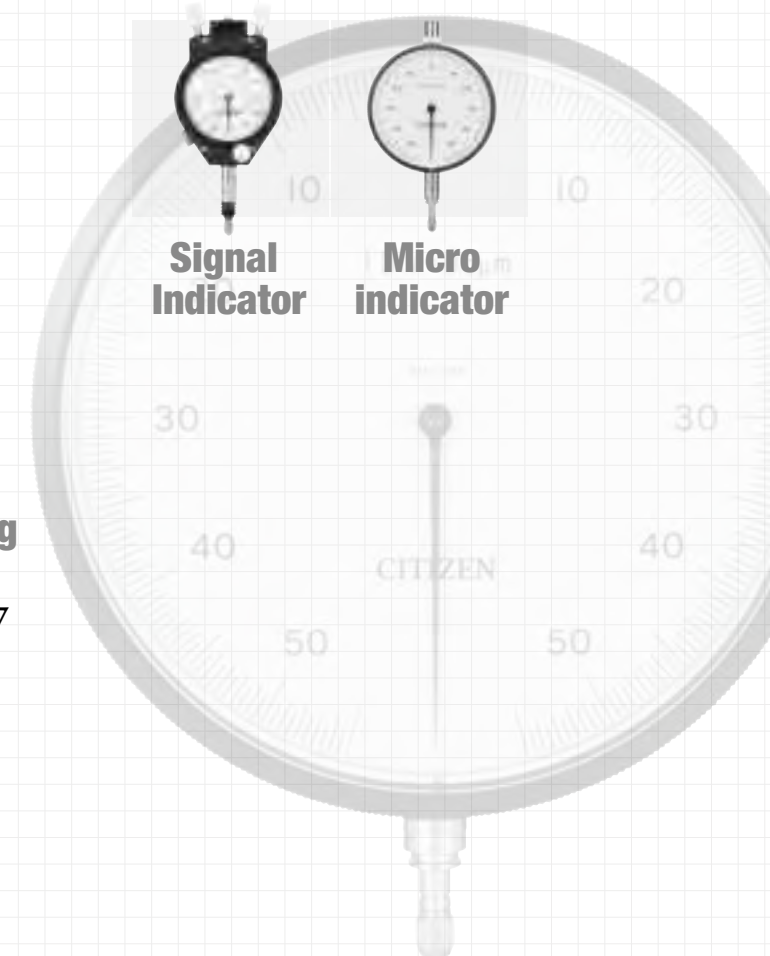
### Two types:

Mu-METRON high-precision micro indicators, and TRI-METRON incorporating electric contacts in Mu-METRON



Signal Indicator

Micro indicator



# Lineup

| SA series                       | ELEMETRON       |
|---------------------------------|-----------------|
| Measurement range 10 mm — 50 mm | ±0.5 mm — ±1 mm |
| Resolution 0.1 μm • 0.5 μm      | 0.1 μm          |

| Measurement range<br>Resolution | ±0.5 mm                                                                                                      | ±0.7 mm                                                                                                        | ±1 mm                                                                                          | 10 mm                                                                                                                                         | 32 mm     | 50 mm     |
|---------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| 0.1 μm                          | DTH - L□□<br>DTH - L□□U<br> | DTH - P□□S<br>DTH - P□□SH<br> | DTH - P□□<br> | SA - S110<br>SA - S110/03N<br>SA - S110AP<br>SA - S110PD<br> |           |           |
| 0.5 μm                          |                                                                                                              |                                                                                                                |                                                                                                | SA - S510<br>SA - S510/03N<br>SA - S510AP<br>SA - S510PD<br> | SA - S532 | SA - S550 |

# Lineup

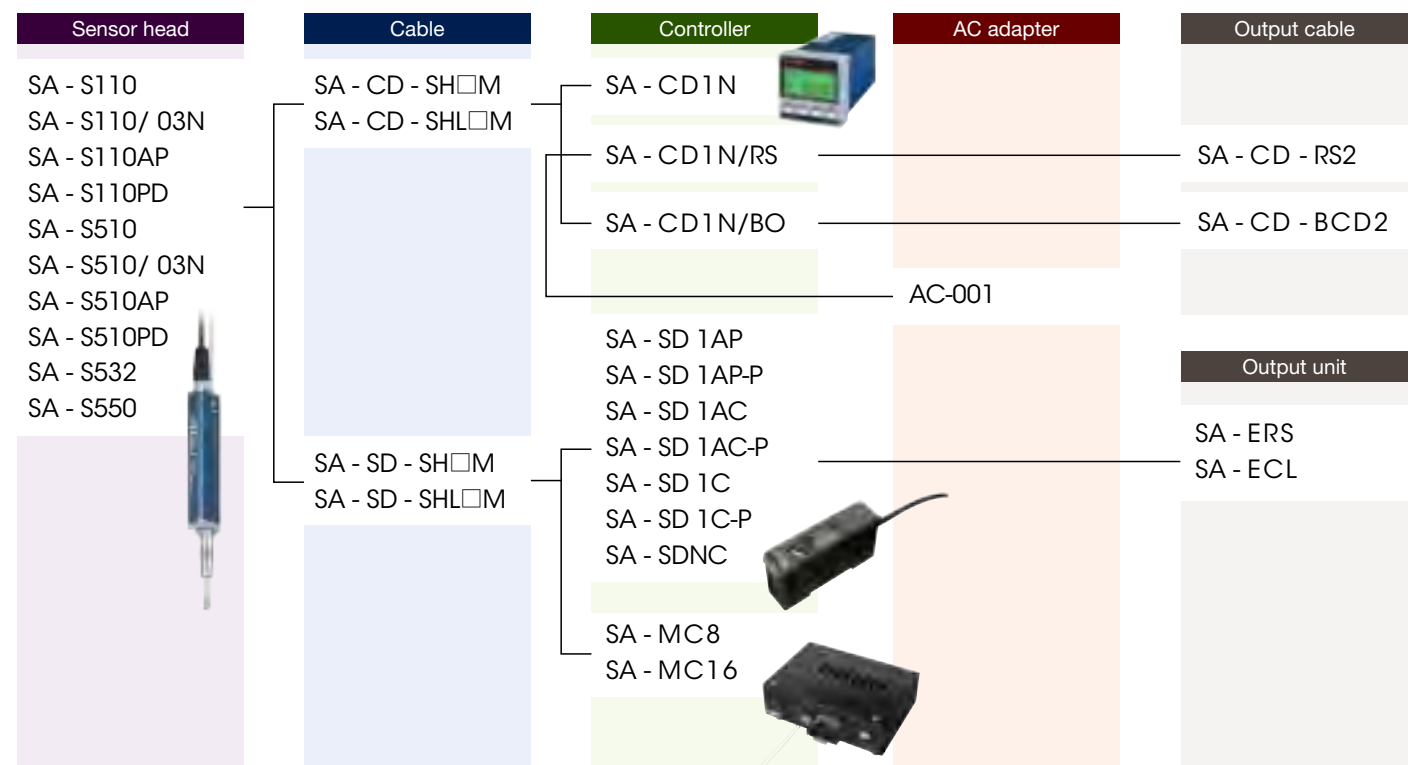
| TRI-METRON                           | Mu-METRON     |
|--------------------------------------|---------------|
| Measurement range ±0.05 mm — ±0.6 mm | ±0.05 mm      |
| Resolution 1 μm — 20 μm              | 0.5 μm — 1 μm |

| Measurement range<br>Resolution | ±0.05 mm                                                                                                                                                                                                                                 | ±0.1 mm                                                                             | ±0.5 mm                    | ±0.6 mm  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------|----------|
| 0.5 μm                          | 4M - 100P<br>                                                                                                                                         |                                                                                     |                            |          |
| 1 μm                            | 1S - 100LP<br>1S - 100<br>2S - 100<br><br>2M - 100<br>3M - 100<br> |  |                            |          |
| 2 μm                            |                                                                                                                                                                                                                                          | 2S - 200                                                                            |                            |          |
| 10 μm                           |                                                                                                                                                                                                                                          |                                                                                     | 1S - 010LP<br>1S - 010     | 2S - 010 |
| 20 μm                           |                                                                                                                                                                                                                                          |                                                                                     | 1S - 010FIS<br>2S - 010FIS |          |

## SA series product set

Sensor head, cable, controller, output cable

# System

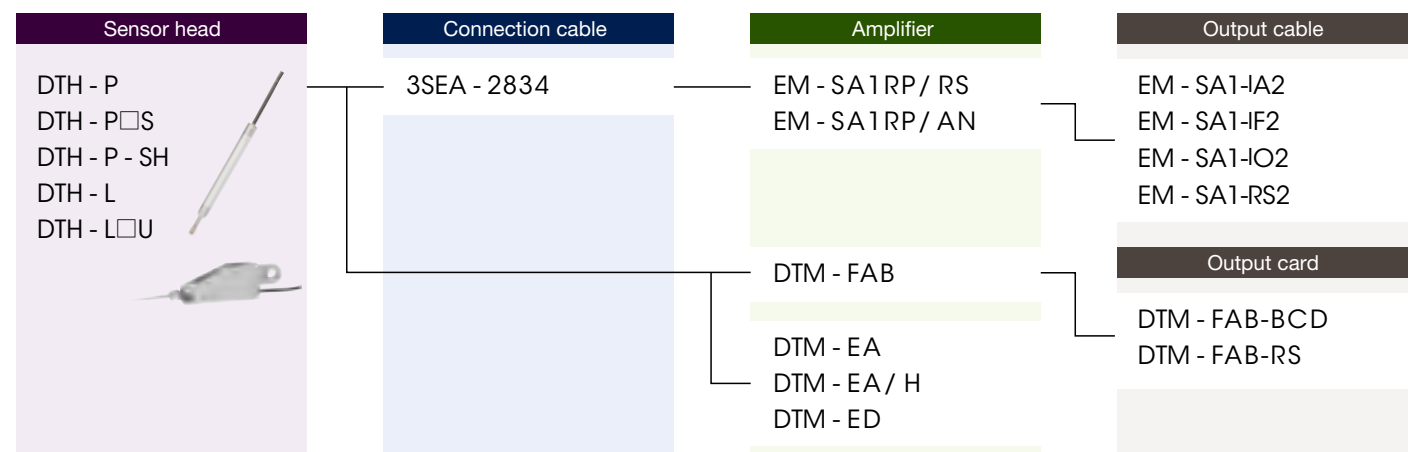


## ELEMETRON product set

Sensor head, connection cable, amplifier, output cable/output card

0.1 μm

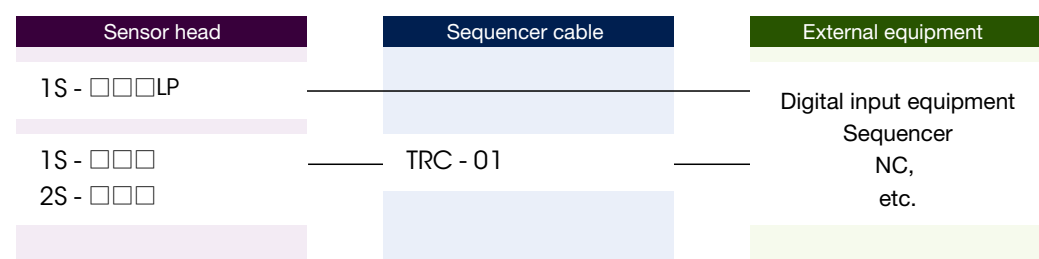
# System



## TRI-METRON product set

Sensor head, sequencer cable, sequencer

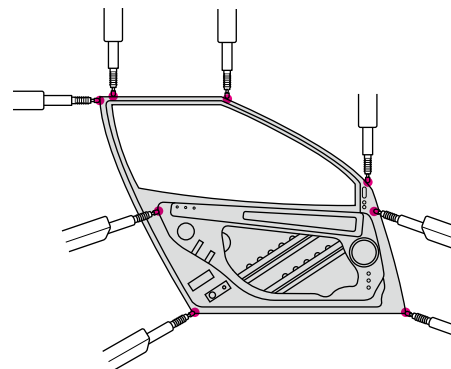
# System



# Application

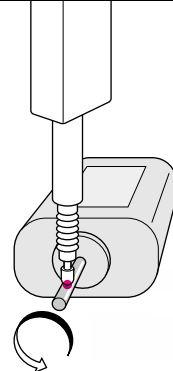
## Automobile

Positioning



- Attachment positions are accurately determined by simultaneous multi-point measurement using multiple contact points.

Eccentricity measurement

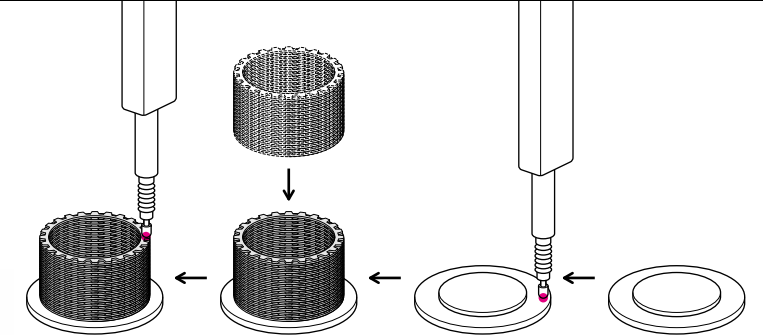


- Eccentricity of motor shafts used for windshield wipers or doors is measured while rotating the shafts at high speed.

With our precision measuring instruments,  
all kinds of automobile components  
can be measured.  
Our instruments greatly contribute to  
the modern automotive industry.

## Automobile

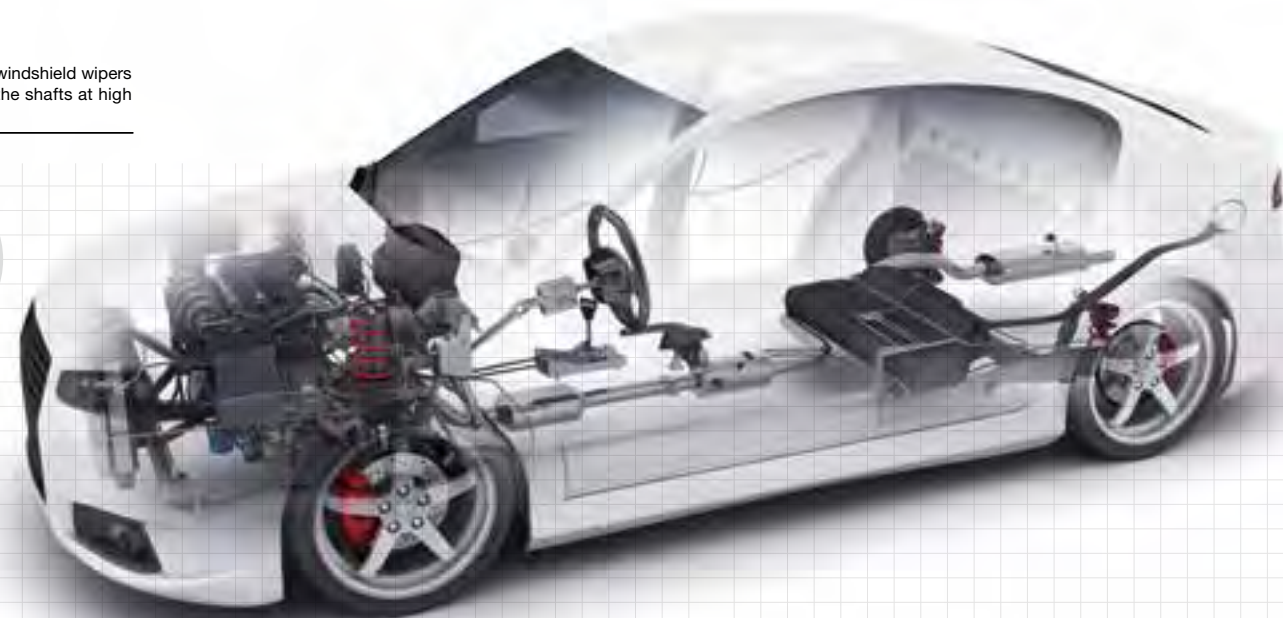
Positioning & height measurement



- Pass/fail judgments are made in each component assembly process based on height measurement.

Doors

Motors



Transmissions

Steering

Brake discs

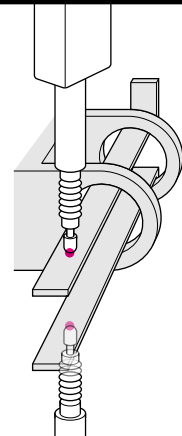
Crankshafts

Valves

Engine piston rings

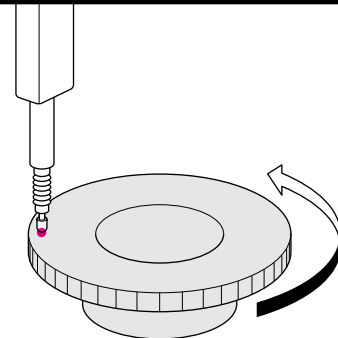
Cylinder head covers  
(Aluminum diecast products)

Angle & inner diameter measurement



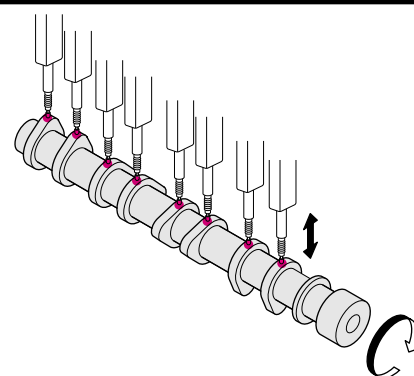
- Shaft inner and outer diameters are measured by two contact points.

Flatness measurement



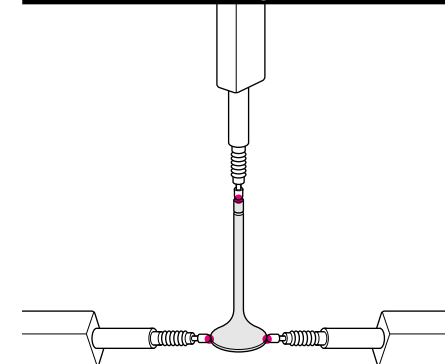
- Disc surface flatness is measured by one contact point while rotating the disc.

Shape, eccentricity, & crank journal runout measurement



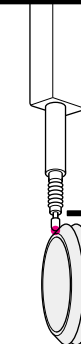
- All measurements required for shafts can be performed.

Outer diameter & height measurement



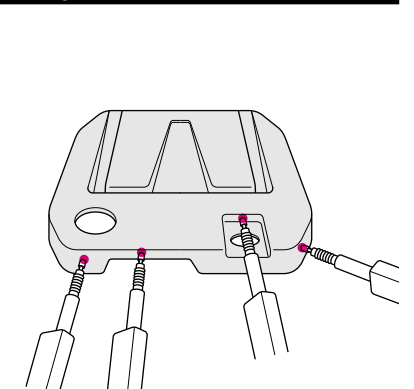
- Measurement is instantaneously performed by simultaneous multi-point measurements using multiple contact points.

Front-back judgment & inner diameter measurement



- Run the sensor over stacked piston rings to judge the front or back.

Height & flatness measurement



- Height and flatness are measured by simultaneous multi-point measurement using multiple contact points.

# Application Mobile Phone

The technologies we cultivated through measurement for watches, which are precision instruments, are used to measure the components of mobile phones, which are essential consumer products.



## Mobile Phone

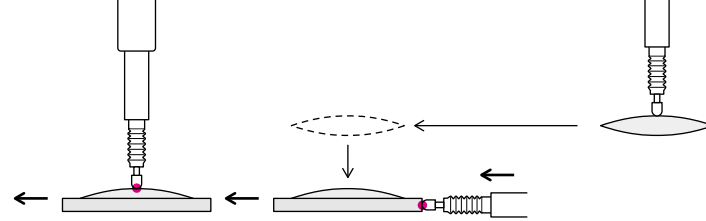
Batteries

Tablet surfaces

Chassis & covers

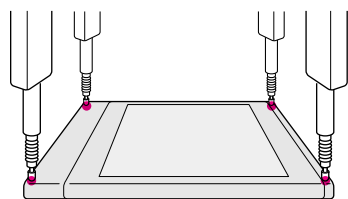
Camera lens cases

### Positioning & thickness/height/flatness measurement



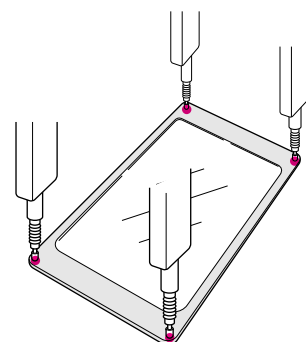
- Pass/fail judgments for the lens based on thickness, height, and flatness measurement. Accurate positioning during assembly and pass/fail judgment based on height measurement.

### Height measurement



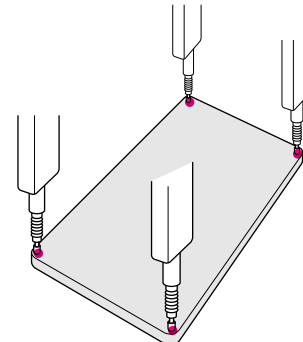
- Pass/fail judgments are made by comparison to the master gauge with one contact point.

### Thickness & flatness measurement



- Instantaneous judgment by multi-point measurement using multiple contact points.

### Thickness & flatness measurement

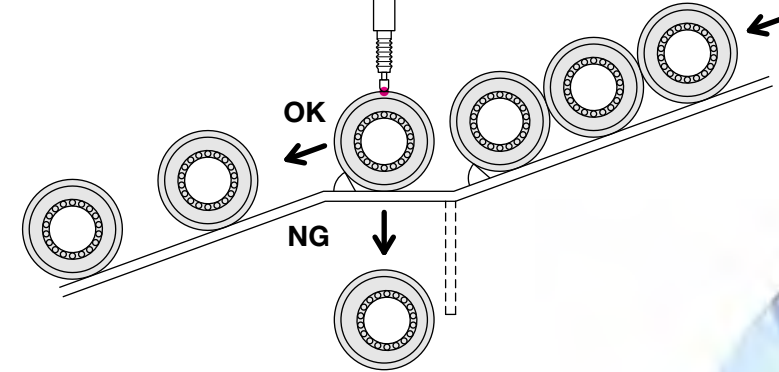


- Instantaneous judgment by multi-point measurement using multiple contact points.

# Application Bearing

Bearings are used in many industrial products. We have handled bearing measurement since our establishment, and we are the leaders in terms of experience and performance in Japan.

### Height measurement



- Judgments are made based on height measurement in the final line after processing.

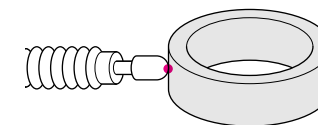
Completed products

## Bearing

Ball bearing rings

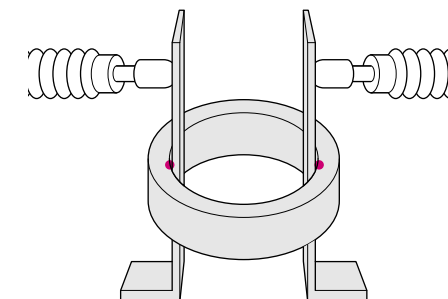
Balls

### Height measurement



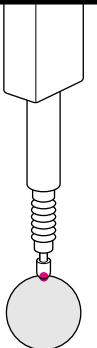
- Pass/fail judgments are made by comparison to the master gauge with one contact point.

### Outer & inner diameter measurement



- Measurement is made with two contact points. Outer and inner diameters are measured in separate processes.

### Height measurement



- Pass/fail judgments are made by comparison to the master gauge with one contact point.



Digital Gauge

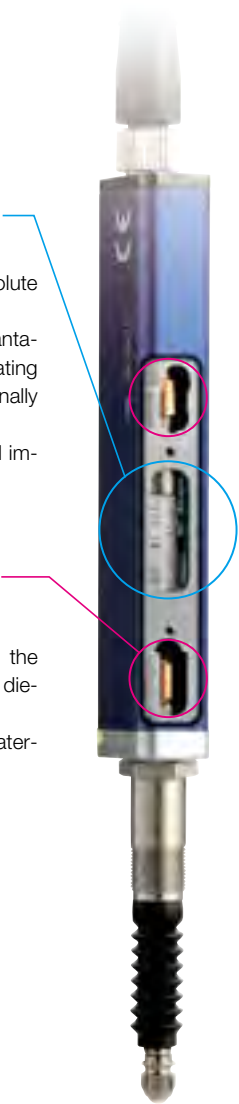
# Displacement Sensors

The SA series of digital gauges adopt the absolute method and W-bearing structure to achieve superior precision and durability. The high-precision contact displacement sensor optically detects the spindle's absolute position and outputs data with a high resolution. The air purge specification type prevents the invasion of foreign objects from the outside by raising the inner pressure. This enables precise measurement in environments with liquids such as permeable oil, coolant liquids, and cutting fluids.

Digital Gauge

## SA Series

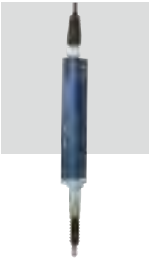
- The advanced absolute method eliminates counting errors  
SA series displacement sensors adopt the optical absolute encoder method. With this method, the absolute position is read instantaneously when the power is turned on, thereby eliminating the need for master adjustment, which has conventionally been required each time. This method reduces the setup time for each use and improves your work efficiency.
- Slim and tough W-bearing structure  
Metal bearings are provided both above and below the measuring part, and they are housed inside a robust die-cast body to achieve extreme durability. Their incredible robustness to vibrations, shocks, and lateral loads have earned customers' trust.



### Detectors

#### Absolute method detectors

SA-S110, SA-S110/03N  
SA-S510, SA-S510/03N  
SA-S532  
SA-S550  
SA-S110AP / SA-S510AP  
Air purge specification  
SA-S110PD / SA-S510PD  
Pneumatic drive specification



### Controllers

#### Controllers for SA series detectors

SA-CD  
SA-SD  
SA-MC8 / SA-MC16  
SA-ERS  
SA-ECL



### Accessories

#### Controllers for SA series detectors

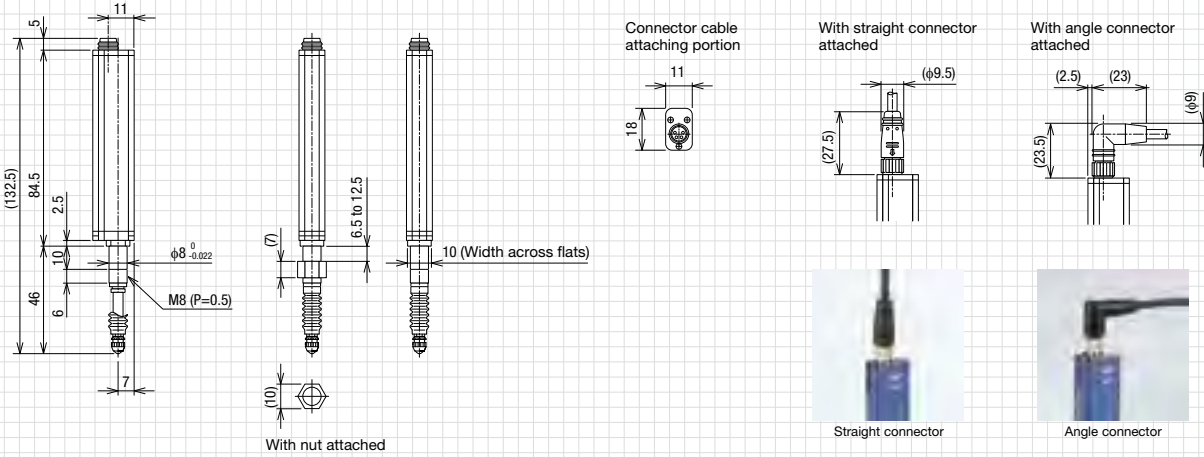
|                                                                         |                                                                                                                                           |                                                                                             |                         |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------|
| SA connector cables<br>SA-CD<br>SA-SD                                   | Contact points<br>F-001, 101, 201, 301<br>F-002<br>F-171<br>F-105<br>F-106<br>F-501<br>F-502<br>F-503<br>F-504<br>F-505<br>F-507<br>F-508 | Rubber bellows<br>M-137<br>For SA-S510, 110<br>M-142<br>For SA-S532<br>M-143<br>For SA-S550 | Indicator bush<br>M-150 |
| Output cables<br>SA-CD-RS2<br>SA-CD-BCD2                                |                                                                                                                                           | Finger lever<br>M-129                                                                       | Lug holder<br>SMA-0417  |
| AC Adapter<br>AC-001<br>For SA-CD1N<br>For SA-CD1N/BO<br>For SA-CD1N/RS |                                                                                                                                           |                                                                                             |                         |

SA series

|            |                 |                 |                   |               |
|------------|-----------------|-----------------|-------------------|---------------|
| 0.1        | 1.65            | 0.35            | 10                | 8             |
| μm         | N               | N               | mm                | mm            |
| Resolution | Measuring Force | Measuring Force | Measurement Range | Stem Diameter |

# SA-S110, SA-S110/03N | SA-S510, SA-S510/03N

This series of sensors achieves high durability owing to the W-bearing structure and die-cast body. The series also eliminates counting errors by adopting the absolute method. In addition to a minimum resolution of 0.5 μm (SA-S510, SA-S510/03N), high resolution products with a resolution of 0.1 μm are also available (SA-S110, SA-S110/03N). The series demonstrates superb capabilities in various measuring situations.



| Model                        | SA-S110, SA-S110/03N                                    | SA-S510, SA-S510/03N |
|------------------------------|---------------------------------------------------------|----------------------|
| Measurement method           | Optical absolute linear encoder method                  |                      |
| Measurement range            | 10 mm                                                   |                      |
| Resolution                   | 0.1 μm                                                  | 0.5 μm               |
| Indication accuracy (P-P) *1 | 1.0 μm                                                  | 2.0 μm               |
| Measuring force *2           | 1.65 N or less (SA-S□10) / 0.35 N or less (SA-S□10/03N) |                      |
| Ingress protection rating *3 | Equivalent to IP67                                      |                      |
| Weight                       | Approx. 80 g                                            |                      |
| Cable                        | Sold separately as an option                            |                      |
| Measuring probe              | Ceramic sphere (diameter: 3.175 mm)                     |                      |
| Rubber bellows*4             | Material: NBR                                           |                      |

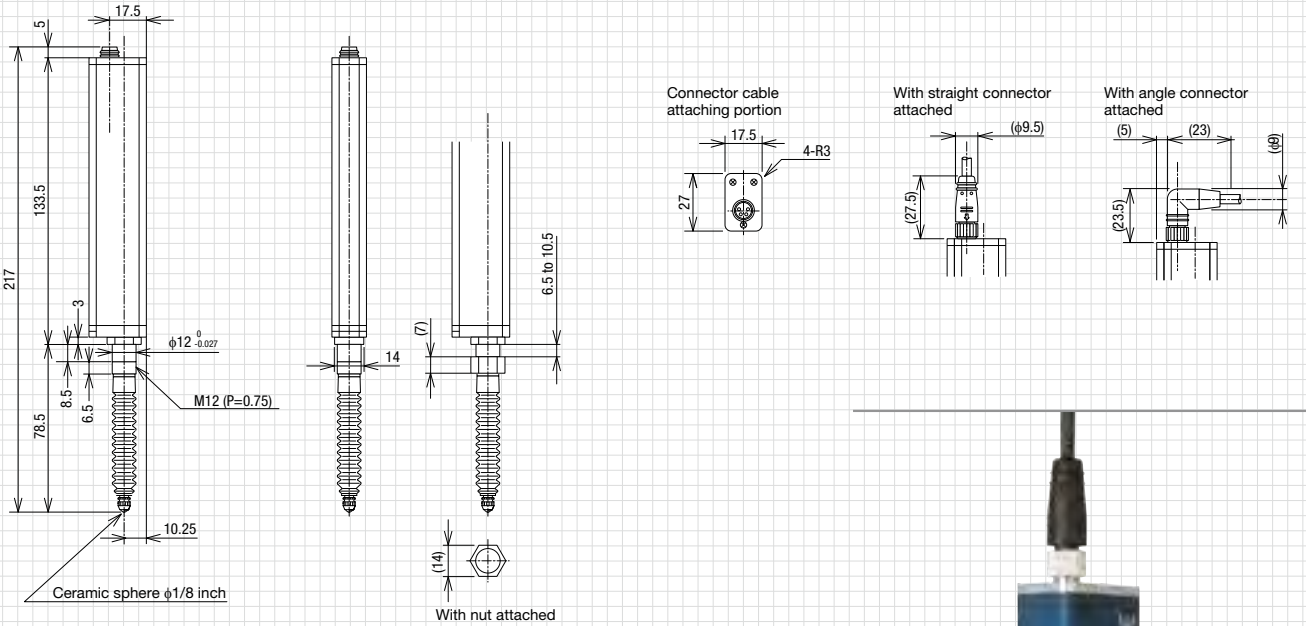
\*1 At an ambient temperature of 20°C  
\*2 When the measuring probe is pushed vertically down by 10 mm  
(For SA-S□10/03N, this indicates the value when no rubber bellows have been installed.)  
\*3 Only when the rubber bellows is attached properly and is not damaged  
\*4 For SA-S□10/03N, no rubber bellows are attached.



|            |                   |               |
|------------|-------------------|---------------|
| 0.5        | 32                | 12            |
| μm         | mm                | mm            |
| Resolution | Measurement Range | Stem Diameter |

# SA-S532

A long stroke of 32 mm extends the measurement range while maintaining high durability.



| Model                        | SA-S532                             |
|------------------------------|-------------------------------------|
| Measurement method           | Optical absolute encoder method     |
| Measurement range            | 32 mm                               |
| Resolution                   | 0.5 μm                              |
| Indication accuracy (P-P) *1 | 3 μm or less                        |
| Measuring force *2           | 2.97 N or less                      |
| Ingress protection rating *3 | Equivalent to IP67                  |
| Weight                       | Approx. 150 g                       |
| Cable                        | Sold separately as an option        |
| Measuring probe              | Ceramic sphere (diameter: 3.175 mm) |
| Rubber bellows               | Material: NBR                       |

\*1 At an ambient temperature of 20°C  
\*2 When the measuring probe is pushed vertically down by 32 mm  
\*3 Only when the rubber bellows is attached properly and is not damaged



0.5

μm

Resolution

50

mm

Measurement Range

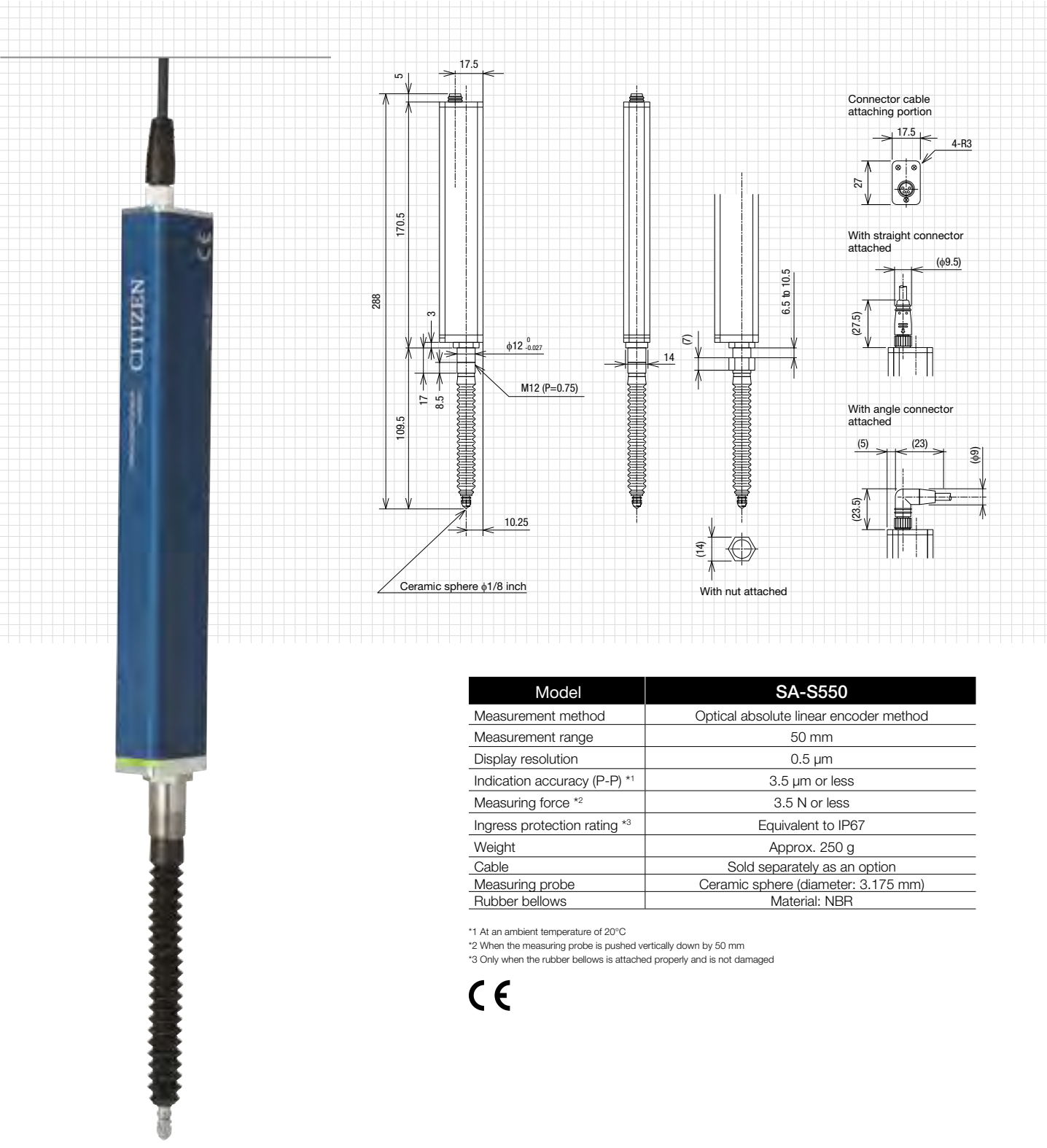
12

mm

Stem Diameter

SA-S550

An ultra-long stroke of 50 mm easily accommodates measurements of large components.



0.1

μm

Resolution

0.5

μm

Resolution

10

mm

Measurement Range

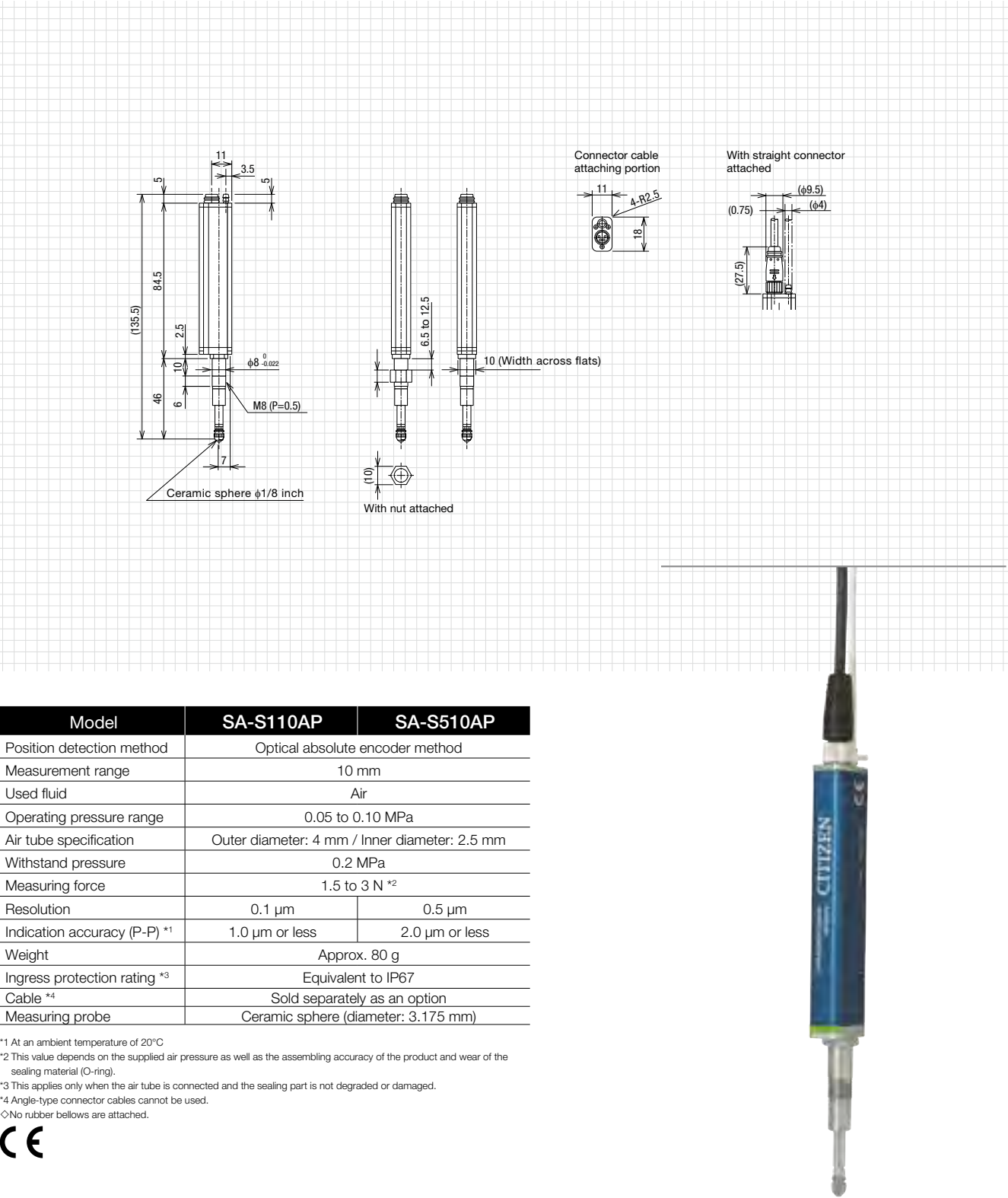
8

mm

Stem Diameter

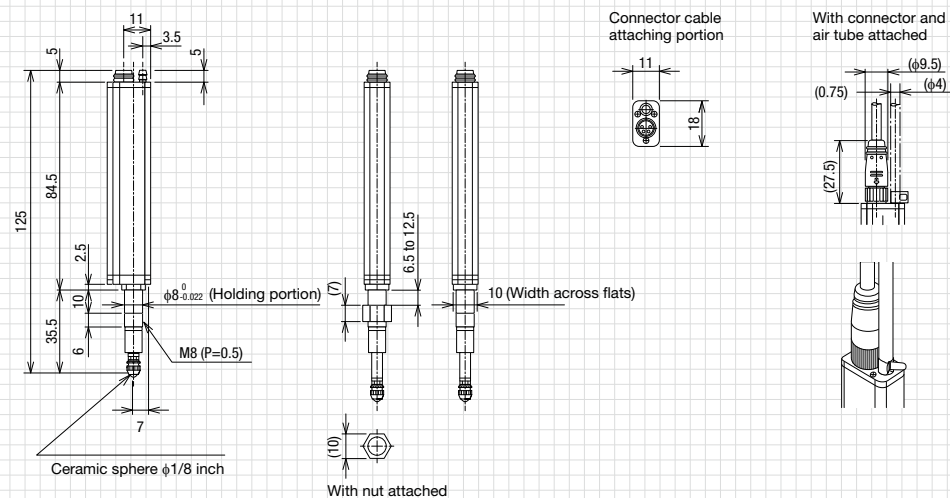
SA-S110AP / SA-S510AP (Air Purge Specification)

Air purge technology provides the ultimate environmental performance. The body's inner pressure is raised by air-purging, which prevents foreign objects from invading. These sensors exhibit strong performance in severe environments where they are exposed to liquids such as permeable oil, coolant liquids, and cutting fluids.



## SA-S110PD / SA-S510PD (Pneumatic Drive Specification)

The pneumatic drive structure, which moves the spindle up and down with air, significantly simplifies the system design process while increasing measurement speed.



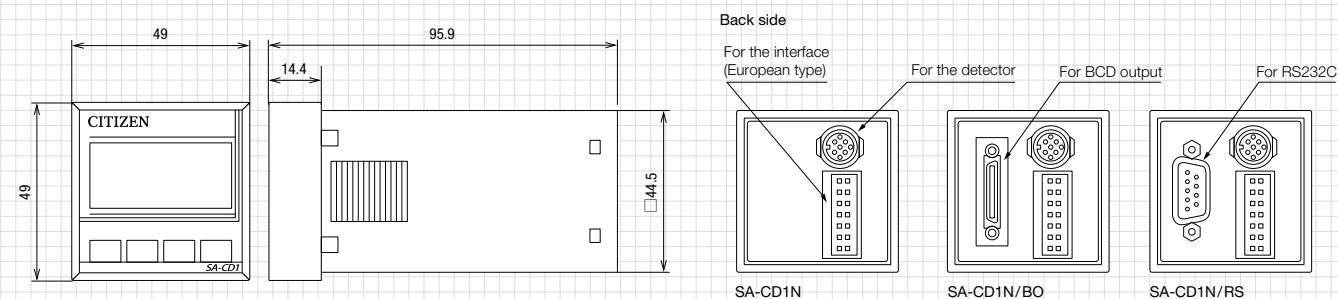
| Model                        | SA-S110PD                                     | SA-S510PD    |
|------------------------------|-----------------------------------------------|--------------|
| Position detection method    | Optical absolute encoder method               |              |
| Measurement range            | 10 mm                                         |              |
| Resolution                   | 0.1 μm                                        | 0.5 μm       |
| Indication accuracy (P-P) *1 | 1 μm or less                                  | 2 μm or less |
| Measuring force              | *2                                            |              |
| Fluid used                   | Dry air                                       |              |
| Operating pressure range     | 0.14 to 0.16 MPa *3                           |              |
| Air tube specification       | Outer diameter: 4 mm / Inner diameter: 2.5 mm |              |
| Withstand pressure           | 0.2 MPa                                       |              |
| Ingress protection rating *4 | Equivalent to IP67                            |              |
| Weight                       | Approx. 80 g                                  |              |
| Cable *5                     | Sold separately as an option                  |              |
| Measuring probe              | Ceramic sphere (diameter: 3.175 mm)           |              |

- \*1 At an ambient temperature of 20°C
- \*2 The measuring force depends on the air pressure used.  
Remove the seal cap to use this sensor as a low measurement force type.
- \*3 This value depends on the supplied air pressure as well as the assembling accuracy of the product and wear of the sealing material (O-ring).
- \*4 This applies only when the air tube is connected and the sealing part is not degraded or damaged.
- \*5 Angle-type connector cables cannot be used.
- No rubber bellows are attached.



## SA-CD

A one-channel type compact controller. The backlight changes between red and green, making it easy to recognize judgment results.



| Model                                  |     | SA-CD1N                                                                      | SA-CD1N/BO           | SA-CD1N/RS      |
|----------------------------------------|-----|------------------------------------------------------------------------------|----------------------|-----------------|
| Display                                |     | LCD with green/red backlight that displays polarity, 6-digit value, and mode |                      |                 |
| Display resolution *1                  |     | 0.1 μm / 1 μm / 10 μm                                                        |                      |                 |
| Display range                          |     | - 99.9999 to 99.9999 mm                                                      |                      |                 |
| Input/<br>Output                       | I/O | ○ (-NG / OK / +NG / Error)                                                   |                      |                 |
|                                        | BCD | —                                                                            | ○                    | —               |
|                                        | RS  | —                                                                            | —                    | ○               |
| No. of detector inputs                 |     | 1 ch                                                                         |                      |                 |
| Data hold method                       |     | Data hold with external signals                                              |                      |                 |
| Sorting function                       |     | 7-level display (Up to 7 types can be registered.)                           |                      |                 |
| Peak measurement                       |     | Maximum, minimum, maximum-minimum, maximum-minimum/2                         |                      |                 |
| Power supply voltage                   |     | 12-24 V DC (±10%)                                                            |                      |                 |
| Consumption current                    |     | 200 mA or less (when the sensor head is connected)                           |                      |                 |
| Accessories                            |     | Panel mount frame                                                            |                      |                 |
| Specialty options<br>(Sold separately) |     | —                                                                            | Cable for BCD output | RS232C cable *2 |
|                                        |     |                                                                              | SA-CD-B02M           | SA-CD-RS2M      |
| AC adapter                             |     | AC-001                                                                       |                      |                 |

\*2 If EXT RS IN (trigger) is not needed, a commercially available interlink cable can be used.



See tolerance judgment results at a glance

Depending on the setting value, the backlight changes to green (OK/pass) or red (NG/fail), making it easy to recognize judgment results even from a distance.



High usability with a 7-level sorting function

### Three types of output terminals

In addition to the standard type, the BCD type and RS-232C output model are available. Choose the model that best suits your facilities.



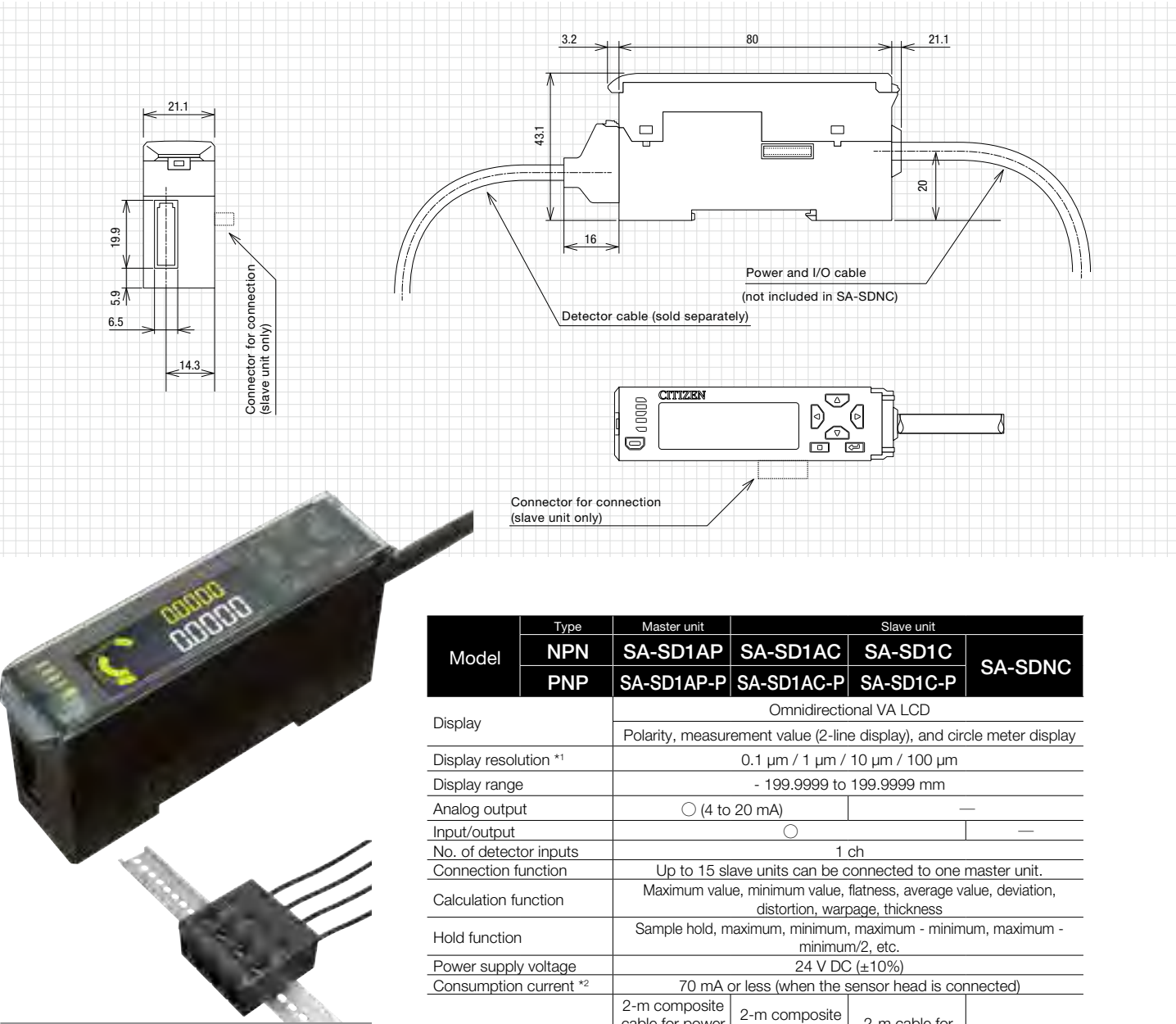
Standard type  
(I/O connector only)

BCD type

RS232C type

SA-SD1AP / SD1AC / SD1C / SDNC

Compact controllers for connecting up to 16 units. Use a DIN rail to connect.



An ultra-compact body equipped with various functions  
Supports connection of up to 16 units

Up to 15 slave units can be connected to one master unit, and all the controllers can be centrally controlled. Multi-point calculation can also be easily performed. In addition, the ultra-compact body has guide tabs for DIN rails, allowing for easy connection with other controllers in lines.  
\* Up to 14 slave units can be connected when using the communication unit.

Link-up installation on a DIN rail

Dual digital display for a wide range of uses

Easy-to-read VA high contrast LCD

| Model                  | Type | Master unit                                                                                      |                                               | Slave unit        |         |
|------------------------|------|--------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|---------|
|                        | NPN  | SA-SD1AP                                                                                         | SA-SD1AC                                      | SA-SD1C           | SA-SDNC |
|                        | PNP  | SA-SD1AP-P                                                                                       | SA-SD1AC-P                                    | SA-SD1C-P         |         |
| Display                |      | Omnidirectional VA LCD                                                                           |                                               |                   |         |
|                        |      | Polarity, measurement value (2-line display), and circle meter display                           |                                               |                   |         |
| Display resolution *1  |      | 0.1 μm / 1 μm / 10 μm / 100 μm                                                                   |                                               |                   |         |
| Display range          |      | - 199.9999 to 199.9999 mm                                                                        |                                               |                   |         |
| Analog output          |      | ○ (4 to 20 mA)                                                                                   |                                               | —                 |         |
| Input/output           |      | ○                                                                                                |                                               | —                 |         |
| No. of detector inputs |      | 1 ch                                                                                             |                                               |                   |         |
| Connection function    |      | Up to 15 slave units can be connected to one master unit.                                        |                                               |                   |         |
| Calculation function   |      | Maximum value, minimum value, flatness, average value, deviation, distortion, warpage, thickness |                                               |                   |         |
| Hold function          |      | Sample hold, maximum, minimum, maximum - minimum, maximum - minimum/2, etc.                      |                                               |                   |         |
| Power supply voltage   |      | 24 V DC (±10%)                                                                                   |                                               |                   |         |
| Consumption current *2 |      | 70 mA or less (when the sensor head is connected)                                                |                                               |                   |         |
| Cable                  |      | 2-m composite cable for power supply, analog output, and I/O                                     | 2-m composite cable for analog output and I/O | 2-m cable for I/O | —       |

\*1 Depends on the resolution of the sensor head used.  
\*2 The consumption current does not include analog current output.  
◇When using the communication unit (SA-ERS), up to 14 slave units can be connected.



Self-diagnosis and notification of disconnections & abnormalities

The controller detects when a sensor head failure occurs, or when a cable is not connected or becomes disconnected, and immediately notifies you by displaying an error.



SA-ERS

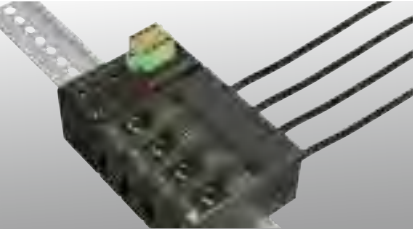
This communication unit supports MODBUS RS485. It enables speedy data communication.

| Model                          | SA-ERS                                                                                    |
|--------------------------------|-------------------------------------------------------------------------------------------|
| Supported controller           | SA-SD□                                                                                    |
| No. of connectable controllers | Up to 15 controllers (1 master unit, 14 slave units) can be connected to a single SA-ERS. |
| Electrical characteristics     | EIA RS-485 compliant                                                                      |
| Communication method           | Two-wire half-duplex communication                                                        |
| Communication protocol         | MODBUS (RTU/ASCII) / MEWTOCOL-COM*1                                                       |
| Power supply voltage *2        | 24 V DC (±10%)                                                                            |
| Consumption current            | 40 mA or less                                                                             |

\*1 MEWTOCOL is a registered trademark of Panasonic Industrial Devices SUNX Co., Ltd.  
\*2 Power is supplied from the connected controller master unit.

Specifically for SA-SD controllers to integrate measurement and monitoring systems

SA-ERS can be easily connected to controllers using the integrated communication connector specifically for SA-SD controllers, which can also easily be removed. Up to 15 controllers (1 master unit + 14 slave units) can be connected to a single SA-ERS unit.



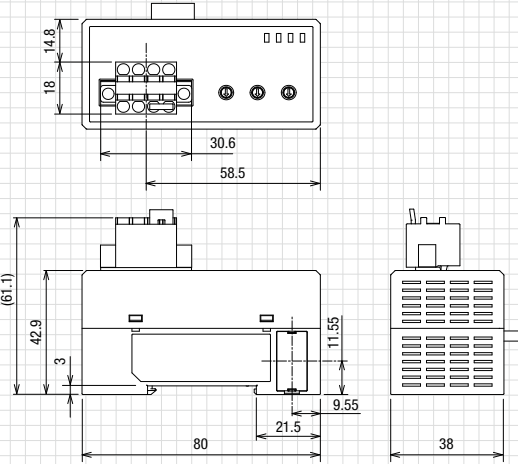
Installed on a 35-mm DIN rail

SA-ECL

This communication unit supports CC-Link. It enables high speed communication up to 10 Mbps.

| Model                             | SA-ECL                                                                                         |
|-----------------------------------|------------------------------------------------------------------------------------------------|
| Supported controller              | SA-SD□                                                                                         |
| Number of connectable controllers | Up to 15 controllers (1 master unit, 14 slave units) can be connected to a single SA-ECL unit. |
| Power supply voltage *1           | 24 V DC ±10 %, including 0.5 V ripple (P-P)                                                    |
| Consumption current               | 80 mA or less                                                                                  |
| Communication method              | CC-Link ver. 1.10/ver. 2.00 (switchable) *2                                                    |
| Remote station classification     | Remote device station                                                                          |
| No. of occupied stations          | CC-Link ver. 1.10: 4 stations, ver. 2.00: 2 stations (switchable)                              |
| Station No. setting               | 1 to 64 (0 or 65 and above will cause an error.)                                               |
| Communication speed               | 156 Kbps 625 Kbps 2.5 Mbps 5 Mbps 10 Mbps                                                      |
| Max. transmission distance        | 1,200 m 900 m 400 m 160 m 100 m                                                                |
| Operating ambient temperature     | -10 to 45°C (no dew condensation or freezing allowed)<br>In storage: -20 to +60°C              |
| Operating ambient humidity        | 35 to 85% RH, in storage: 35 to 85% RH                                                         |
| Material                          | Main body case: PC                                                                             |
| Weight                            | Approx. 80 g                                                                                   |

\*1 Power is supplied from the connected controller master unit.  
\*2 CC-Link is a registered trademark of Mitsubishi Electric Corporation that is managed by the CC-Link Partner Association (CLPA).

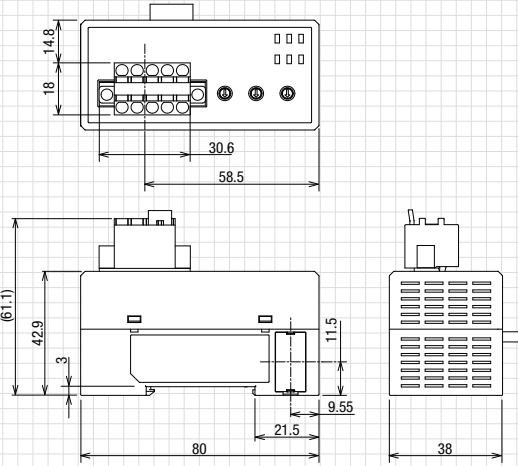


Optimal for large-scale systems with support for high-speed MODBUS.

Receives power from the SA-SD controller main unit.

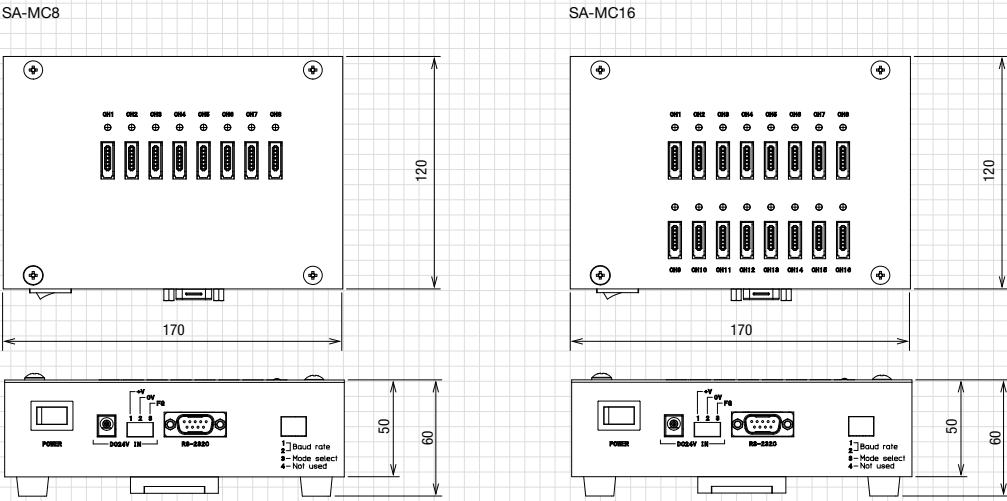
Also, supports MEWTOCOL\*communication.

\* MEWTOCOL is a registered trademark of Panasonic Industrial Devices SUNX Co., Ltd.



SA-MC8 / SA-MC16

These multi-channel type controllers are specifically for RS-232C data output.  
8-channel and 16-channel types are available.



SA-MC8



SA-MC16

| Model                     | SA-MC8                                                          | SA-MC16     |
|---------------------------|-----------------------------------------------------------------|-------------|
| Display                   | Status display LED for each channel                             |             |
| Resolution *1             | 0.1 μm                                                          |             |
| Display range             | -99.9999 to 99.9999 mm                                          |             |
| No. of sensor head inputs | 8 channels                                                      | 16 channels |
| External output           | Equipped with RS-232C output terminal (measurement data output) |             |
| Power supply voltage      | 24 V DC (±10%)                                                  |             |
| Consumption current       | 500 mA or less (with sensor head connected)                     |             |

\*1 Depends on the resolution of the sensor head used.



Supports the SA series. Enables easy, convenient multi-point measurement.

These controllers are sized to be easily handled and enable you to build a safe, reliable multi-point measurement system. They can easily realize a multi-channel system while meeting the constraints for general-purpose communication via RS-232C. Measurement data can be output from up to 16 channels.



Easy-to-see status LED lamp with a simple display

8-channel and 16-channel types available



DIN rail guide

Both SA-MC8 and SA-MC16 can be installed on DIN rails.



Electric  
Micrometer

Displacement  
Sensors

The ELEMETRON electric micrometers are long-selling products that employ differential transformers to accommodate any measuring conditions with a variety of specifications. These products are optimal for high-precision measurement that requires readings in 0.1- $\mu$ m units or measurement that requires low measuring force (0.1 g). Besides the standard plunger type, we offer a universal type (lever type) that can freely change the measurement direction and is suitable for measuring objects susceptible to damage or deformation as well as a small-size type that is useful for making measurements in small spaces.

Electric Micrometer

ELEMETRON

Plunger



Plunger type

This is the standard sensor head.  
A contact point is attached to the tip of the plunger held by the ball retainer and spring.  
Thanks to its durable body, this type can accurately measure various targets even in environments with extreme temperature fluctuations.

Detectors

Electric Micrometers  
ELEMETRON

- DTH-P
- DTH-P□S
- DTH-P-SH
- DTH-L
- DTH-L□U



Universal



Universal type (lever type)

The strong lever bearing mechanism is resistant to breakage caused by large loads or fluctuations.  
In addition, since the measuring direction can be changed freely, this type can be used in any location, freeing you of concern about damaging or deforming measurement targets.  
This type is suitable for measuring bearing runout, etc.



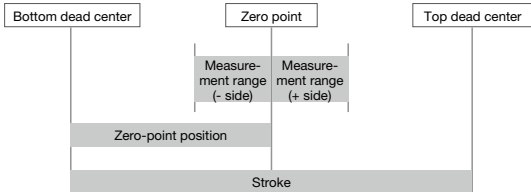
Amplifiers

Electric Micrometers  
ELEMETRON

- EM-SA1R
- DTM-FAB
- DTM-EA
- DTA-EA / H
- DTM-ED



Measurement range



Accessories

Electric Micrometers  
ELEMETRON

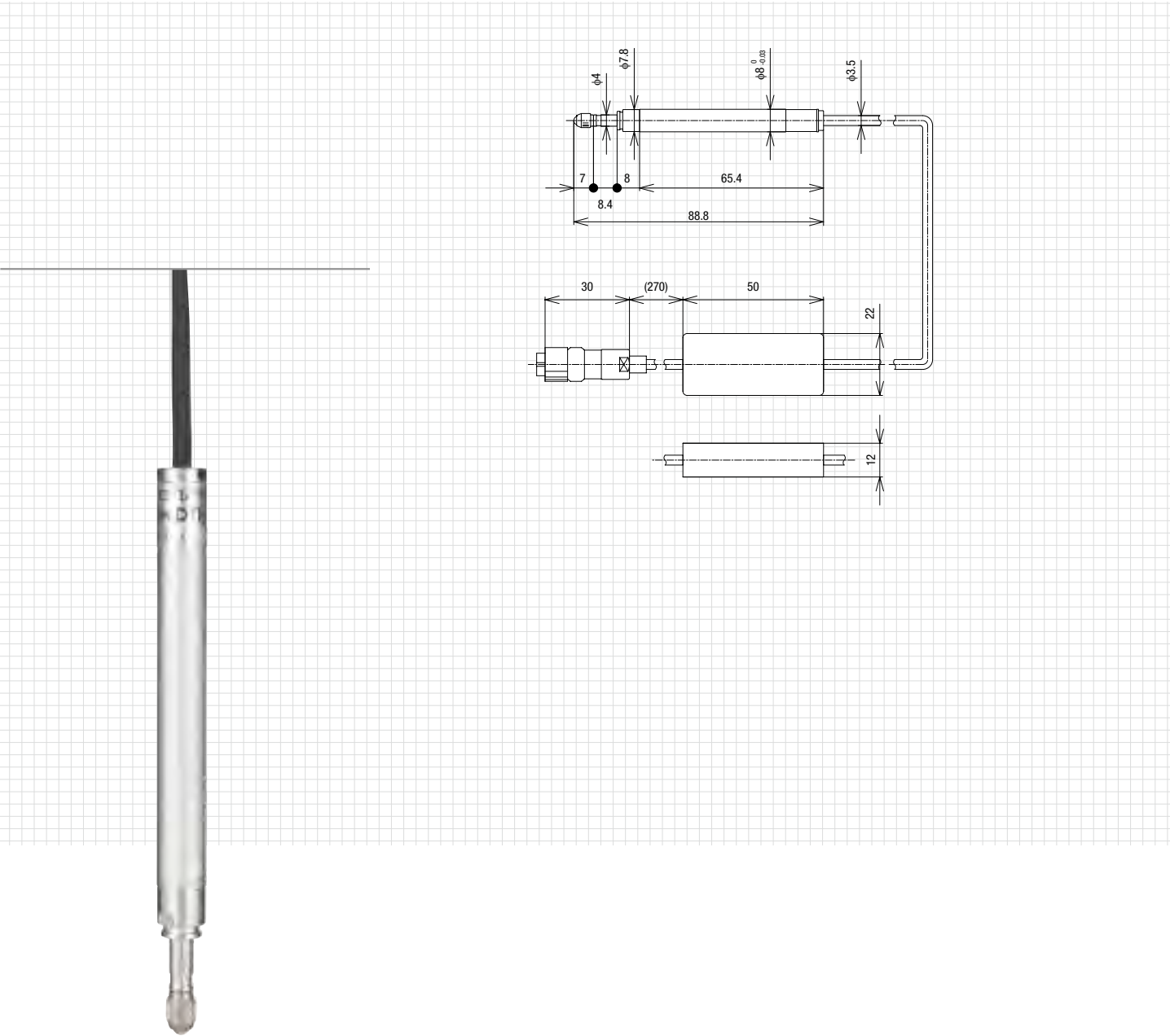
|                  |                      |                |                |
|------------------|----------------------|----------------|----------------|
| Output cable     | Contact point        | Rubber bellows | Indicator bush |
| EM-SA1-IA2       | F-001, 101, 201, 301 | M-131          | M-150          |
| EM-SA1-IF2       | F-002                |                |                |
| EM-SA1-IO2       | F-171                | Finger lever   | Lug holder     |
| EM-SA1-RS2       | F-105                | M-129          | SMA-0417       |
|                  | F-106                |                |                |
| Conversion cable | F-501                |                |                |
| 3SEA-2834        | F-502                |                |                |
|                  | F-503                |                |                |
|                  | F-504                |                |                |
|                  | F-505                |                |                |
|                  | F-507                |                |                |
|                  | F-508                |                |                |

Electric Micrometer

DTH-P

Optimal for measurement that requires a low measuring force.  
We offer products for various measuring forces.

|            |                 |                 |                 |                   |              |               |
|------------|-----------------|-----------------|-----------------|-------------------|--------------|---------------|
| 0.1        | 0.2             | 0.4             | 0.7             | ±1                | 3            | 8             |
| μm         | N               | N               | N               | mm                | m            | mm            |
| Resolution | Measuring Force | Measuring Force | Measuring Force | Measurement Range | Cable Length | Stem Diameter |



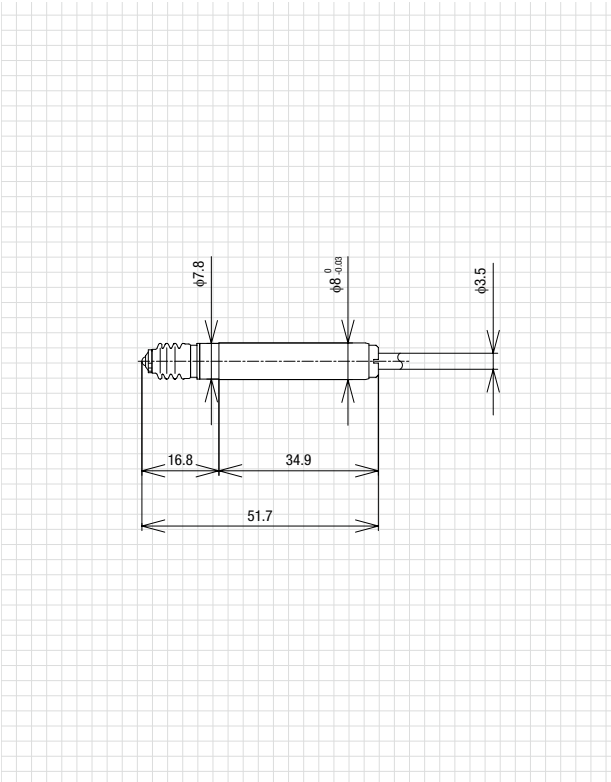
| Model                                 | DTH-P20                          | DTH-P40 | DTH-P70 | DTH-P16AL |
|---------------------------------------|----------------------------------|---------|---------|-----------|
| Measuring force                       | 0.196N                           | 0.392N  | 0.686N  | 0.157N    |
| Measurement range                     | ±1 mm (-0.4 to +1 mm for type A) |         |         |           |
| Stroke                                | 4 mm (3.5 mm for type A)         |         |         |           |
| Zero-point position                   | Approx. 2 mm (0.5 mm for type A) |         |         |           |
| Repeatability                         | 0.3 μm                           |         |         |           |
| Accuracy guaranteed temperature range | 24°C±5°C                         |         |         |           |
| Operating temperature range           | 0 to 50°C                        |         |         |           |
| Weight (main body only)               | Approx. 25 g                     |         |         |           |
| Standard specifications               | Cable length                     | 3 m     |         |           |
|                                       | Contact point                    | F-001   |         |           |
|                                       | Rubber bellows                   | M-131   |         |           |

◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)

DTH-P□S

Small in size and optimal for installation in a machine

|            |                 |                 |                 |                   |              |               |
|------------|-----------------|-----------------|-----------------|-------------------|--------------|---------------|
| 0.1        | 0.2             | 0.4             | 0.7             | ±0.7              | 3            | 8             |
| μm         | N               | N               | N               | mm                | m            | mm            |
| Resolution | Measuring Force | Measuring Force | Measuring Force | Measurement Range | Cable Length | Stem Diameter |



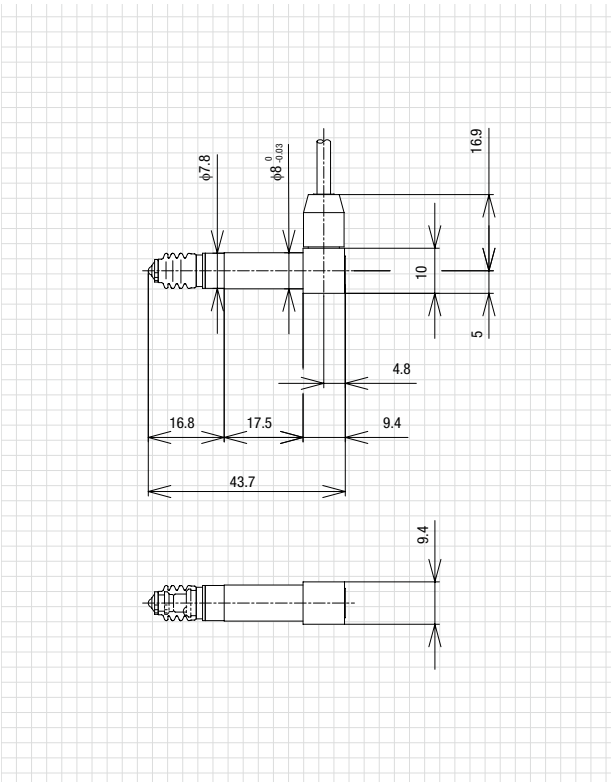
| Model                                 | DTH-P20S       | DTH-P40S | DTH-P70S |
|---------------------------------------|----------------|----------|----------|
| Measuring force                       | 0.196N         | 0.392N   | 0.686N   |
| Measurement range                     | ±0.7 mm        |          |          |
| Stroke                                | 2 mm           |          |          |
| Zero-point position                   | Approx. 1 mm   |          |          |
| Repeatability                         | 0.3 μm         |          |          |
| Accuracy guaranteed temperature range | 24°C±5°C       |          |          |
| Operating temperature range           | 0 to 50°C      |          |          |
| Weight (main body only)               | Approx. 20 g   |          |          |
| Standard specifications               | Cable length   | 3 m      |          |
|                                       | Contact point  | F-171    |          |
|                                       | Rubber bellows | M-131    |          |

◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)

DTH-P-SH

Small in size with a laterally connected cord

|            |                 |                 |                 |                   |              |               |
|------------|-----------------|-----------------|-----------------|-------------------|--------------|---------------|
| 0.1        | 0.2             | 0.4             | 0.7             | ±0.7              | 3            | 8             |
| μm         | N               | N               | N               | mm                | m            | mm            |
| Resolution | Measuring Force | Measuring Force | Measuring Force | Measurement Range | Cable Length | Stem Diameter |

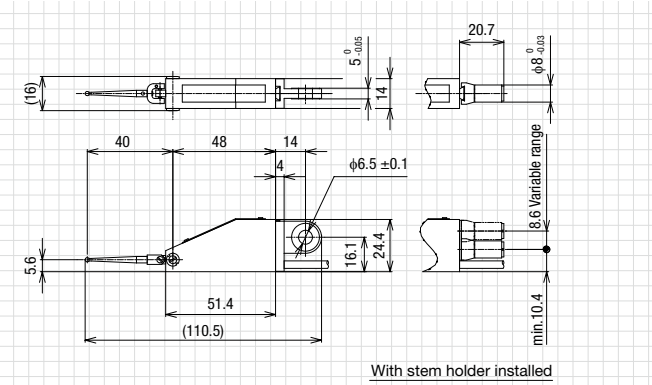


| Model                                 | DTH-P20SH      | DTH-P40SH | DTH-P70SH |
|---------------------------------------|----------------|-----------|-----------|
| Measuring force                       | 0.196N         | 0.392N    | 0.686N    |
| Measurement range                     | ±0.7mm         |           |           |
| Stroke                                | 2 mm           |           |           |
| Zero-point position                   | Approx. 1 mm   |           |           |
| Repeatability                         | 0.3 μm         |           |           |
| Accuracy guaranteed temperature range | 24°C±5°C       |           |           |
| Operating temperature range           | 0 to 50°C      |           |           |
| Weight (main body only)               | Approx. 20 g   |           |           |
| Standard specifications               | Cable length   | 3 m       |           |
|                                       | Contact point  | F-171     |           |
|                                       | Rubber bellows | M-131     |           |

◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)

DTH-L

The lever-type sensor is optimal for measuring flatness and roundness.

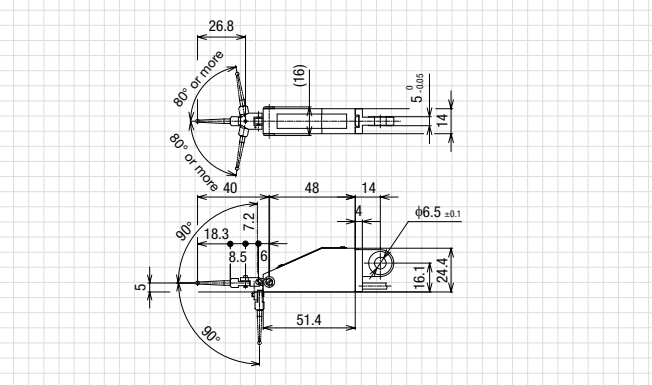


| Model                                 | DTH-L02       | DTH-L08        | DTH-L15 |
|---------------------------------------|---------------|----------------|---------|
| Measuring force                       | 0.0196N       | 0.0785N        | 0.147N  |
| Measurement range                     |               | ±0.5 mm        |         |
| Stroke                                |               | 1.5 mm         |         |
| Zero-point position                   |               | Approx. 0.5 mm |         |
| Repeatability                         |               | 0.3 μm         |         |
| Accuracy guaranteed temperature range |               | 24°C±5°C       |         |
| Operating temperature range           |               | 0 to 50°C      |         |
| Weight (main body only)               |               | Approx. 115 g  |         |
| Standard specifications               | Cable length  | 3 m            |         |
|                                       | Contact point | F-138          |         |



DTH-L□U

The universal lever-type sensor enables the measurement direction to be changed up to 80° to the right and to the left.

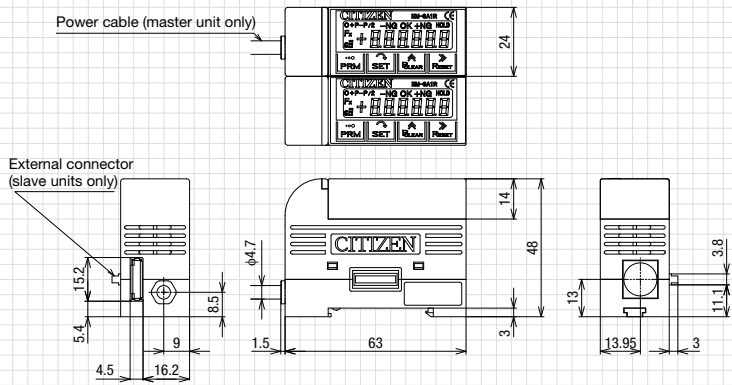


| Model                                 | DTH-L02U      | DTH-L08U       | DTH-L15U |
|---------------------------------------|---------------|----------------|----------|
| Measuring force                       | 0.0196N       | 0.0785N        | 0.147N   |
| Measurement range                     |               | ±0.5 mm        |          |
| Stroke                                |               | 1.5 mm         |          |
| Zero-point position                   |               | Approx. 0.5 mm |          |
| Repeatability                         |               | 0.3 μm         |          |
| Accuracy guaranteed temperature range |               | 24°C±5°C       |          |
| Operating temperature range           |               | 0 to 50°C      |          |
| Weight (main body only)               |               | Approx. 115 g  |          |
| Standard specifications               | Cable length  | 3 m            |          |
|                                       | Contact point | F-118          |          |

|            |                 |                 |                 |                   |              |
|------------|-----------------|-----------------|-----------------|-------------------|--------------|
| 0.1        | 0.02            | 0.08            | 0.15            | ±0.5              | 3            |
| μm         | N               | N               | N               | mm                | m            |
| Resolution | Measuring Force | Measuring Force | Measuring Force | Measurement Range | Cable Length |

EM-SA1R

This small-size amplifier enables up to eight units to be linked.



| Model                                 | EM-SA1RP/RS (Master unit)                                                                                | EM-SA1RP/AN (Master unit) | EM-SA1RC (Slave unit) |
|---------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|-----------------------|
| Display                               | LCD with 6 digits/polarity, mode display, and 2-color backlight (red/green)                              |                           |                       |
| Display resolution                    | 0.1 / 1 / 10 μm (selectable by setting)                                                                  |                           |                       |
| Display range                         | -99.9999 to +99.9999 mm                                                                                  |                           |                       |
| Indication error                      | ±1% ±1 digit                                                                                             |                           |                       |
| Response speed                        | Reset / Peak clear / Hold: Max 20 ms<br>RS-232C communication: Approx. 2 × n units + 3 ms                |                           |                       |
| Fault detection                       | -NG / OK / +NG / 6-rank judgement                                                                        |                           |                       |
| RS-232C *1                            | Available                                                                                                | None                      | None                  |
| Analog output *1                      | None                                                                                                     | Available                 | Available             |
| No. of detector inputs                | 1 ch                                                                                                     |                           |                       |
| Zero set function                     | Can be reset by the switch on the front face or at any position by an external signal or the RS command. |                           |                       |
| Data hold method                      | Hold of the display and data by an external signal                                                       |                           |                       |
| Measuring direction                   | +/- (Can be switched by a setting)                                                                       |                           |                       |
| Preset function                       | 6 digits & polarity                                                                                      |                           |                       |
| Peak measurement                      | +P, -P, P-P, (P-P)/2 (+P: Maximum, -P: Minimum)                                                          |                           |                       |
| Error functionality                   | Available                                                                                                |                           |                       |
| Measurement condition registration    | Seven items (key, RS command)                                                                            |                           |                       |
| Accuracy guaranteed temperature range | 24°C ±5°C                                                                                                |                           |                       |
| Operating ambient temperature         | 0 to +40°C (no dew condensation or freezing allowed), in storage: -10 to +60°C                           |                           |                       |
| Power supply                          | 12 V DC ± 10% or 24 V DC ± 10%                                                                           |                           |                       |
| Consumption current                   | 100 mA or less                                                                                           |                           |                       |
| Weight                                | Approx. 110 g                                                                                            |                           | Approx. 60 g          |
| Dimensions                            | 63 (W) × 24 (H) × 48 (D) mm                                                                              |                           |                       |
| Applicable standards                  | EMC Directive (EN61326-1:2006)                                                                           |                           |                       |

\*1 An optional dedicated cable is required. Note that analog output supports absolute value display.



Register up to 7 types of measuring conditions

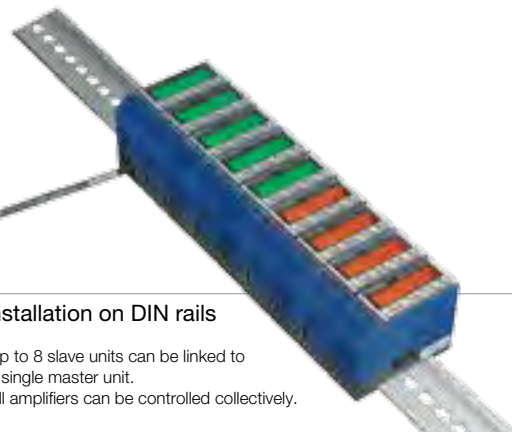
Using the switches on the front face or by input via the interface, you can easily register up to seven output judgment values for measuring conditions in order to categorize and sort. For example, this allows you to broaden the range of control for the peak measurement function.



Supports RS-232C and analog output

Using an optional cable with each dedicated amplifier makes it simple to introduce the product in your current environment. This is also ideal for delicate lines that require visibility.

|         |        |
|---------|--------|
| RS-232C | Analog |
| Output  | Output |



Installation on DIN rails

Up to 8 slave units can be linked to a single master unit.  
All amplifiers can be controlled collectively.

Confirm Pass or Fail at a glance with the 2-color (red/green) display



The backlight switches between green (Pass) and red (Fail) in accordance with the set value. This makes it easy to confirm judgment results even from a distance. You are also notified immediately if an error occurs by a red backlight and error indication.

Innovative, compact form enables various kinds of link-up installations

Because the display unit is detachable, it can be removed from the amplifier's body and mounted on a panel. Arranging the elements close together helps save space in the system.  
\* For panel mounting, the optional display mounting unit (EM-SA1-DPM) is required.

While maintaining high sensitivity and high accuracy with a resolution of 0.1 μm, the Elemetron EM-SA1R has an ultra-compact form with a volume just one-fiftieth that of previous models. Additionally, new functions that enable multiple point measurement have been added (such as link-up installation and batch control by combining base and client devices). Thus, space savings are achieved while expanding upon the range of functions offered previously.

Conversion cable

| Model | Dimensions | Product No. |
|-------|------------|-------------|
|       | 15 cm      | 3SEA-2834   |

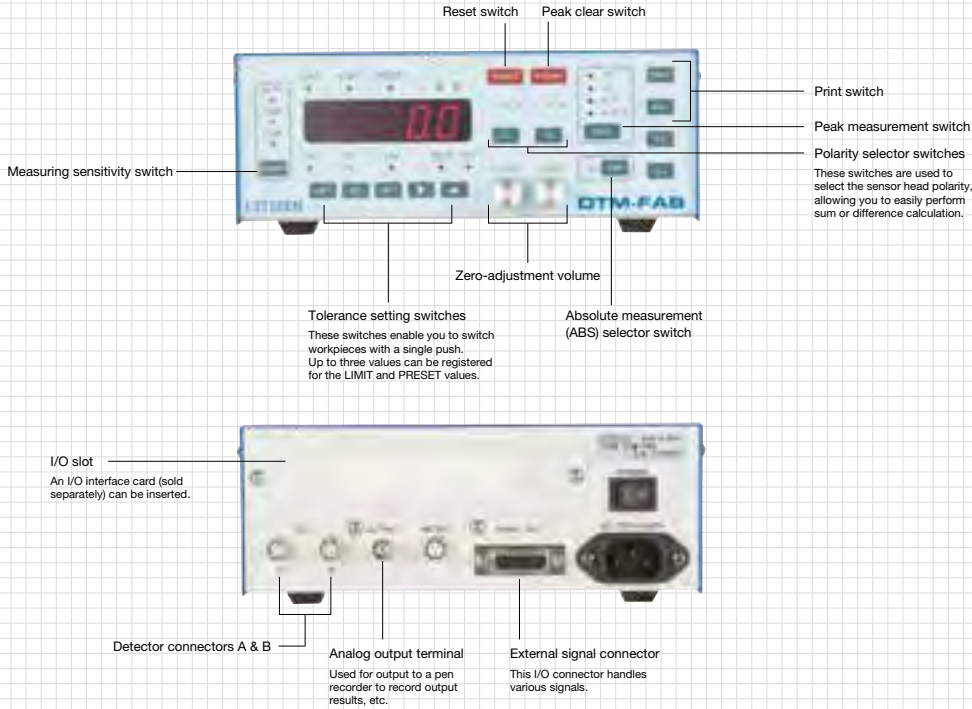
◇The conversion cable (3SEA-2834) is required to connect to conventional detectors.

DTM-FAB

These flexible amplifiers can be used in a wide range of applications.  
All the modes are arranged on the front panel, enabling easy operation.

RS-232C  
Output

BCD  
Output



| Model                                 |               | DTM-FAB                                                                 |
|---------------------------------------|---------------|-------------------------------------------------------------------------|
| Sensitivity selection                 | HIGH          | ±999.9 μm, resolution: 0.1 μm                                           |
|                                       | LOW           | ±1999 μm, resolution: 1 μm *1                                           |
|                                       | AUTO          | Automatic selection of HIGH or LOW                                      |
| Indication error                      |               | ±1% rdg ±1 digit                                                        |
| Zero-point adjustment range           |               | ±20 μm or more                                                          |
| Display                               |               | 4-digit LED display & polarity (-)                                      |
| Input/ Output                         | I/O connector | ○ (-NG/OK/+NG, error) *2                                                |
|                                       | RS-232C       | DTM-FAB-RS (optional interface card) *3                                 |
|                                       | BCD           | DTM-FAB-BCD (optional interface card) *3                                |
|                                       | Analog output | ○ (DC±1 V/full scale) *4                                                |
| No. of sensor head inputs             |               | 2 channels                                                              |
| I/O slot                              |               | One I/O interface card can be inserted.                                 |
| Simple measurement                    |               | +A, -A, +B, -B                                                          |
| Sum or difference                     |               | +A+B, +A-B, -A+B, -A-B                                                  |
| Reset method                          |               | Can be reset by the front switch or at any point by an external signal. |
| Data hold method                      |               | Hold of the display and data by an external signal                      |
| Preset function                       |               | 4 digits & polarity                                                     |
| Measurement condition registration    |               | 3 types                                                                 |
| Peak measurement                      |               | +P, -P, P-P, (P-P)/2 (+P: Maximum, -P: Minimum)                         |
| Accuracy guaranteed temperature range |               | 24°C±5°C                                                                |
| Operating temperature range           |               | 0°C to 40°C                                                             |
| Power supply                          |               | 100 V to 240 V AC ±10% 50/60 Hz 10 VA *5                                |
| Dimensions                            |               | 204 (W) × 240 (D) × 82 (H) mm                                           |
| Weight                                |               | Approx. 2.2 kg                                                          |

\*1 The performance assurance range is ±999 μm when LOW is selected.  
\*2 Applicable connector: RDAD-15SE1/M2.6 (55) (Hirose) or equivalent  
\*3 An optional I/O interface card is required. (See p. 00.)  
\*4 DC±1 V is the output at ±100.0 μm when HIGH is selected and ±100 μm when LOW is selected.  
\*5 The power cable attached to the unit has a rating of 125 V/10 A. If using the unit with a higher voltage, procure and use a high-voltage cable with a suitable rating.

DTM-EA DTM-EA / H

This analog indication type is equipped with a sensitivity selection function (three ranks).

| Model                                 |      | DTM-EA                                                        | DTM-EA/H                        |
|---------------------------------------|------|---------------------------------------------------------------|---------------------------------|
| Sensitivity selection                 | HIGH | ±5 μm<br>(Graduation: 0.2 μm)                                 | ±2.5 μm<br>(Graduation: 0.1 μm) |
|                                       | LOW  | ±25 μm<br>(Graduation: 1 μm)                                  | ±25 μm<br>(Graduation: 1 μm)    |
|                                       | AUTO | ±125 μm<br>(Graduation: 5 μm)                                 | ±125 μm<br>(Graduation: 5 μm)   |
| Indication error                      |      | HIGH: Within ±1 graduation<br>MED/LOW: Within ±1/2 graduation |                                 |
| Zero-point adjustment range           |      | ±50 μm or more                                                |                                 |
| Display                               |      | —                                                             |                                 |
| Response speed                        |      | (Pointer) Approx. 0.5 sec/full scale                          |                                 |
| Analog output                         |      | DC±1 V/full scale*                                            |                                 |
| Accuracy guaranteed temperature range |      | 24°C ±5°C                                                     |                                 |
| Operating temperature range           |      | 0°C to 50°C                                                   |                                 |
| Power supply                          |      | 100 to 240 V AC ± 10% 50/60 Hz<br>Approx. 4 VA *1             |                                 |
| Dimensions                            |      | 110 (W) × 175 (D) × 185 (H) mm                                |                                 |
| Weight                                |      | Approx. 1.1 kg                                                |                                 |

\* The power cable attached to the unit has a rating of 125 V/10 A. If using the unit with a higher voltage, procure and use a high-voltage cable with a suitable rating.



DTM-ED

This digital indication type is equipped with a sensitivity selection function (two ranks).

| Model                                 |      | DTM-ED                                            |
|---------------------------------------|------|---------------------------------------------------|
| Sensitivity selection                 | HIGH | ±199.9 μm, resolution: 0.1 μm                     |
|                                       | LOW  | —                                                 |
|                                       | AUTO | ±1999 μm, resolution: 1 μm                        |
| Indication error                      |      | ±1% rdg ±1 digit *1                               |
| Zero-point adjustment range           |      | ±50 μm or more                                    |
| Display                               |      | 3-digit LED display & polarity (-)                |
| Response speed                        |      | Approx. 400 ms (max)                              |
| Analog output                         |      | DC±1 V/full scale *2                              |
| Accuracy guaranteed temperature range |      | 24°C ±5°C                                         |
| Operating temperature range           |      | 0°C to 50°C                                       |
| Power supply                          |      | 100 to 240 V AC ± 10% 50/60 Hz<br>Approx. 5 VA *3 |
| Dimensions                            |      | 110 (W) × 175 (D) × 185 (H) mm                    |
| Weight                                |      | Approx. 1.0 kg                                    |

\*1 Performance assurance range: ±99.9 μm when HIGH is selected and ±999 μm when LOW is selected. Note that the assurance differs depending on the display range and indication error.  
\*2 DC±1 V is the output at ±100.0 μm when HIGH is selected and ±1000 μm when LOW is selected.  
\*3 The power cable attached to the unit has a rating of 125 V/10 A. If using the unit with a higher voltage, procure and use a high-voltage cable with a suitable rating.

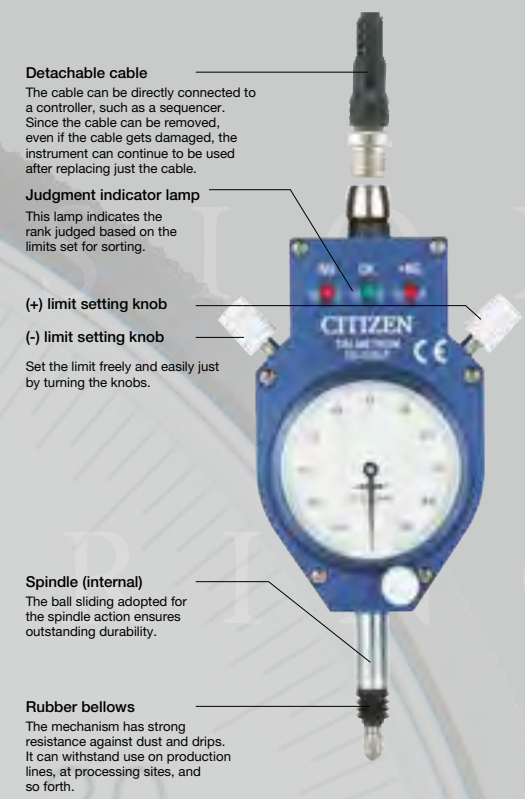


Signal Indicators  
TRI-METRON

Micro Indicators  
Mu-METRON

Signal Indicators  
&  
Micro Indicators

These analog models of signal indicators and micro indicators have simple structures that do not require amplifiers. They are the most cost-efficient options for simple pass/fail measurement. We offer Mu-METRON high-precision mechanical micro indicators, and TRI-METRON with electrical contacts incorporated into Mu-METRON. The LP type enables you to confirm pass or fail judgment results even from a distance via lamp lighting.



Signal Indicators & Micro Indicators

TRI-METRON  
Mu-METRON

How to use TRI-METRON

**STEP 1 Checking**  
Move the spindle up and down to confirm that the indicator moves over the entire scale range.

**STEP 2 Zero point setting**  
Use the master gauge to adjust the detector's zero-point position. Loosen the clamp screw, move the detector up and down until the needle points to zero. Then tighten the clamp screw.

**STEP 3 Fine adjustment**  
If the needle does not point to zero after moving the detector up and down, turn the scale plate to adjust it to zero. Once the zero-point position has been adjusted, move the spindle up and down two or three times. Ensure that the needle returns to the zero-point position.

**STEP 4 Minus tolerance**  
Remove the master gauge. Turn the left limit setting dial to the right until the needle points to the minus tolerance for measurement.

**STEP 5 Plus tolerance**  
Press the spindle fully against the workpiece and turn the right limit setting dial to the right until the needle points to the plus tolerance for measurement.

**STEP 6 Tolerance check**  
After setting the minus and plus tolerances, move the spindle up and down two or three times. Ensure that the needle can move between the minus limit and the plus limit (within the product's tolerance range).

Signal Indicators  
TRI-METRON

1S series  
1S-□□□□LP  
1S-□□□□

2S series  
2S-□□□□



Micro Indicators  
Mu-METRON

2M-100  
3M-100  
4M-100P



Accessories

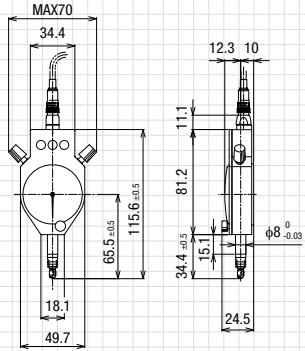
Signal Indicators/Micro Indicators  
TRI-METRON  
Mu-METRON

|                                                                                                                                           |                                                                                                                                  |                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Contact points<br>F-001, 101, 201, 301<br>F-002<br>F-171<br>F-105<br>F-106<br>F-501<br>F-502<br>F-503<br>F-504<br>F-505<br>F-507<br>F-508 | Back mounts<br>F-M100<br>F-M101<br>F-M103-1<br>C-M100<br>C-M101<br>C-M103-1<br><br>Release<br>M-140<br><br>Finger lever<br>M-129 | Indicator bush<br>M-150<br><br>Lug holder<br>SMA-0417 |
| Rubber bellows<br>M-131                                                                                                                   |                                                                                                                                  |                                                       |

Signal Indicator & Micro Indicator

1S-□□□LP

These signal indicators can be directly connected to a controller, such as a sequencer. The green and red judgment indication lamps enable you to visually confirm pass/fail results.

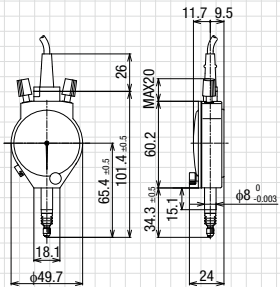


| Model                | 1S-100LP                       | 1S-010LP             |
|----------------------|--------------------------------|----------------------|
| Graduation           | 1 μm                           | 10 μm                |
| Range                | ±0.05 mm                       | ±0.5 mm              |
| Precision            | ±1 μm                          | ±5 μm                |
| Measuring force      | 0.98 N                         |                      |
| Spindle stroke       | 2.5 mm                         |                      |
| Contact rating       | 24 V DC 4 mA (resistance load) |                      |
| Standard attachments | Contact point                  | F-001                |
|                      | Back                           | Flat back (F-M103-1) |
|                      | Cable                          | 1 m                  |
|                      | Rubber bellows                 | M-131                |
| Option               | Release                        | —                    |

◇In the 1S series, the contacts are insulated from the body.  
◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)

1S-□□□

These are small-size signal indicators.

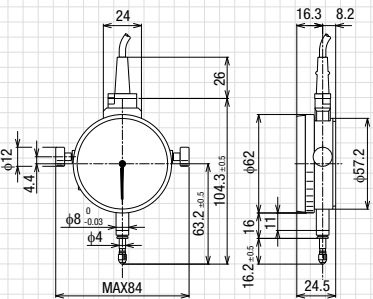


| Model                | 1S-100                         | 1S-010                | 1S-010FIS |
|----------------------|--------------------------------|-----------------------|-----------|
| Graduation           | 1 μm                           | 10 μm                 | 20 μm     |
| Range                | ±0.05 mm                       | ±0.5 mm               | ±0.5 mm   |
| Precision            | ±1 μm                          | ±5 μm                 | ±15 μm    |
| Measuring force      | 0.98 N                         | 0.78 N                | 0.78 N    |
| Spindle stroke       | 2.5 mm                         |                       |           |
| Contact rating       | 24 V DC 4 mA (resistance load) |                       |           |
| Standard attachments | Contact point                  | F-001                 |           |
|                      | Back                           | Flat back (F-M103-1)  |           |
|                      | Cable                          | 3SMA-0061-1.5 (1.5 m) |           |
|                      | Rubber bellows                 | M-131                 |           |
| Option               | Release                        | M-140                 |           |

◇In the 2S series, the contacts are connected to the body.  
◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)

2S-□□□

This low-priced version features a large display.



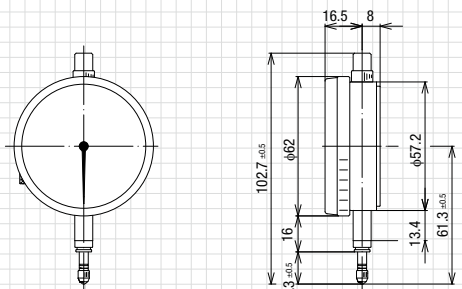
| Model                | 2S-100                         | 2S-200                | 2S-010  | 2S-010FIIS |
|----------------------|--------------------------------|-----------------------|---------|------------|
| Graduation           | 1 μm                           | 2 μm                  | 10 μm   | 20 μm      |
| Range                | ±0.05 mm                       | ±0.1 mm               | ±0.6 mm | ±0.5 mm    |
| Precision            | ±1 μm                          | ±1.5 μm               | ±5 μm   | ±15 μm     |
| Measuring force      | 1.18 N                         | 0.78 N                | 0.78 N  | 0.78 N     |
| Spindle stroke       | 2.8 mm                         |                       |         |            |
| Contact rating       | 24 V DC 4 mA (resistance load) |                       |         |            |
| Standard attachments | Contact point*1                | F-001                 |         |            |
|                      | Back                           | Flat back (F-M101)    |         |            |
|                      | Cable                          | 3SMA-0061-1.5 (1.5 m) |         |            |
|                      | Rubber bellows                 | *2                    |         |            |
| Option               | Release                        | M-140                 |         |            |

◇In the 2S series, the contacts are connected to the body.  
◇All measuring forces are for the state in which no rubber bellows is attached. (The measuring force is about 5 to 15 g higher if a rubber bellows is attached.)  
\*1 Various other contact points are available.  
\*2 In the 2S series, rubber bellows can be installed as an option.

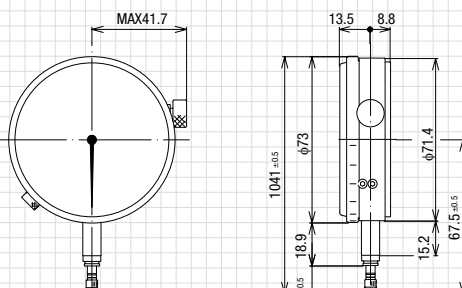
|                |        |             |
|----------------|--------|-------------|
| Optional cable | Model  | 3SMA-0061-3 |
|                | Length | 3 m         |

2M-100 • 3M-100 • 4M-100

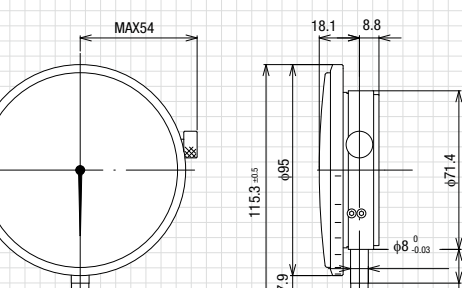
2M-100



3M-100



4M-100P



| Model                | 2M-100           | 3M-100   | 4M-100   |
|----------------------|------------------|----------|----------|
| Graduation           | 1 μm             | 1 μm     | 0.5 μm   |
| Range                | ±0.05 mm         | ±0.05 mm | ±0.05 mm |
| Precision            | ±1 μm            | ±1 μm    | ±0.5 μm  |
| Measuring force      | 0.784 N          | 0.588 N  | 0.784 N  |
| Spindle stroke       | 2.8 mm           |          |          |
| Standard attachments | Contact point *1 | F-001    |          |
|                      | Back             | F-M101   | F-M100   |
|                      | Release          | M-140    |          |
| Option               | Rubber bellows   | M-131    |          |

\*1 Various other contact points are available.

The low-priced version has a graduation of 1 μm.



The standard type has a graduation of 1 μm.



The high-precision type has a graduation of 0.5 μm.





PRECISION  
MEASURING  
INSTRUMENTS

Horizontal Stands

# Measuring Stands

Our lineup of horizontal stands can be used to measure inner and outer diameters. By attaching SA series displacement sensors or Mu-METRON to these stands, you can obtain measurement values with minimal measurement error. In addition, you can measure abnormally shaped workpieces or grooves by using special contact points. Use the H-2 series to measure outer diameters and the BST series to measure inner diameters.

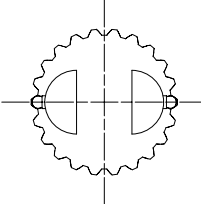
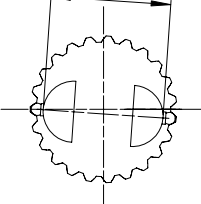
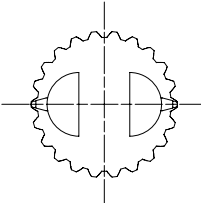
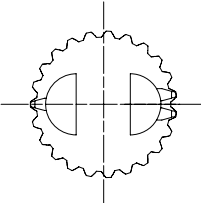
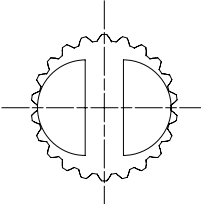
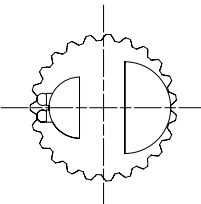
- Indicator**  
DIGIMETRON and ELEMETRON can be used to suit your application.
- Lever**  
A lever for moving the contact point back and forth, which facilitates stable measurement while keeping the measuring force constant.
- Table**  
The table can be moved horizontally and vertically to suit the work's size and shape.

Measuring Stands

# Horizontal Stands

Internal gear spline measurement BST-2B, BST-1B (3LB)

You can measure the over-pin diameter, large diameter, and small diameter using the BST-2B or BST-1B (3LB) inner diameter measuring instruments and a special-order contact point. Although different measurement methods are used for odd and even numbers of teeth, the following gives some measurement examples.  
\* Since these measurements are comparative measurements against a master (reference work), a master workpiece is required.

| Even No. of teeth                                                                                        | Odd No. of teeth                                                                                         | Contact point selection condition                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Over-pin diameter<br> | Over-pin diameter<br> | For both even and odd numbers of teeth, measurement can be performed using a two-point-type ball contact point. However, to ensure that the contact point does not touch the large diameter surface, you must consider the ball diameter at the tip or whether the ball has been cut into a D-shape. |
| Large diameter<br>   | Large diameter<br>   |                                                                                                                                                                                                                                                                                                      |
| Small diameter<br>  | Small diameter<br>  | For an even number of teeth, two R-shaped contact points are used. For an odd number of teeth, two ball contact points and an R-shaped contact point are used.                                                                                                                                       |

Horizontal Stands

- Outer diameter measurement  
H-2B  
H-2LB
- Inner diameter measurement  
BST-1B  
BST-2B  
BST-3LB



# H-2B • H-2LB

0-25

mm

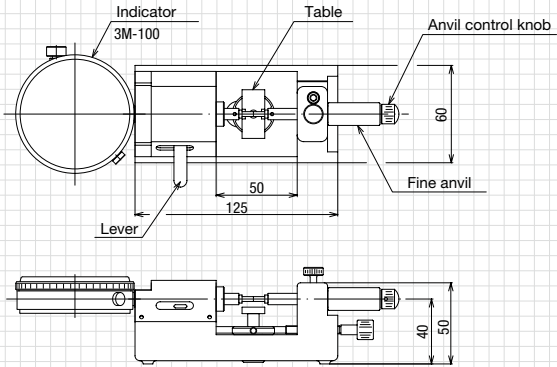
Measurement Range

0-45

mm

Measurement Range

These stands support measurement of outer diameters within the range of 0 to 25 mm.



| Model                     | H-2B                                   |                       | H-2LB                                  |                       |
|---------------------------|----------------------------------------|-----------------------|----------------------------------------|-----------------------|
|                           | Without indicator                      | With indicator 3M-100 | Without indicator                      | With indicator 3M-100 |
| Measurement range         | 0 to 25 mm                             |                       | 18 to 45 mm                            |                       |
| Precision                 | —                                      |                       | —                                      |                       |
| Measuring force           | As per the indicator's measuring force |                       | As per the indicator's measuring force |                       |
| Standard contact point *1 | F-150                                  |                       | F-150                                  |                       |

\*1 Various other contact points are available.

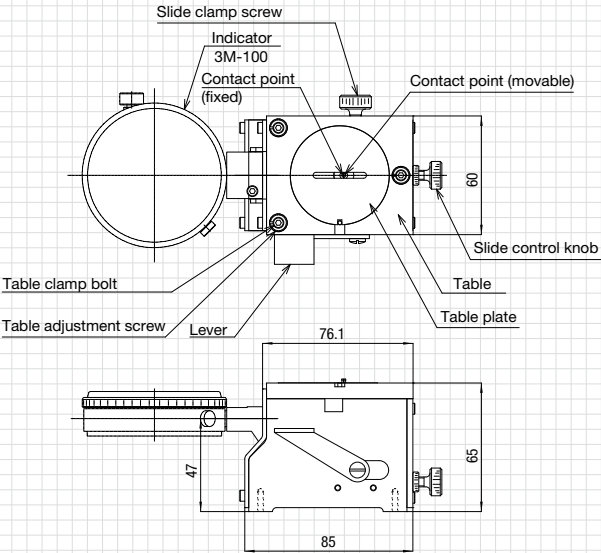
# BST-2B

2-23

mm

Measurement Range

This stand supports measurement of inner diameters within the range of 2 to 23 mm.



| Model                        | BST-2B            |                       |
|------------------------------|-------------------|-----------------------|
|                              | Without indicator | With indicator 3M-100 |
| Measurement range            | φ2~23 mm          |                       |
| Measurement depth adjustment | 3 mm              |                       |
| Measuring force              | 1.47N             |                       |
| Contact point stroke         | 1 mm              |                       |
| Standard contact point       | F-060             |                       |

◇Because this inner diameter measuring instrument is a comparative measuring instrument, a reference gauge is required. Error will result if the dimensional difference between this gauge and the target workpiece is large.

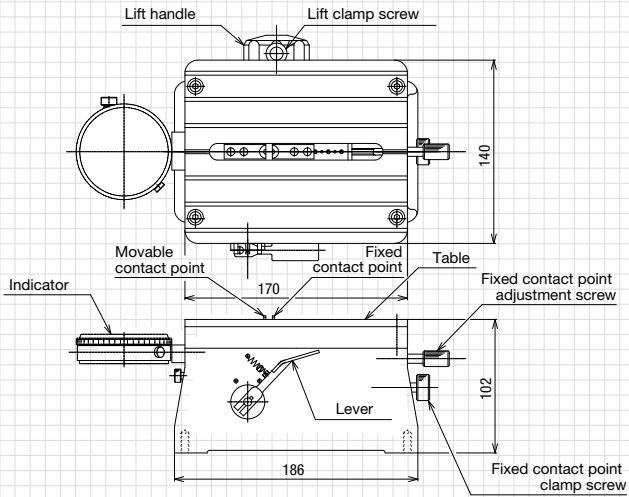
# BST-1B

4-67

mm

Measurement Range

This stand supports measurement of inner diameters within the range of 4 to 67 mm.



| Model                        | BST-1B            |                       |
|------------------------------|-------------------|-----------------------|
|                              | Without indicator | With indicator 3M-100 |
| Measurement range            | φ4 to 67 mm       |                       |
| Measurement depth adjustment | 15 mm             |                       |
| Measuring force              | 0.98 to 2.94 N    |                       |
| Contact point stroke         | 3 mm              |                       |
| Standard contact point       | F-050             |                       |

◇Because this inner diameter measuring instrument is a comparative measuring instrument, a reference gauge is required. Error will result if the dimensional difference between this gauge and the target workpiece is large.

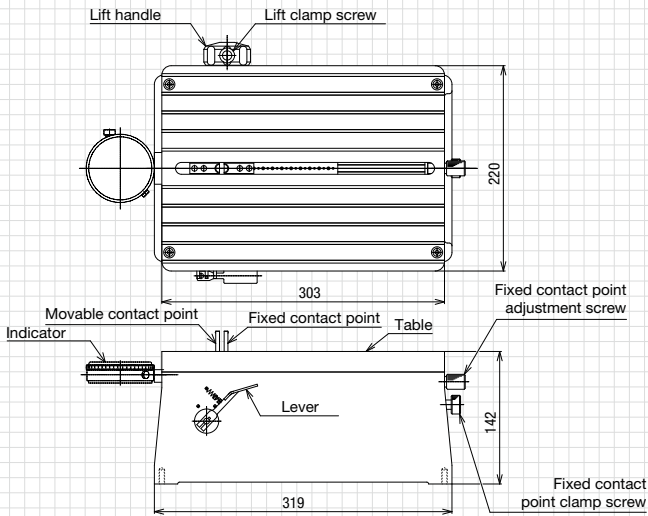
# BST-3LB

10-260

mm

Measurement Range

This stand supports measurement of inner diameters within the range of 10 to 260 mm.



| Model                        | BST-3LB                    |                       |
|------------------------------|----------------------------|-----------------------|
|                              | Without indicator          | With indicator 3M-100 |
| Measurement range            | φ10 to 260 mm              |                       |
| Measurement depth adjustment | 15 mm                      |                       |
| Measuring force              | 0.98 to 4.90 N             |                       |
| Contact point stroke         | 5 mm                       |                       |
| Standard contact point       | F-070, F-071, F-072, F-073 |                       |

◇Because this inner diameter measuring instrument is a comparative measuring instrument, a reference gauge is required. Error will result if the dimensional difference between this gauge and the target workpiece is large.



# Option & Accessories

## Connector Cables

|                     |  | SA-CD-SH□M |     |      | SA-SD-SH□M |     |      |
|---------------------|--|------------|-----|------|------------|-----|------|
| Product No.         |  | 2M         | 5M  | 10M  | 2M         | 5M  | 10M  |
|                     |  | 2 m        | 5 m | 10 m | 2 m        | 5 m | 10 m |
| Shape<br>(Straight) |  |            |     |      |            |     |      |
|                     |  |            |     |      |            |     |      |
| Shape<br>(L-shaped) |  |            |     |      |            |     |      |
|                     |  |            |     |      |            |     |      |

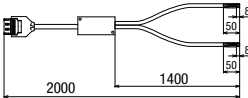
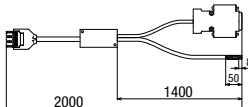
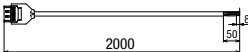
## Output Cables

| Shape                                                                                                                                                                                                                        | Straight | Output  | Product No.       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|-------------------|
| <p>Counter side</p> <p>D-sub 9-pin female</p> <p>2000 <math>^{+200}_{-0}</math></p> <p>D-sub 9-pin female</p> <p>* If you do not need "EXT RS IN" (trigger input), you can use a commercially available interlink cable.</p> | 2 m      | RS-232C | <b>SA-CD-RS2</b>  |
| <p>Counter side</p> <p>2000 <math>^{+200}_{-0}</math></p> <p>50</p>                                                                                                                                                          | 2 m      | BCD     | <b>SA-CD-BCD2</b> |

## SA-CD1N (RS, BO) Adapter

| Shape                                                                               | Output | Product No. |
|-------------------------------------------------------------------------------------|--------|-------------|
|  | 100 V  | AC-001      |

## EM-SA1R Output Cables

| Shape                                                                               | Straight | Output        | Product No        |
|-------------------------------------------------------------------------------------|----------|---------------|-------------------|
|   | 2 m      | Analog<br>+IO | <b>EM-SA1-IA2</b> |
|   | 2 m      | RS232C+<br>IO | <b>EM-SA1-IF2</b> |
|   | 2 m      | IO            | <b>EM-SA1-IO2</b> |
|  | 2 m      | RS232C        | <b>EM-SA1-RS2</b> |

## EM-SA1R Conversion Cable

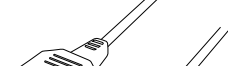
| Shape                                                                                | Dimensions | Product No       |
|--------------------------------------------------------------------------------------|------------|------------------|
|  | 15 cm      | <b>3SEA-2834</b> |

\* Required when connecting a detector to EM-SA1R.

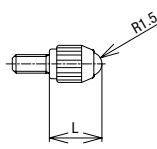
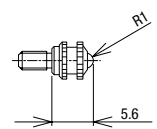
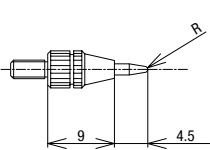
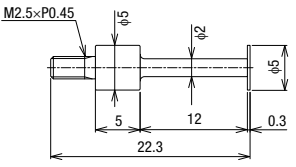
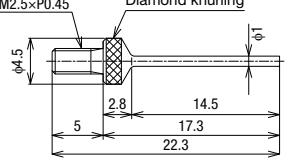
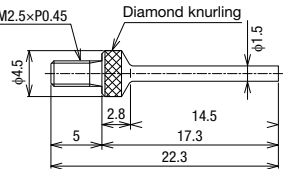
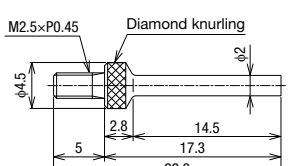
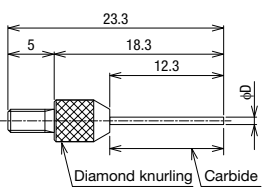
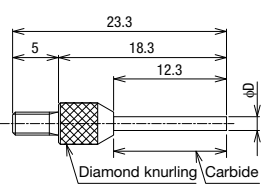
TRI-METRON

Optional cable

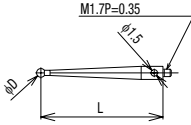
## Optional Cable

| Shape                                                                                | Straight | Product No.        |
|--------------------------------------------------------------------------------------|----------|--------------------|
|  | 3 m      | <b>3SMA-0061-3</b> |

## Contact Points

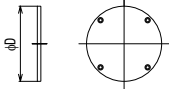
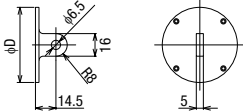
| Shape                                                                                 | Dimensions                       | Product No.  |              |              |              |
|---------------------------------------------------------------------------------------|----------------------------------|--------------|--------------|--------------|--------------|
|                                                                                       |                                  | Steel        | Carbide      | Ceramic      | Nylon        |
|    | L=7                              | <b>F-001</b> | <b>F-101</b> | <b>F-201</b> | <b>F-301</b> |
|                                                                                       | L=9                              | <b>F-002</b> |              |              |              |
|    | L=5.6                            |              | <b>F-171</b> |              |              |
|    | R=0.4                            |              | <b>F-105</b> |              |              |
|                                                                                       | R=0.6                            |              | <b>F-106</b> |              |              |
|   | L1=5 L2=12.3 $\phi D=5$          | <b>F-501</b> |              |              |              |
|  | L1=2.8 L2=14.5 $\phi D=\phi 1.0$ | <b>F-502</b> |              |              |              |
|  | L1=2.8 L2=14.5 $\phi D=\phi 1.5$ | <b>F-503</b> |              |              |              |
|  | L1=2.8 L2=14.5 $\phi D=\phi 2$   | <b>F-504</b> |              |              |              |
|  | L1=6 L2=12.3 $\phi D=\phi 0.5$   |              | <b>F-505</b> |              |              |
|                                                                                       | L1=6 L2=12.3 $\phi D=\phi 1.0$   |              | <b>F-507</b> |              |              |
|  | L1=6 L2=12.3 $\phi D=\phi 2.0$   |              | <b>F-508</b> |              |              |

\* The fixing screw is M2.5P0.45. It can be used commonly for the SA series, ELEMETRON, TRI-METRON, Mu-METRON, etc.

| For ELEMETRON Lever Type                                                          |                 |         |                              |              |
|-----------------------------------------------------------------------------------|-----------------|---------|------------------------------|--------------|
| Shape                                                                             | Dimensions      |         | Applicable model             | Product No.  |
|                                                                                   |                 |         |                              | Carbide      |
|  | $\phi D=\phi 2$ | L =28   | DTH-L                        | <b>F-138</b> |
|                                                                                   | $\phi D=\phi 1$ | L =28   | DTH-L                        | <b>F-139</b> |
|                                                                                   | $\phi D=\phi 2$ | L =18.3 | DTH-L□□U<br>(Universal type) | <b>F-118</b> |

TRI-METRON / Mu-METRON

Backs

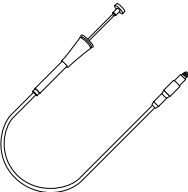
| Backs                                                                               |  |               |  |
|-------------------------------------------------------------------------------------|--|---------------|--|
| Shape                                                                               |  | Flat back F   |  |
|    |  | Shape         |  |
|                                                                                     |  | Center back C |  |
|  |  |               |  |

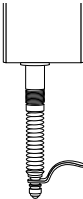
| Model                          | Dimensions (mm)    | No. of holes | Product No.     |
|--------------------------------|--------------------|--------------|-----------------|
| 3M-□□□<br>4M-100P              | $\phi D=\phi 68$   | 4            | <b>F-M100</b>   |
| 2S-□□□<br>2M-100               | $\phi D=\phi 53.2$ | 4            | <b>F-M101</b>   |
| 1S-□□□<br>1S-100LP<br>1S-010LP | $\phi D=\phi 47.1$ | 3            | <b>F-M103-1</b> |

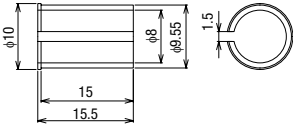
| Model             | Dimensions (mm)    | No. of holes | Product No.     |
|-------------------|--------------------|--------------|-----------------|
| 3M-□□□<br>4M-100P | $\phi D=\phi 68$   | 4            | <b>C-M100</b>   |
| 2S-□□□<br>2M-100  | $\phi D=\phi 53.2$ | 4            | <b>C-M101</b>   |
| 1S-□□□            | $\phi D=\phi 47.1$ | 3            | <b>C-M103-1</b> |

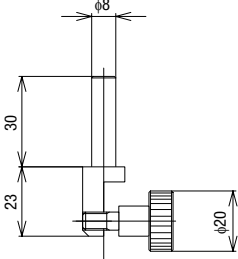
TRI-METRON / Mu-METRON

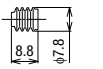
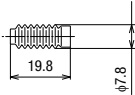
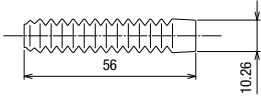
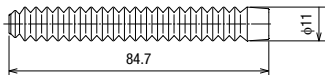
Release / Finger Lever

| Release                                                                             |                    |              |
|-------------------------------------------------------------------------------------|--------------------|--------------|
| Shape                                                                               | Applicable models  | Product No.  |
|  | 1S, 2S, 2M, 3M, 4M | <b>M-140</b> |

| Finger lever                                                                        |                                                         |              |
|-------------------------------------------------------------------------------------|---------------------------------------------------------|--------------|
| Shape                                                                               | Applicable models                                       | Product No.  |
|  | Can be installed in any model with M2.5 contact points. | <b>M-129</b> |

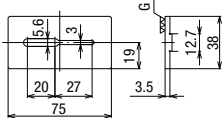
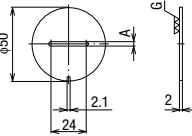
| Indicator bush                                                                      |                                                                              |              |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------|
| Shape                                                                               | Applicable models                                                            | Product No.  |
|  | All models with an 8-mm diameter stem can be fixed with this indicator bush. | <b>M-150</b> |

| Lug holder                                                                          |                 |
|-------------------------------------------------------------------------------------|-----------------|
| Shape                                                                               | Product No.     |
|  | <b>SMA-0417</b> |

| Rubber bellows                                                                      |                                                                   |              |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------|
| Shape                                                                               | Applicable models                                                 | Product No.  |
|  | 1S-□□□<br>2S-□□□<br>DTH-P□□□<br>2M - 100<br>3M - 100<br>4M - 100P | <b>M-131</b> |
|  | SA - S110, SA - S110 / 03N<br>SA - S510, SA - S510 / 03N          | <b>M-137</b> |
|  | SA - S532                                                         | <b>M-142</b> |
|  | SA - S550                                                         | <b>M-143</b> |

Horizontal stands

Table plates (hardened lap)

| Table plates (hardened lap)                                                           |                             |                 |                 |
|---------------------------------------------------------------------------------------|-----------------------------|-----------------|-----------------|
| Shape                                                                                 | Applicable stand            | Dimensions (mm) | Product No.     |
|                                                                                       |                             |                 | Hardened lap    |
|  | BST-1B<br>(Auxiliary table) |                 | <b>TP-106*1</b> |
|  | BST-2B                      | A=3             | <b>TP-107</b>   |
|                                                                                       |                             | A=5.6           | <b>TP-108</b>   |

\*1 Make-to-order manufacturing

| Contact points (BST-1B) |          |           |            |            |
|-------------------------|----------|-----------|------------|------------|
| Product No.             | F-050    | F-051     | F-052      | F-053      |
| Shape                   |          |           |            |            |
| Measurement range (mm)  | φ4 to 59 | φ12 to 67 | φ1.5 to 56 | φ87 to 126 |
| Measurement depth (mm)  | 0 to 7   | 0 to 12   | 0 to 2.5   | 0 to 12    |

◇Made of SK carbon hardened steel. ◇F-050 is provided as standard.

| Contact point (BST-2B) |          |          |          |
|------------------------|----------|----------|----------|
| Product No.            | F-060    | F-061    | F-062    |
| Shape                  |          |          |          |
| Measurement range (mm) | φ2 to 20 | φ5 to 23 | φ5 to 23 |
| Measurement depth (mm) | 0 to 2   | 2 to 5   | 2 to 5   |

◇Made of SK carbon hardened steel. ◇F-060 is provided as standard. Note that a table plate (TP-108) is required when using F-061 or F-062.

| Contact point (BST-3LB) |                       |                       |                             |                             |
|-------------------------|-----------------------|-----------------------|-----------------------------|-----------------------------|
| Product No.             | F-070*                | F-071*                | F-072*                      | F-073*                      |
| Shape                   |                       |                       |                             |                             |
| Dimensions (mm)         | L =43.5 L1=30.5 L2=42 | L =30.5 L1=17.5 L2=29 | L =44.5 L1=10 L2=42 L3=34.5 | L =31.5 L1=10 L2=29 L3=21.5 |
| Measurement range (mm)  | φ10 to 180            | φ10 to 180            | φ25 to 203 (φ105 to 260)    | φ25 to 203 (φ105 to 260)    |
| Measurement depth (mm)  | 13 to 28              | 0 to 15               | 13 to 28                    | 0 to 15                     |

◇Made of SK carbon hardened steel. ◇Can be used with BST-1B. \* Make-to-order manufacturing

| Contact point (H-2B, H-2LB) |          |           |
|-----------------------------|----------|-----------|
| Product No.                 | F-150    | F-152     |
| Shape                       |          |           |
| Measurement range (mm)      | φ4 to 59 | φ12 to 67 |
| Measurement depth (mm)      | 0 to 7   | 0 to 12   |

◇Made of carbide.

| Product                                          | Model                            |
|--------------------------------------------------|----------------------------------|
| [Amplifier] ELEMETRON                            | DTM-FA                           |
| I/O interface card<br>(For DTM-FA, DGM-FC)       | RK-R                             |
|                                                  | RK-P                             |
|                                                  | RK-O                             |
|                                                  | BCD-T                            |
|                                                  | BCD-O                            |
|                                                  | RS232C                           |
|                                                  | RS232C-9F                        |
|                                                  | CN-N                             |
| [Amplifiers] ELEMETRON                           | CN-C                             |
|                                                  | DTM-CD                           |
|                                                  | DTM-CA                           |
|                                                  | DTM-CA/H                         |
|                                                  | DTM-CB/1V                        |
|                                                  | DTM-CB/5V                        |
|                                                  | DTM-CB/10V                       |
|                                                  | DTM-MD4                          |
| Light boxes for signal indicators                | TLB-1 TLB-7 TLB-3L TLB-3B TLB-5L |
| [Detectors] DIGIMETRON<br>DGM series             | DGM-0501B                        |
|                                                  | DGM-0505B                        |
|                                                  | DGM-1001B                        |
|                                                  | DGM-1005B                        |
|                                                  | DGM-2501B                        |
|                                                  | DGM-2505B                        |
|                                                  | DGM-0201BT                       |
|                                                  | DGM-0205BT                       |
| Machining sound level detectors                  | GPH-2N                           |
| TRI-METRON                                       | 1S-010BF                         |
| [Counter] DIGIMETRON                             | DGM-FC                           |
| All dial gauge models (including the lever type) | C-105E                           |
|                                                  | C105EP                           |
|                                                  | C-105B                           |
|                                                  | C-106N                           |
|                                                  | C-107N                           |
|                                                  | C-107S                           |
|                                                  | C-107B                           |
|                                                  | C-108                            |
|                                                  | 2A-104                           |
|                                                  | 2A-104R                          |
|                                                  | 2A-254                           |
|                                                  |                                  |

| Product                                                | Model       |
|--------------------------------------------------------|-------------|
| All dial gauge models (including the lever type)       | 2A-254R     |
|                                                        | 2B-104      |
|                                                        | 2B-104P     |
|                                                        | 2B-254      |
|                                                        | 0B-054      |
|                                                        | 0B-054P     |
|                                                        | T-201       |
|                                                        | T-202       |
|                                                        | T-203       |
|                                                        | TC-100      |
|                                                        | TC-101      |
|                                                        | TC-102      |
| [Checker] TRI-METRON                                   | CHK-001     |
|                                                        | 2BF-3       |
|                                                        | CLS-1L      |
| Signal limit                                           | 4B-5        |
|                                                        |             |
|                                                        |             |
| [Amplifier] ELEMETRON                                  | DTM-AM      |
| [Detectors] ELEMETRON                                  | DTH-P50L    |
|                                                        | DTH-P70W    |
| Paper thickness measuring instrument                   | MEI-10B     |
| Cable for sequencers                                   | TRC-200     |
| TRI-METRON                                             | 1S-010BT    |
|                                                        | 1S-100BT    |
| Mini-METRON                                            | 1T-100      |
|                                                        | 1T-100D     |
|                                                        | 1T-200D     |
| Small bore measuring instruments<br>(Bore Check)       | MEI-6D      |
|                                                        | MEI-6E      |
|                                                        | MEI-6F      |
|                                                        | 2M-250S     |
| [Detector] DIGIMETRON                                  | IPD-C1003   |
| [Counter] DIGIMETRON                                   | DGB-FCB1    |
|                                                        | DGB-FCB1/BO |
|                                                        | DGB-FCB1/RS |
|                                                        | IPD-FCC1    |
|                                                        | IPD-FCC1/RS |
|                                                        | IPD-FCC1/BO |
|                                                        |             |
| Rubber hardness tester / soft material hardness tester | CH-R01/V    |
|                                                        | CH-R01/IRHD |