# Featured Products


## Linear Gages (Environment-Resistant)

### LG100 Series

Refer to pages G-5 to G-6 for details.


## Linear Gages (Environment-Resistant and Slim Type)

### LG200 Series

Refer to page G-7 for details.

## Industrial Interface-mounted Compact Counter

### EJ-102N/NE Counter, Interface Unit

Refer to page G-13 for details.

## High Accuracy Non-contact Measuring System/ Laser Scanning Micrometer

Refer to pages G-30 for details.


# In-line, Non-contact Measuring System / Laser Scanning Micrometer

Refer to pages G-31 for details.

PROPRIETARY INSPECTION CERTIFICATE

### Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

### ABSOLUTE Linear Encoder

Mitutoyo developed the unique absolute method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

MiCAT
Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
SENSOR

### Measurement Program

Free downloadable software available. **LSMPak** and **QuickTool**.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

### Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring machines by simply combining the functions necessary for your purpose.



IP67 G IP66

### IP Codes

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2001) and JIS C 0920: 2003.
(Refer to page IX)

## INDEX

# Gage Heads/Display Units

[Gage Heads]

[Conversion plug]

Environment-Resistant

**LG100**

IP67 G

Measuring range: 10 mm/25 mm/50 mm
Resolution: 1 µm/0.5 µm/0.1 µm

Refer to page G-5

Environment-Resistant and Slim Type

**LG200***

IP67 G

Measuring range: 10 mm
Resolution: 1 µm/0.5 µm/0.1 µm

Refer to page G-7

* Function of reference point detection on counter is disabled.

Conversion Plug
**21HZA196**

Conversion Cable
**21HZA261**

Conversion Plug
**21HZA195**

Conversion Cable
**21HZA260**

Digimatic output Type

**LGS**

Digimatic IP66

Measuring range: 12.7 mm
Resolution: 10 µm

Refer to page G-8

High-accuracy Type

**LGH**

Measuring range: 10 mm
Resolution: 0.01 µm/0.005 µm

Refer to page G-9

# Gage Heads/Display Units

## [Display Units]

### DIN rail-mounted Type

**EJ-102N / NE**

2-axis input, subtraction calculations
8 units can be connected

Refer to page G-13

### Panel mount

**EH-102Z**

2-axis input, subtraction calculations
Multi-function

Refer to page G-12

**EH-101P** (1 axis)
**EH-102P** (2 axes)

Multi-function

Refer to page G-12

**EH-102D**

2-axis input, subtraction calculations
Multi-function

Refer to page G-12

### Compact display Unit

**EC-101D**

1-axis input

Refer to page G-11

## [Interface Unit / Software]

### Interface Unit

**CC-Link**
**21HZA186**

Refer to page G-13

**PROFINET**
**21HZA187**

Refer to page G-13

**EtherNet/IP**
**21HZA188**

Refer to page G-13

**EtherCAT**
**21HZA264**

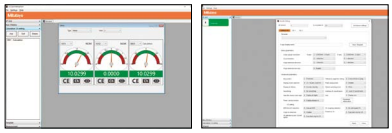
Refer to page G-13

**USB**
**21HZA149**

Refer to page G-13

### Setup tool for EJ counters

**LG QuickSetupTool**
(can be downloaded for free from the Mitutoyo website)



Refer to page G-15

### Measurement data acquisition software

**SENSORPAK**

Refer to page G-16

Find a Distributor

# Linear Gages

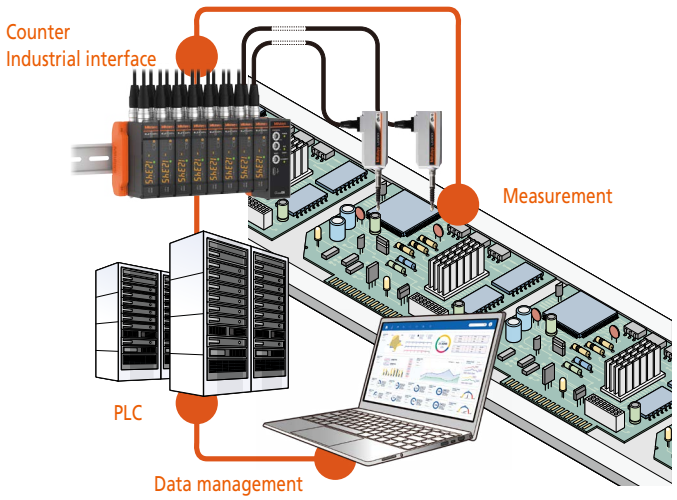
IP67 G

## LG100 Standard Type Probe
## SERIES 542 — Environment-Resistant type

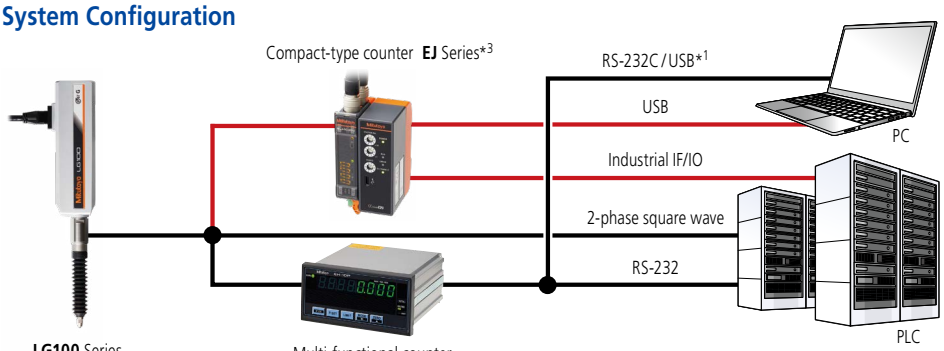
- High-accuracy gage head suitable for in-line and general use.
- Guaranteed Accuracy and Repeatability.
- Sliding durability of 50 million+ cycles*1.
- Can be connected to various counters such as:
  - EJ series - built-in display, modular, compact, with PLC interfaces, as well as USB
  - EH series - high-visibility display, serial and I/O communication (adapter required)
  - or direct to machines via TTL output from the Linear Gage
- **IP67G** protection rating with superior oil-resistance compared to standard gages.
- All models have the origin point signal output function to restore the origin point position after recovery from problems such as overspeed.
- When using any EJ+interface, a free setup and viewing software is available: LG Quicksetuptool (refer to page G-15)

*1 10 mm range models (Actual value from in-house tests)


### Enables real-time measurement and data management

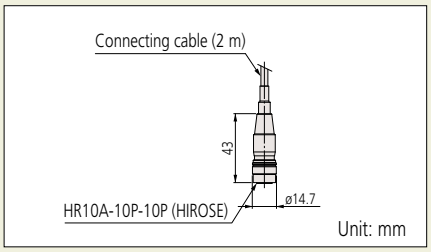



### System Configuration




*1 USB output of **EH** counter is specifically for **SENSORPAK**.
*2 A conversion plug is required for connecting to **EH** counter.
*3 Conventional gages can be connected using conversion connectors. (Please contact us for details of connectable gages.)

### Connector

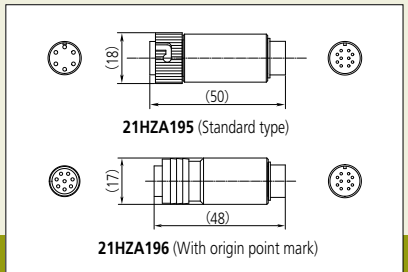



### Optional Accessories

- Air lifter
  For 10 mm range models: **02ADE230**
  For 25 mm range models: **02ADE250**
  For 50 mm range models: **02ADE270**
  Note 1: Required air pressure: 0.2 to 0.4 MPa
  (With a 0.1 µm resolution type: 0.2 MPa)
  Note 2: Spindle extends when air is supplied.

- Rubber boot (spare)
  For 10 mm range models: **21HAA331**
  For 25 mm range models: **21HZA176**
  For 50 mm range models: **21HZA184**
  Note 3: Dimensions are shown in the external dimensions drawing of the product.
- Thrust stem set:
  For 10 mm range models: **02ADB680**
  (Thrust stem: **02ADB681**, Clamp nut: **02ADB682**)
  For 25/50 mm range models: **02ADN370**
  (Thrust stem: **02ADN371**, Clamp nut: **02ADB692**)
  This is a combination of thrust stem and a clamp nut.
- Spanner wrench:
  For 10 mm range models: **02ADB683**
  For 25/50 mm range models: **02ADB693**
  If required spanner wrench is required for tightening.
  If using multiple gages, a thrust stem set is required for each gage and one spanner wrench.
- Extension cable
  5 m: **21HZA197**
  10 m: **21HZA198**
  20 m: **21HZA199**
  Note 4: Connectable up to 3 pieces, 20 m at maximum.
- Conversion Plugs / Cables
  Plug connection to EH-101P/102P: **21HZA195**
  Plug connection to EH-102Z: **21HZA196**
  Cable connection to EH-101P/102P: **21HZA260**
  Cable connection to EH-102Z: **21HZA261**

Note: Connectable to EH-102Z but the function of reference point detection is disabled.



## SPECIFICATIONS

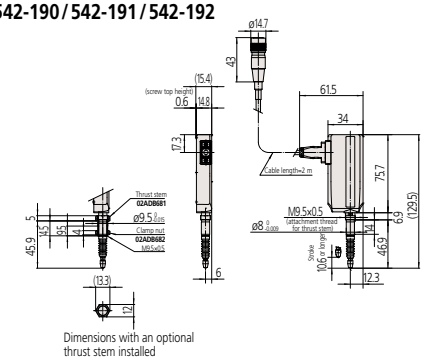
| Order No. | | 542-190 | 542-191 | 542-192 | 542-193 | 542-194 | 542-195 | 542-196 | 542-197 |
|---|---|---|---|---|---|---|---|---|---|
| Measuring range | | 10 mm / .4" | | | 25 mm / 1" | | | 50 mm / 2" | |
| Resolution | | 1 µm | 0.5 µm | 0.1 µm | 1 µm | 0.5 µm | 0.1 µm | 1 µm | 0.5 µm |
| | | .00005" | .000020" | 5 uinch | .00005" | .000020" | 5 uinch | .00005" | .000020" |
| Measuring accuracy (20 °C) L=arbitrary measuring length (mm) | | 1.5 + L/50 µm | | 0.8 + L/50 µm | 1.5 + L/50 µm | | 0.8 + L/50 µm | 1.5 + L/50 µm | |
| Small range accuracy (20 °C) | | 0.5 µm (Arbitrary 20 µm range) | | | | | | | |
| Repeatability: 2σ (20 °C) | | 0.3 µm | | | | | | | |
| Reference mark repeatability: σ (20 °C) | | σ≤0.5 µm (at a constant reference point passing speed less than 300 mm/s in the same direction) | | | | | | | |
| Measuring force | Contact point downwards | 1.4 N or less | | | 4.6 N or less | | | 5.7 N or less | |
| | Contact point horizontal | 1.3 N or less | | | 4.3 N or less | | | 5.3 N or less | |
| | Contact point upwards | 1.2 N or less | | | 4.0 N or less | | | 4.9 N or less | |
| Position detection method | | Optical transmission-type Linear encoder | | | | | | | |
| Maximum response speed | | 1,500 mm/s | | 400 mm/s | 1,500 mm/s | | 400 mm/s | 1,500 mm/s | |
| Output signal | | 90° phase difference, differential square wave (RS-422A equivalent) | | | | | | | |
| Minimum edge intervals | | 500 ns (2 MHz) | 250 ns (4 MHz) | | 500 ns (2 MHz) | 250 ns (4 MHz) | | 500 ns (2 MHz) | 250 ns (4 MHz) |
| Output signal pitch | | 4 µm | 2 µm | 0.4 µm | 4 µm | 2 µm | 0.4 µm | 4 µm | 2 µm |
| Reference mark position (Phase-Z) | | Approx. 3 mm from contact point tip (lowest rest point) | | | Approx. 5 mm from contact point tip (lowest rest point) | | | | |
| Mass | | Approx. 260 g | | | Approx. 300 g | | | Approx. 400 g | |
| Contact point | | ø3 mm carbide tipped (fixing screw: (M2.5 x 0.45), standard contact point: **901312** | | | | | | | |
| Stem | | ø8 mm | | | ø15 mm | | | | |
| Bearing | | Linear ball type | | | | | | | |
| Output cable length | | 2 m (directly from casing) | | | | | | | |
| Connector | | Plug: HR10A-10P-10P (HIROSE), Compatible receptacle: HR10A-10R-10S (HIROSE), Compatible connector: HR10A-10J-10S (HIROSE) | | | | | | | |
| Operating temperature (humidity) ranges | | 0 to 50 °C (RH 20 to 80%, non-condensing) | | | | | | | |
| Storage temperature (humidity) ranges | | -10 to 60 °C (RH 20 to 80%, non-condensing) | | | | | | | |
| Standard accessories | | Wrench for contact point: **538610** | | | Wrench for contact point: **210187** | | | | |

G

## DIMENSIONS

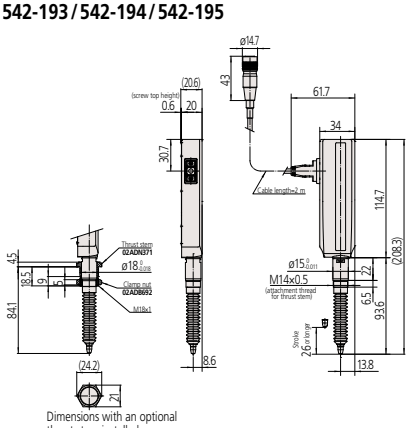
Unit: mm

**542-190 / 542-191 / 542-192**



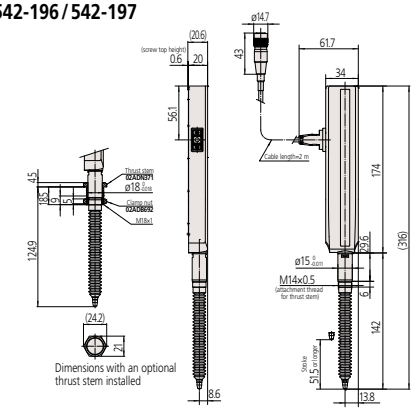

Dimensions with an optional thrust stem installed

**542-193 / 542-194 / 542-195**



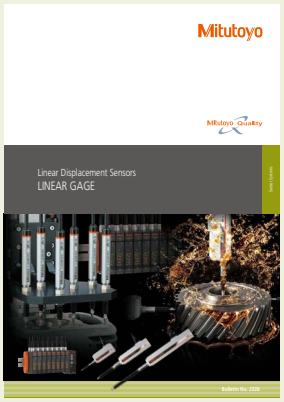

Dimensions with an optional thrust stem installed

**542-196 / 542-197**




Dimensions with an optional thrust stem installed

Got Questions?




Refer to the Linear Gage Brochure (**2326**) for more details.

# Linear Gages

IP67 G

## LG200 Pencil Probe Style
## SERIES 542 — Environment-Resistant and Slim Type

- High-accuracy gage head suitable for in-line and general use.
- Guaranteed Accuracy and Repeatability.
- Sliding durability of 100 million+ cycles*1.
- Can be connected to various counters such as:
  - EJ series - built-in display, modular, compact, with PLC interfaces, as well as USB
  - EH series - high-visibility display, serial and I/O communication (adapter required)
  - Direct to machines via TTL output from the Linear Gage
- **IP67G** protection rating with superior oil-resistance compared to standard gages.
- When using any EJ+interface, a free setup and viewing software is available: LG Quicksetuptool (refer to page G-15)

*1 10 mm range models (Actual value from in-house tests)


**542-187**

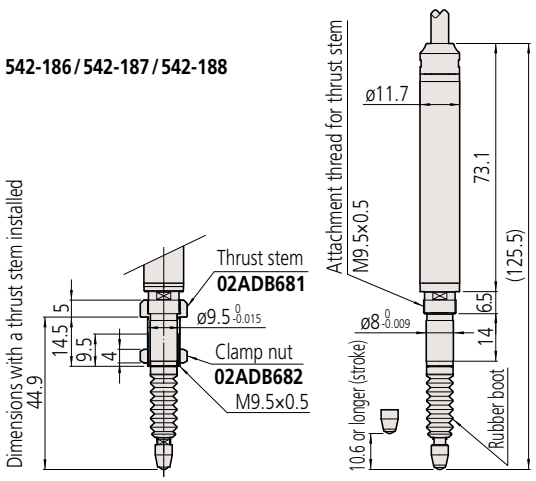
## SPECIFICATIONS

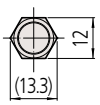
| Order No. | | 542-186 | 542-187 | 542-188 |
|---|---|---|---|---|
| Measuring range | | 10 mm / .4" | | |
| Resolution | | 1 µm / 5 uinch | 0.5 µm / .000020" | 0.1 µm / .000050" |
| Measuring accuracy (20 °C) | | (1.5 + L/50) µm L=arbitrary measuring length (mm) | | (0.8 + L/50) µm L=arbitrary measuring length (mm) |
| Small range accuracy | | 0.5 µm (Arbitrary 20 µm range) | | |
| Repeatability: 2 σ (20 °C) | | 0.3 µm | | |
| Measuring force | Contact point downwards | 0.8 N or less | | |
| | Contact point horizontal | 0.75 N or less | | |
| | Contact point upwards | 0.7 N or less | | |
| Position detection method | | Optical transmission-type Linear encoder | | |
| Maximum response speed | | 1500 mm/s | | 400 mm/s |
| Output signal | | 90° phase difference, differential square wave (RS-422A equivalent) | | |
| Minimum edge intervals | | 500 ns (2 MHz) | 250 ns (4 MHz) | |
| Output signal pitch | | 4 µm | 2 µm | 0.4 µm |
| Mass | | Approx. 210 g | | |
| Contact point | | ø3 mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: **901312** | | |
| Stem | | ø8 mm | | |
| Bearing | | Linear ball type | | |
| Output cable length | | Approx. 2.5 m (directly from casing) | | |
| Connector | | Plug: HR10A-10P-10P (HIROSE), Compatible receptacle: HR10A-10R-10S (HIROSE), Compatible connector: HR10A-10J-10S (HIROSE) | | |
| Operating temperature (humidity) ranges | | 0 to 50 °C (RH 20 to 80%, non-condensing) | | |
| Storage temperature (humidity) ranges | | –10 to 60 °C (RH 20 to 80%, non-condensing) | | |
| Standard Accessories | | Wrench for contact point: **538610** | | |

## DIMENSIONS

Unit: mm

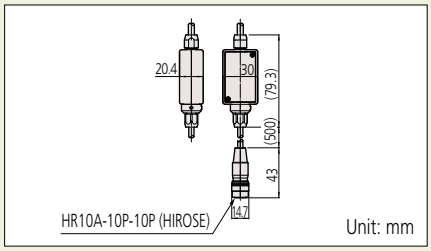
**542-186 / 542-187 / 542-188**




Dimensions with an optional thrust stem installed

### Connector




### Optional Accessories

- Air lifter: **02ADE230**
  Note 1: Required air pressure: 0.2 to 0.4 MPa
  (With a 0.1 µm resolution type: 0.2 MPa)
  Note 2: Spindle extends when air is supplied.


- Rubber boot: **21HAA331** (spare)
- Thrust stem set: **02ADB680**
  (Thrust stem: **02ADB681**, Clamp nut: **02ADB682**)
  This is a combination of thrust stem and a clamp nut.
- Spanner wrench: **02ADB683**
  If required spanner wrench is required for tightening.
  If using multiple gages, one spanner wrench and a thrust stem set is required for each gage.

### Thrust stem set / Spanner Wrench

- Extension cable
  5 m: **21HZA197**
  10 m: **21HZA198**
  20 m: **21HZA199**
  Note 1: Connectable up to 3 pieces, 20 m at maximum.
- Conversion Plugs / Cables
  Plug connection to EH-101P/102P: **21HZA195**
  Plug connection to EH-102Z: **21HZA196**
  Cable connection to EH-101P/102P: **21HZA260**
  Cable connection to EH-102Z: **21HZA261**

Note: Connectable to EH-102Z but the function of reference point detection is disabled.

**Custom order example**
- Measuring force change
- Cable length change (less than 2 m)
- Connector change

G

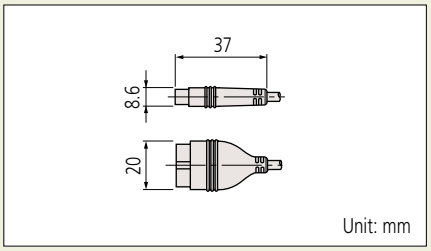
# Linear Gages

## LGS-1012P
## SERIES 575 — Digimatic output Type

- ABSOLUTE electrostatic capacitance type encoder makes it possible to maintain the reference point even when the power is switched off.
- Excellent protection against dust and splashing water (IP66) on the factory floor.


575-303

### Connector




Unit: mm

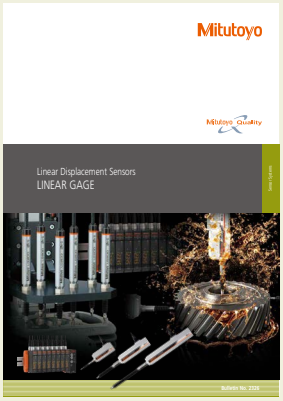
### Optional Accessories

- EC Counter: **542-007A**
- EH Counter: **542-072A**
- Air lifter (metric): **903594**
- Air lifter (inch): **903598**
- SPC cable extension adapter: **02ADF640**
- Extension cable for Digimatic gages (0.5 m): **02ADD950**
- Extension cable for Digimatic gages (1 m): **936937**
- Extension cable for Digimatic gages (2 m): **965014**
- Rubber boot: **238774** (spare)

Note: When connecting an extension cable, an SPC cable extension adapter is required.


**542-007A**


**542-072A**




Refer to the Linear Gage Brochure (**2326**) for more details.

## SPECIFICATIONS

### Inch

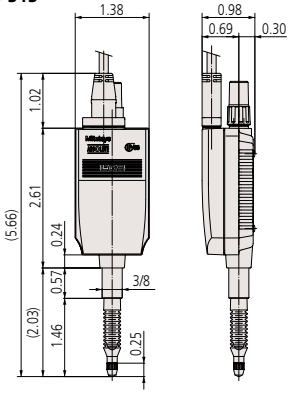
| Order No. | | 575-313 |
|---|---|---|
| Measuring range | | 0.5 in |
| Resolution | | 0.0005 in |
| Measuring accuracy (20 °C) | | 0.0008 in |
| Measuring force | Contact point downwards | 2 N or less |
| | Contact point horizontal | 1.8 N or less |
| | Contact point upwards | 1.6 N or less |
| Position detection method | | ABSOLUTE electrostatic capacitance type linear encoder |
| Response speed | | Unlimited (not applicable to scanning measurement) |
| Output | | Digimatic code |
| Mass | | Approx. 190 g |
| Contact point | | ø3 mm carbide tipped (fixing screw: 4-48 UNF), standard contact point: **21BZB005** |
| Stem | | ø9.52=3/8 in DIA |
| Bearing | | Plain type |
| Output cable length | | 2 m (directly extended from the main unit) |
| Operating temperature (humidity) ranges | | 0 to 40 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | | –10 to 60 °C (RH 20 to 80%, non-condensing) |

### Metric

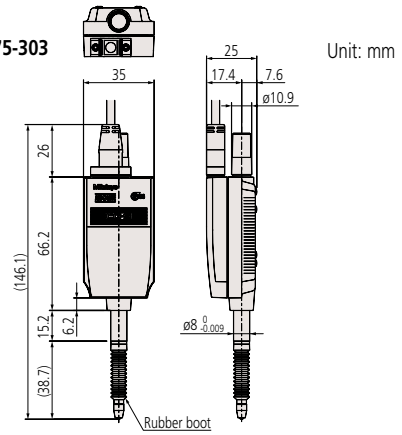
| Order No. | | 575-303 |
|---|---|---|
| Measuring range | | 12.7 mm |
| Resolution | | 10 µm |
| Measuring accuracy (20 °C) | | 15 µm |
| Measuring force | Contact point downwards | 2 N or less |
| | Contact point horizontal | 1.8 N or less |
| | Contact point upwards | 1.6 N or less |
| Position detection method | | ABSOLUTE electrostatic capacitance type linear encoder |
| Response speed | | Unlimited (not applicable to scanning measurement) |
| Output | | Digimatic code |
| Mass | | Approx. 190 g |
| Contact point | | ø3 mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: **901312** |
| Stem | | ø8 mm |
| Bearing | | Plain type |
| Output cable length | | 2 m (directly extended from the main unit) |
| Operating temperature (humidity) ranges | | 0 to 40 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | | –10 to 60 °C (RH 20 to 80%, non-condensing) |

## DIMENSIONS

**575-313** Unit: ina



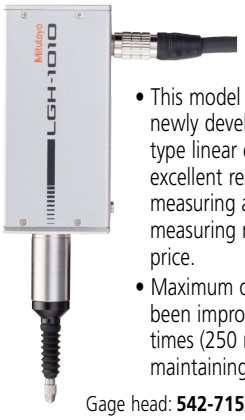

**575-303** Unit: mm



# Linear Gages

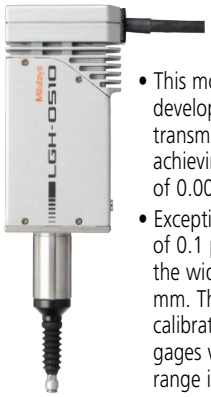
## LGH (0.01/0.005 µm resolution)
## SERIES 542 — High-accuracy/resolution Type

- This series has achieved very high accuracy combined with a resolution of 0.01/0.005 µm (according to model), practically equivalent to that of a laser interferometer, and a wide measuring range of 10 mm.
- A compact body design makes a significant contribution to a downsizing of this gage itself, which is best suited for calibration/evaluation of master gages as well as measurement of high-precision parts and as a length measuring sensor incorporated into high-precision positioning/control units.
- A low measuring force model is available for those applications where measurement of easily deformed or damaged workpieces is required.
- Every LGH Series gage is bundled with a dedicated counter.




- This model is equipped with a newly developed optical reflection-type linear encoder, achieving an excellent resolution of 0.01 µm, a measuring accuracy of 0.2 µm and a measuring range of 10 mm at a low price.
- Maximum operating speed has been improved by a factor of 2.8 times (250 mm/s → 700 mm/s) while maintaining very high accuracy.

Gage head: **542-715A**




- This model is equipped with a newly developed ultra-high precision transmission type linear encoder, achieving the outstanding resolution of 0.005 µm (5 nm).
- Exceptional measuring accuracy of 0.1 µm has been attained over the wide measuring range of 10 mm. This series is most suited for calibration/evaluation of master gages where its wide measuring range is a great advantage.

Gage head: **542-720A**


Dedicated counter

## TYPICAL APPLICATIONS

Master gage calibration/evaluation

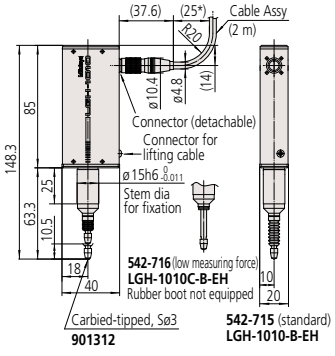
Inspection of high-precision parts

Needle contact-point mounting example

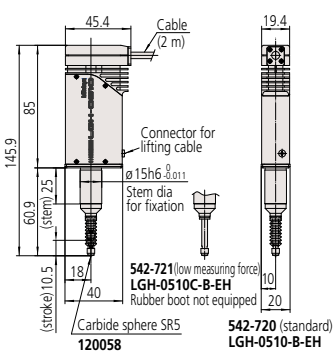
## DIMENSIONS

Unit: mm

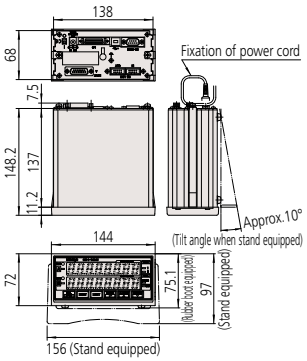
**542-716A**




**542-721A**



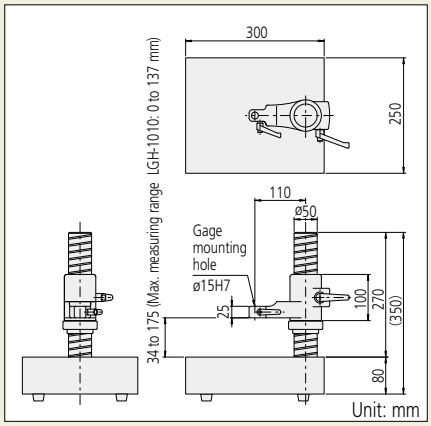

**Dedicated counter (set)**



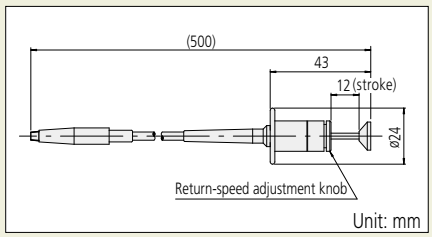

* Minimum bending radius or minimum dressed dimension

## Optional Accessories

- Measuring stand: **971750**

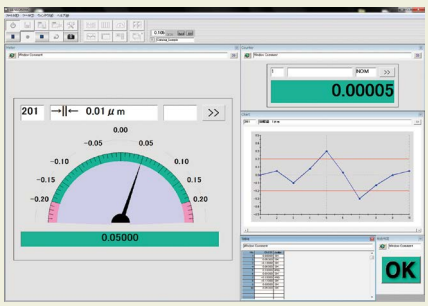



- Spindle lifting cable: **971753**




- I/O connector: **02ADB440**

- **SENSORPAK**




Note: Refer to page G-16 for more details.

- Rubber boot: **238772**
  (Spare for **542-715A** and **542-720A**)


Refer to the Linear Gage Brochure (**2326**) for more details.

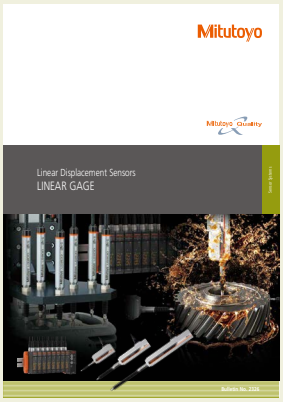
## SPECIFICATIONS

| Order No. | | Resolution 0.01 µm / Accuracy 0.2 µm model | |
|---|---|---|---|
| | | **542-715A** (Standard) | **542-716A** (Low measuring force) |
| Measuring range | | 10 mm | |
| Resolution | | 0.01 µm (0.05 µm, 0.1 µm, 0.5 µm, 1 µm can be selected from the counter) | |
| Measuring accuracy (20 °C)*1 | | 0.2 µm | |
| Repeatability (20 °C)*1 | | 0.1 µm (2σ) | |
| Retrace error (20 °C)*1 | | 0.1 µm | |
| Measuring force | Contact point downwards | 0.65 N or less | Approx. 0.12 N |
| | Contact point horizontal | 0.55 N or less | Not applicable |
| | Contact point upwards | 0.45 N or less | Not applicable |
| Position detection method | | Optical reflection type linear encoder | |
| Detectable operation speed | | In normal measurement: 700 mm/sec; for peak detection: 120 mm/sec | |
| Mass of gage head | | Approx. 370 g | |
| Contact point | | Carbide tipped, Sø3 mm (M2.5x0.45), standard contact point: **901312** | |
| Stem | | ø15 mm | |
| Bearing | | Linear ball type | |
| Output cable length | | Approx. 2 m | |
| Operating temperature (humidity) ranges | | 0 to 40 °C (Reference temperature 20 °C)/20 to 80% RH (non-condensing) | |
| Storage temperature (humidity) ranges | | –10 to 60 °C/20 to 80% RH (non-condensing) | |
| **Counter Specifications** | | | |
| Display range | | ±999.99999 mm | |
| Functions | | Zero-setting, presetting, direction changeover, tolerance judgment (3 steps/5 steps), RS-LINK | |
| Peak hold function | | Yes | |
| Interface | | RS-232C, USB (only for **SENSORPAK**), Digimatic (Printer: **DP-1VA LOGGER**)*3, I/O Connector | |
| External output | | • RS-232C: counting data • Digimatic output: counting data*3<br>• I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output | |
| External control | | Zero-setting, presetting, data hold, peak measurement mode selection, peak clear | |
| Power supply | | Suppplied AC Adapter, or 12 to 24 V DC, max. 700 mA | |
| Power consumption | | 8.4 W (max. 700 mA), ensure at least 1 A power supply per unit. | |
| Mass of counter | | Approx. 900 g (AC Adapter excluded) | |
| Standard accessories | | Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate | |

| Order No. | | Resolution 0.005 µm / Accuracy 0.1 µm model | |
|---|---|---|---|
| | | **542-720A** (Standard) | **542-721A** (Low measuring force) |
| Measuring range | | 10 mm | |
| Resolution | | 0.005 µm (0.01 µm, 0.05 µm, 0.1 µm can be selected from the counter) | |
| Measuring accuracy (20 °C)*1 | | 0.1 µm | |
| Repeatability (20 °C)*1 | | 0.02 µm (2σ) | |
| Retrace error (20 °C)*1 | | 0.05 µm | |
| Measuring force | Contact point downwards | 0.65 N or less | Approx. 0.1 N |
| | Contact point horizontal | 0.55 N or less | Not applicable |
| | Contact point upwards | 0.45 N or less | Not applicable |
| Position detection method | | Ultra-high accuracy transmission type linear encoder | |
| Detectable operation speed | | In normal measurement: 250 mm/sec | |
| Mass of gage head | | Approx. 370 g | |
| Contact point | | Carbide sphere SR5 (M2.5x0.45), standard contact point: **120058** | |
| Stem | | ø15 mm | |
| Bearing | | Linear ball type | |
| Output cable length | | Approx. 2 m | |
| Operating temperature (humidity) ranges | | 15 to 25 °C (Reference temperature 20 °C)/30 to 60% RH (non-condensing) | |
| Storage temperature (humidity) ranges | | –10 to 60 °C/20 to 80% (non-condensing)*2 | |
| **Counter Specifications** | | | |
| Display range | | ±99.999995 mm | |
| Functions | | Zero-setting, presetting, direction changeover, tolerance judgment (3 steps/5 steps), RS-LINK | |
| Peak hold function | | No | |
| Interface | | RS-232C, USB (only for **SENSORPAK**), Digimatic (Printer: **DP-1VA LOGGER**)*3, I/O Connector | |
| External output | | • RS-232C: counting data • Digimatic output: counting data*3<br>• I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output | |
| External control | | Zero-setting, presetting, data hold | |
| Power supply | | Suppplied AC Adapter, or +12 to 24 V DC, max. 700 mA | |
| Power consumption | | 8.4 W (max. 700 mA), ensure at least 1 A power supply per unit. | |
| Mass of counter | | Approx. 900 g (AC Adapter excluded) | |
| Standard accessories | | Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate | |

*1 Applies when used with counter.
*2 The storage temperature/humidity ranges after unpacking are the same as the operating temperature/humidity ranges.
*3 When using Digimatic output, the format is d1 and is limited to 5 decimal places

Talk to Sales




Refer to the Linear Gage Brochure (**2326**) for more details.

# Linear Gages

## EC Counter
## SERIES 542 — For Gages with Digimatic output

- This Digimatic display can be connected to Linear gages with Digimatic output (**LGS**).
- Employs DIN size (96×48 mm) and mount-on-panel configuration to facilitate system integration.
- It has a data output and tolerance evaluation function.


**542-007A**

### Function
- Preset
- Tolerance judgment (3 steps)
- Digimatic output

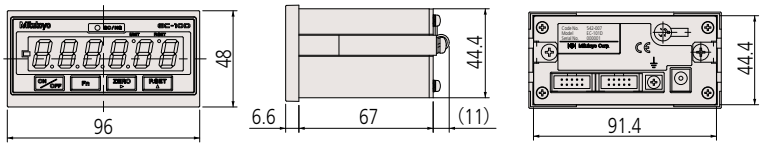
### Optional Accessories
- Connecting cable for digimatic mini-processor: **936937** (1 m), **965014** (2 m)
- DC plug: **214938**
- I/O cable (2 m): **21HZA222**

## SPECIFICATIONS

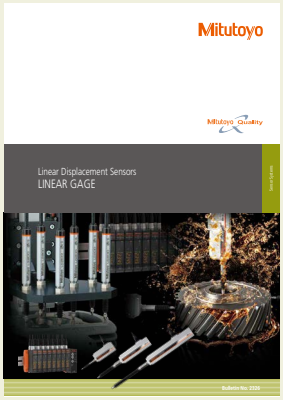
| Model | | **EC-101D** |
|---|---|---|
| **Order No.** | | **542-007A** |
| Resolution<br>( ) indicates maximum display range | | 0.0005 in (±99.9995 in)<br>0.001 in (±999.999 in)<br>0.00005 in (±9.99995 in)<br>0.0001 in (±99.999 in)<br>0.01 mm (±9999.99)<br>0.001 mm (±999.999)<br>[Automatic setting by gage] |
| Display | | Sign plus 6 digits (Green LED) |
| Tolerance judgment display | | LED display (3 steps: Amber, Green, Red) |
| External output (switching type) | Tolerance judgment output | –NG, OK, +NG (open-collector) |
| | Data output | Digimatic output |
| Control input | | External PRESET, external HOLD |
| Power supply | Voltage | Supplied AC adapter, or 9 to 12 V DC |
| | Consumption | 4.8 W (max. 400 mA) Ensure at least 1 A is available per unit. |
| Operating temperature (humidity) ranges | | 0 to 40 °C (RH 20 to 80%, non-condensing) |
| External dimensions | | 96 (W) ×48 (H) ×84.6 (D) mm |
| Standard Accessories | | AC adapter: **12BAR954**<br>AC cable: **12BAK730** |
| Applicable gage head | | **LGS**, **Digimatic Indicators** |
| Mass | | 500 g |

## DIMENSIONS

Unit: mm




Need Repair?




Refer to the Linear Gage Brochure (**2326**) for more details.

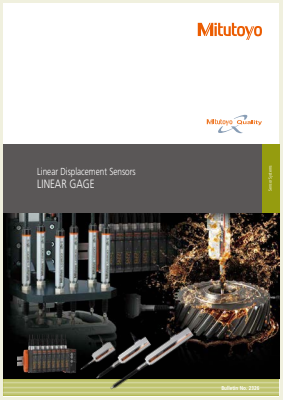
## Optional Accessories

- I/O output connector (with cover): **02ADB440**
- SPC cable (0.5 m): **02ADD950**
- SPC cable (1 m): **936937**
- SPC cable (2 m): **965014**
- Measurement data loading software: **SENSORPAK** (refer to page G-16)

Note: The Digimatic connecting cable doubles as a RS Link cable.

- Conversion Plugs / Cables
  Plug connection to EH-101P/102P: **21HZA195**
  Plug connection to EH-102Z: **21HZA196**
  Cable connection to EH-101P/102P: **21HZA260**
  Cable connection to EH-102Z: **21HZA261**

Note: Connectable to EH-102Z but the function of reference point detection is disabled.




Refer to the Linear Gage Brochure (**2326**) for more details.

## EH Counter
## SERIES 542 — Panel Mount, Multi-function Type with RS-232C and I/O Communication Functions

- Two types are available for this model: a 1-axis display and a 2-axis display, both of which enable addition or subtraction calculations between two gages.
- Multifunctional counter equipped with zero-setting, presetting, tolerance judgment.
- RS-232C and USB are equipped as standard. Data transfer to a PC is possible. (USB is supported only by Mitutoyo **SENSORPAK**.)
- A multi-point measuring system (max. 20 points and max. 10 units) can easily be configured with the built-in RS Link networking function. Refer to "Quick Guide to Precision Measuring Instruments" on page G-18 for details of the RS link.
- Employs DIN size (144×72 mm) and mount-on-panel configuration to facilitate system integration.


**542-075A**


**542-071A**


**542-073A**

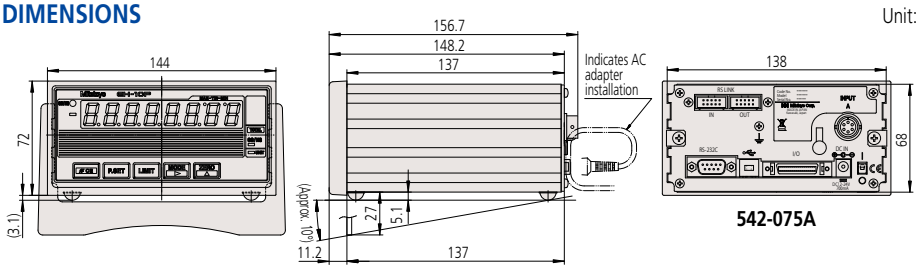

**542-072A**

## SPECIFICATIONS

| Model | | EH-101P | EH-102P | EH-102Z | EH-102D |
|---|---|---|---|---|---|
| **Order No.** | | **542-075A** | **542-071A** | **542-073A** | **542-072A** |
| Number of axes to be displayed | | 1 axis | 2 axes | | |
| Origin point detection function | | — | — | ✔ | — |
| Maximum input frequency | | 2.5 MHz (2-phase square wave) | | | — |
| Resolution<br>( ) indicates maximum display range | | 0.0005 in (±99.9995 in)/0.01 mm (±9999.99 mm)<br>0.00005 in (±9.99995 in)/0.005 mm (±999.995 mm)<br>0.00005 in (±9.99995 in)/0.001 mm (±999.999 mm)<br>0.000005 in (±0.999995 in)/0.0005 mm (±99.9995 mm)<br>0.000005 in (±0.999995 in)/0.0001 mm (±99.9999 mm) [Parameter set] | | | Automatic setting by gage |
| Tolerance judgment display | | LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flashing, Green, Red flashing, Red) | | | |
| Interface | | RS-232C/USB/parameter selection via digimatic (only **DP-1VA LOGGER**, Digimatic Mini-Processor can be connected) (USB used only with **SENSORPAK**.)<br>Selection by parameter from 3-step, 5-step, or simple BCD<br>Total tolerance judgment output (when tolerance function is enabled)<br>Analog output (1 V to 4 V) | | | |
| Input/output | Control output | Open-collector | | | |
| | Control input | Display BANK switching, peak mode, presetting, display hold, hold per axis: open-collector or no-voltage contact signal (with/without contact point) | | | |
| Power supply | Voltage | Supplied AC adapter, or 12 to 24 V DC | | | |
| | Consumption | 8.4 W (max. 700 mA)<br>Ensure at least 1 A is available per unit. | | | |
| Operating temperature (humidity) ranges | | 0 to 40 °C (RH 20 to 80%, non-condensing) | | | |
| Storage temperature (humidity) ranges | | –10 to 50 °C (RH 20 to 80%, non-condensing) | | | |
| Standard Accessories | | AC adapter: **357651**/<br>AC cable: **02ZAA010** | | | |
| Applicable gage head | | **LG100/LG200**<br>A conversion plug **21HZA195** is required<br>(The origin point detection function is disabled) | | **LG100/LG200**<br>A conversion plug **21HZA196** is required<br>(The origin point detection function is disabled when connected to **LG200**) | Any gage with Digimatic output: **LGS**, **Digimatic Indicators**, **Digimatic Scale Units**, etc. |
| Mass | | Approx. 760 g | Approx. 800 g | Approx. 800 g | Approx. 800 g |

## DIMENSIONS

Unit: mm




**542-075A**

# Linear Gages

## EJ-102N/NE Counter, Interface Unit: CC-Link, PROFINET, EtherNet/IP, EtherCAT, USB
## SERIES 542 — Linear Gage Counter

- A modular, high-speed, space-saving counter for linear gage suitable for in-line and general use.
- Up to 8 counters can be linked providing the capacity to connect up to 16 gages.
- DIN rail mountable.
- All linked units can be driven by a single power source.
- Data can be output through an industrial interface by linking a counter with an interface unit.
- Enables sum/difference operations between 2 gages connected to the same counter.

Counter unit

**EJ-102N/NE**

Interface unit

**CC-Link** **PROFINET** **EtherNet/IP** **EtherCAT** **USB**


### Optional Accessories

- USB Cable - 2m w/ferrite: **64PMI269**
- AC adapter: **357651**
- AC cable*: **02ZAA010**
- DC connector with bar terminal: **21HZA209***

* Required when using AC adapter.

| Connectable linear gage Series | Conversion cable (optional) |
|---|---|
| **LGF-Z** | Necessary (**21HZA194**) |
| **LGF*/LGK*/LGB*/LG*** | Necessary (**21HZA193**) |

* The origin point detection function is disabled.

Image of mounting

## SPECIFICATIONS

| Model | | EJ-102N | |
|---|---|---|---|
| **Order No.** | | **542-081A** Includes AC components | **542-081** |
| Unit | | inch/mm | |
| Resolution | | 0.0002, 0.00005, 0.00002, 0.000005 (inch)/ 0.005, 0.001, 0.0005, 0.0001 (mm) | |
| Number of linear gage connection ports | | 2 | |
| Supported gage signal | | Differential square wave, differential square wave with reference point mark | |
| Maximum input frequency | | 5 MHz | |
| User Interface | Display | Negative sign + 8 digits and indicator (1 gage value displayed, manually switchable) | |
| External I/O | Number of I/O ports | Input: 4 ports (Ch switch, peak clear, data hold, preset) Output: 4 ports (Err/ALLGO, Tolerance judgment) | |
| | Compatible communication standards | CC-Link, USB (Supported with optional interface units) | |
| Max. number of linked units | | EJ Counter 8 units + 1 (optional) interface unit (Max. number of linear gage connections: 16) | |
| Power supply | Input voltage | 10 V to 27 V DC | |
| | Power consumption | 1 unit only: 3 W or less (Includes 2 linear gages) Max. number of links: 30 W or less (Interface unit and 16 linear gages included) | |
| Operating temperature (humidity) ranges | | 0 to 50 °C (RH 20 to 80%, non-condensing) | |
| Storage temperature (humidity) ranges | | -10 to 60 °C (RH 20 to 80%, non-condensing) | |
| Mass | | Approx. 120 g | |

| Model | Interface unit USB |
|---|---|
| **Order No.** | **21HZA149** |
| Applicable interface | USB 2.0 Full Speed |
| User Interface | POWER (green) |
| Functions | Readout of current value, Current value hold (software hold), Parameter setting on **EJ** counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear |
| Power supply | Power is supplied from **EJ Counter** (Cannot be charged via USB) |
| Operating temperature (humidity) ranges | 0 to 50 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | -10 to 60 °C (RH 20 to 80%, non-condensing) |

| Model | Interface unit EtherNet/IP |
|---|---|
| **Order No.** | **21HZA188** |
| Applicable interface | EtherNet/IP |
| User Interface | POWER (green), NETWORK (green/red), MODULE (green/red), LINK PORT1 (green/amber), LINK PORT2 (green/amber), EJ-CONNECT (green) |
| Functions | Common protocols for USB and EtherNet/IP Readout of current value, Current value hold (software hold), Parameter setting on **EJ** counter, Tolerance judgment value settings, Preset valuesettings, preset/ zero-set clear, peak clear, error clear |
| Power supply | Power is supplied from **EJ Counter** (Cannot be charged via USB) |
| Operating temperature (humidity) ranges | 0 to 50 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | -10 to 60 °C (RH 20 to 80%, non-condensing) |

## SPECIFICATIONS

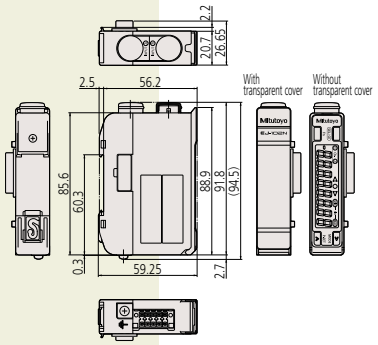
| Model | Interface unit EtherCAT |
|---|---|
| **Order No.** | **21HZA264** |
| Applicable interface | EtherCAT |
| User Interface | POWER (green), RUN (green), ERROR (red),<br>L/A IN (green), L/A OUT (red), EJ-CONNECT (green) |
| Functions | Common protocols for USB and EtherCAT<br>Readout of current value, Current value hold (software hold), Parameter setting on **EJ** counter, Tolerance judgment value settings, Preset valuesettings, preset/zero-set clear, peak clear, error clear |
| Power supply | Power is supplied from **EJ Counter**<br>(Cannot be charged via USB) |
| Operating temperature (humidity) ranges | 0 to 50 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | -10 to 60 °C (RH 20 to 80%, non-condensing) |

| Model | Interface unit PROFINET |
|---|---|
| **Order No.** | **21HZA187** |
| Applicable interface | PROFINET RT (RT Class1)/USB 2.0 Full Speed |
| User Interface | POWER (green), NETWORK (green/red), MODULE (green/red),<br>LINK PORT1 (green), LINK PORT2 (green), EJ-CONNECT (green) |
| Functions | Common protocols for USB and PROFINET, Readout of current value, Current value hold (software hold), Parameter setting on **EJ** counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear |
| Power supply | Power is supplied from **EJ Counter**<br>(Cannot be charged via USB) |
| Operating temperature (humidity) ranges | 0 to 50 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | -10 to 60 °C (RH 20 to 80%, non-condensing) |

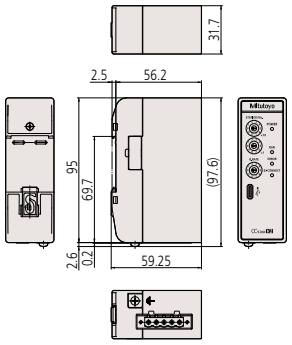
| Model | | Interface unit CC-Link |
|---|---|---|
| **Order No.** | | **21HZA186** |
| Applicable interface | | USB 2.0 Full Speed |
| | | CC-Link Ver. 1.10 |
| | | CC-Link Ver. 2.00 |
| User Interface | Display | POWER (green), RUN (green), ERROR (red),<br>EJ-CONNECT (green) |
| | Switch | Rotary switch×3<br>(Exchange number settings×2, communication speed settings×1) |
| Functions | | Common protocols for USB and CC-Link, Readout of current value*, Current value hold (software hold), Parameter setting on **EJ** counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear<br>* For CC-Link, Ver. 1.10 allows for transition only while Ver. 2.00 allows for both cyclic communication and transition. |
| Power supply | | Power is supplied from **EJ Counter**<br>(Cannot be charged via USB) |
| Operating temperature (humidity) ranges | | 0 to 50 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | | -10 to 60 °C (RH 20 to 80%, non-condensing) |

## DIMENSIONS

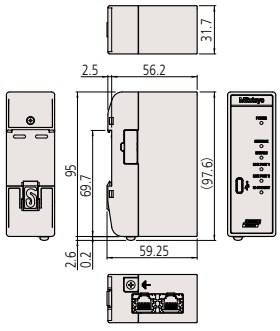
**EJ-102N/NE**



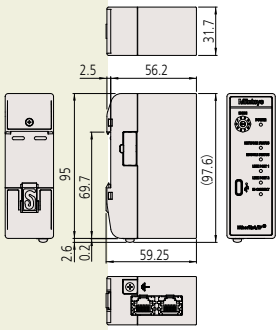

**Interface unit CC-Link**



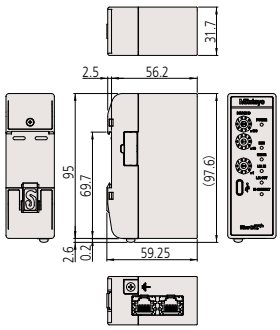

**Interface unit PROFINET**



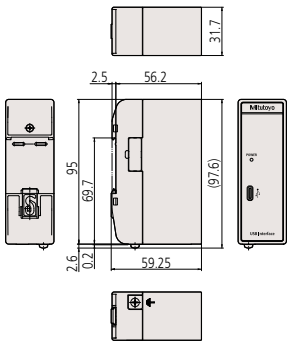

**Interface unit EtherNet/IP**




**Interface unit EtherCAT**




**Interface unit USB**




Note: Can be mounted on DIN rail. Case material: PC, POM

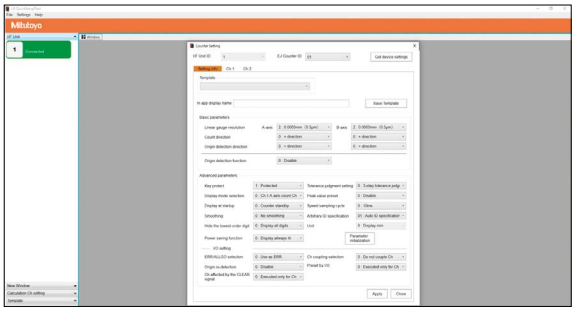
Where to Buy

# Linear Gages

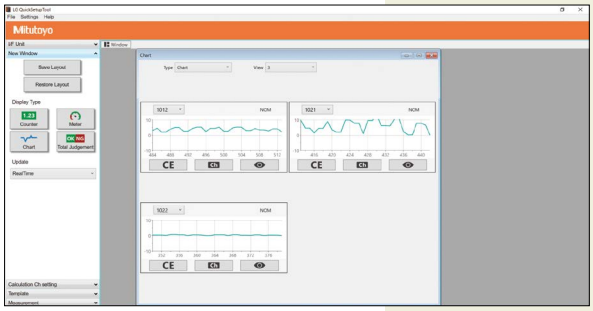
## LG QuickSetupTool Application Software

- For use with EJ Counters when connected to the USB port of any optional interface.
- Intuitive software for setting up the counters and viewing measurement data.
- Data can be saved in CSV format.

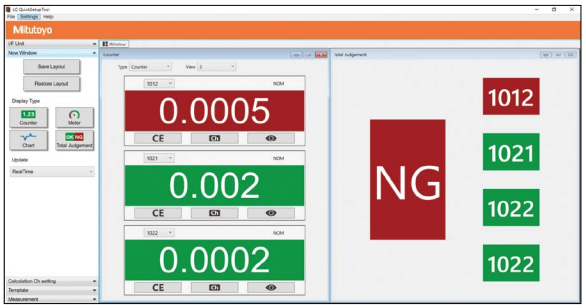
Note: This software can be used free of charge and downloaded from the Mitutoyo website. https://www.mitutoyo.co.jp/eng/contact/products/lg/



Parameter setting

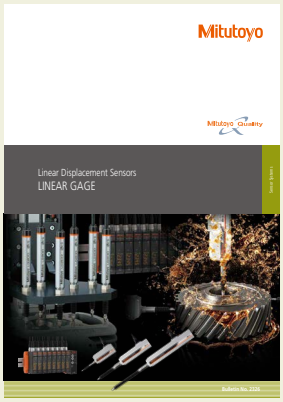


Chart




General settings


**Recommended system environment**
OS: Windows10 Pro 32 bit/64 bit
Display: 1600×1200 or more
Memory: 1024 MB or more
Communication method: USB2.0 (Full speed)
USB connector: Type C connector
Note: USB device drivers are standard Windows drivers.



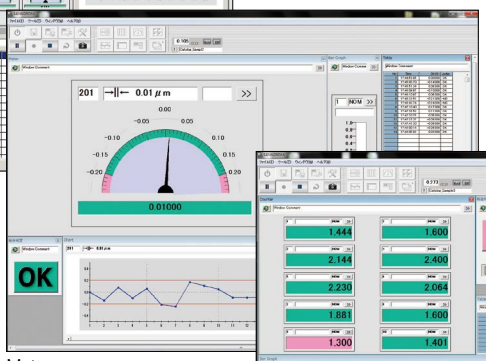

Refer to the Linear Gage Brochure (**2326**) for more details.

# Linear Gages

## SENSORPAK
## Measurement Data Loading Software

- This software facilitates loading measurement data onto a personal computer with RS-232C output (**EH**, **EV, Litematic**), with USB output (**EH**).
- 60 channels (max.) of measurement data can be processed.
- Arithmetical calculations and maximum width calculations can be performed using the measurement data.
- Exporting measurement data into MS-Excel format is supported (CSV format).
- Real-time graphical display by means of bar-graph or meter is provided.


Measurement screen


Meter screen

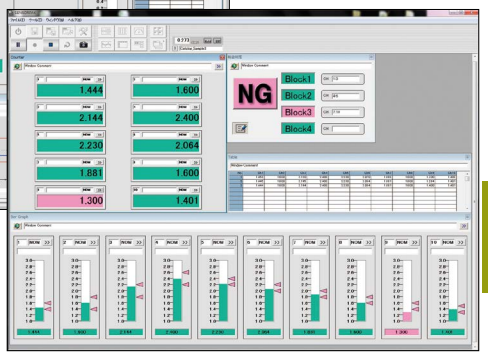
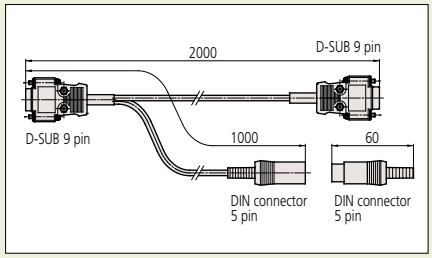


Chart screen


License key

### Standard Accessory
- I/O cable: **21HZA137**




## SPECIFICATIONS

| Order No. | | 02NGB073 |
|---|---|---|
| Product Configuration | | Program disk (CD), license key, operation manual |
| Compatible devices (Connection method) | | Mitutoyo RS_LINK compatible devices<br>• **LGH** Series (USB, RS-232C)<br>• **EH** counter (USB, RS-232C)<br>• **EV** counter (RS-232C)<br>• **VL** Litematic (RS-232C) |
| Connecting cable | | • RS-232C connection: I/O cable (**21HZA137**)*1 standard accessory<br>• USB connection: USB cable (type A to type B)<br>• RS-232C connection: RS-232C cross cable*1 |
| Number of connectable gages | | Max. 60 units (when 10 units of **EV** counter for linear gage are connected via RS-Link) |
| Functions | Display*2 | Display format: counting, bar graph, indicator, chart, and table<br>Display cycle: 1s (when 60 gage units are connected, 1-window display, and no Excel output) |
| | Calculation | Calculation (up to 30 items) between designated gages is available.<br>Calculation items: Sum, difference, total, average, maximum, minimum, range (maximum–minimum), calculation with a constant |
| | Tolerance judgment | Per item: Displays the result in colors (3-step tolerance: red/green/red; 5-step tolerance: red/yellow/green/yellow/red)<br>Total judgment: Displays in colors (red/green) by monitoring the multiple gages and calculation result |
| | Recording*2 | Items: channel values, calculation result, tolerance judgment, total tolerance judgment, timestamp<br>Max. number of records: 60000 for software recording (with 6 gages connected); up to 9000 (with 60 gages connected)<br>Output function: Direct output to Excel, CSV file output (compatible with MeasurLink®)<br>Recording trigger: key, timer, external TRG |
| | Input/ output*3 | Input: TRG for recording (HOLD)<br>Output: Total tolerance judgment result |
| System Environment | | DOS/V compatible PC environment<br>CPU: Pentium4 2 GHz or more, Memory: 2 GB or more, Hard disk: 2 GB or more free space<br>OS: Windows 7 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (64 bit) |

*1 If the PC is not equipped with an RS-232C port, please contact your nearest M³ Solution Center.
*2 Display cycle and the maximum number of records differ depending on the environment (specification of PC, number of connected gages, display format and communication setting).
*3 With use of the I/O cable (accessory). When an I/O cable is not used, the I/O connector of the counter alternatively functions. (Refer to the user's manual of the counter in use.)

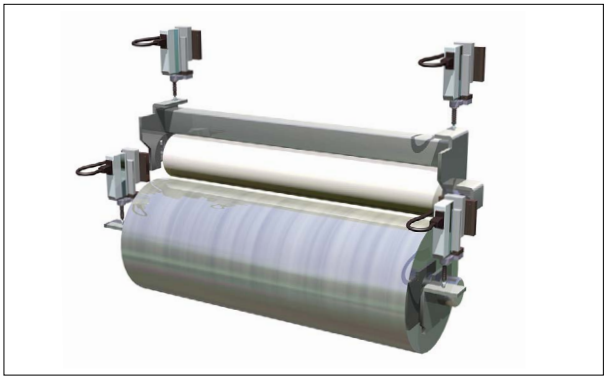
Get a Quote


Refer to the Linear Gage Brochure (**2326**) for more details.

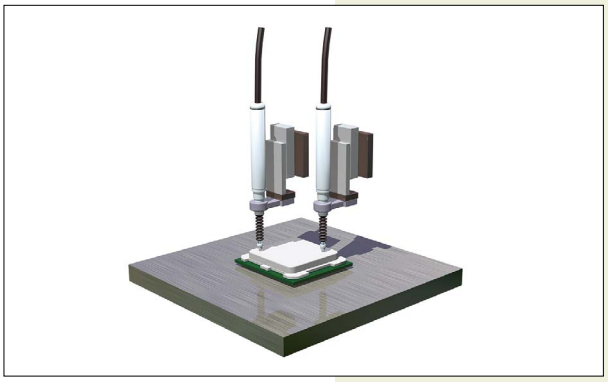
# Linear Gages

## Measurement Examples

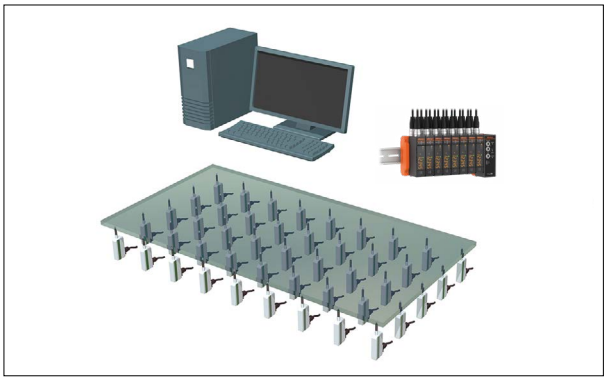
Roll gap measurement



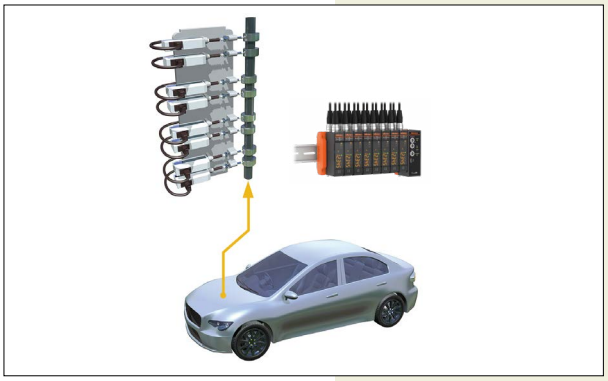
Chip parallelism measurement



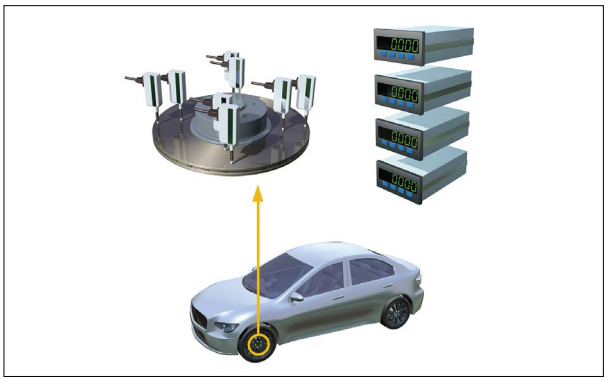
FPD board multipoint measurement



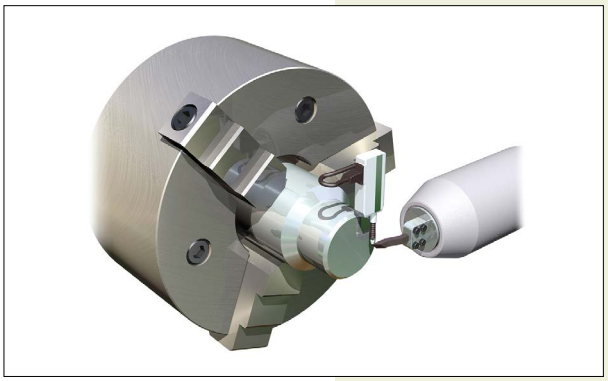
Cam-lift measurement



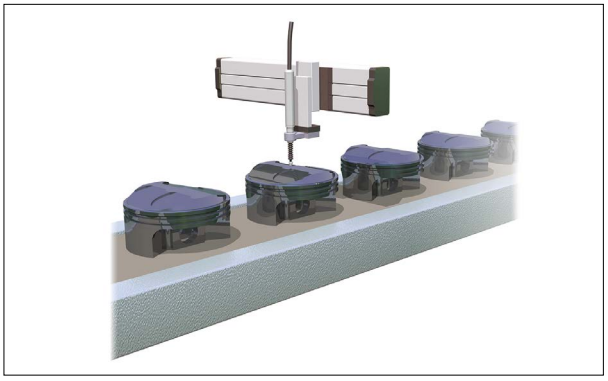
Brake disk multipoint measurement



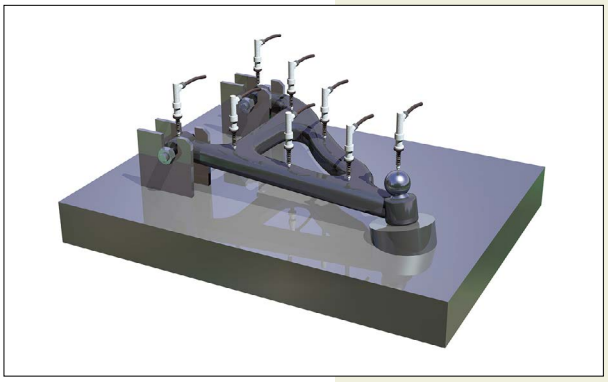
Machine device tool length measurement



Workpiece discrimination



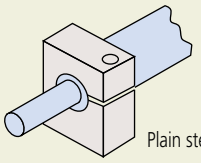
Inspection fixture



## Gage Head

### Plain Stem

The plain stem has the advantage of wider application and slight positional adjustment in the axial direction on final installation, although it does requires a split-fixture clamping arrangement or adhesive fixing. However, take care so as not to exert excessive force on the stem.




### Measuring Force

This is the force exerted on a workpiece during measurement by the contact point of a linear gage head, at its stroke end, expressed in newtons.

### Comparative Measurement

A measurement method where a workpiece dimension is found by measuring the difference in size between the workpiece and a master gage representing the nominal workpiece dimension.

### Ingress Protection Code

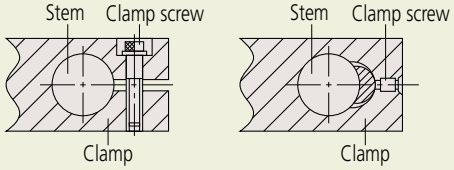
| Protection code | Type | Level | Description |
|---|---|---|---|
| IP66 | Protection against contact with the human body and foreign objects | 6: Dust tight | Protection from dust ingress<br>Complete protection against contact |
| | Protection against exposure to water | 6: Water-resistant type | Water jets directed against the enclosure from any direction shall have no harmful effects. |
| IP67 | Protection against contact with the human body and foreign objects | 6: Dust tight | Protection from dust ingress<br>Complete protection against contact |
| | Protection against exposure to water | 7: Immersion-protection | Protection against the effects of immersion in water between 1 cm and 1 m for 30 minutes |
| IP□□G | Protection against entry of oil | — | Protection against entry of oil droplets or splashes from all directions |

### Precautions in Mounting a Gage Head

- Insert the stem of the gage into the mounting clamp of a measuring unit or a stand and tighten the clamp screw.
- Notice that excessively tightening the stem can cause problems with spindle operation.
- Never use a mounting method in which the stem is clamped by direct contact with a screw.
- Never mount a linear gage by any part other than the stem.
- Mount the gage head so that it is in line with the intended direction of measurement. Mounting the head at an angle to this direction will cause an error in measurement.
- Exercise care so as not to exert a force on the gage through the cable.

### Precautions in Mounting LGH Series

To fix the **LGH** Series, insert the stem into the dedicated stand or fixture.




Recommended hole diameter on the fixing side: 15 mm +0.034/+0.014

- Machine the clamping hole so that its axis is parallel with the measuring direction. Mounting the gage at an angle will cause a measuring error.
- When fixing the **LGH** Series, do not clamp the stem too tightly. Over-tightening the stem may impair the sliding ability of the spindle.
- If measurement is performed while moving the **LGH** Series, mount it so that the cable will not be strained and no undue force will be exerted on the gage head.

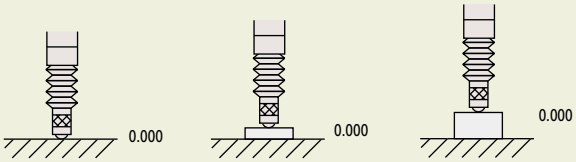
G

Need Support?

# Display Unit

## Zero-setting

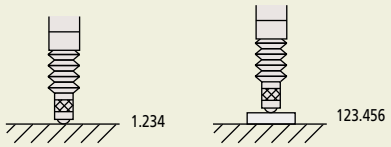
The display value can be set to 0 (zero) at any position of the spindle.




Note: Perform the zero-setting beyond 0.2 mm stroke from the rest position.
This puts the spindle in the guaranteed accuracy region.

## Presetting

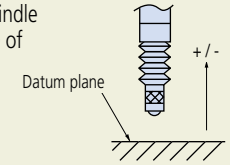
Any numeric value can be set on the display unit for starting the count from this value.




Note: Perform the zero-setting beyond 0.2 mm stroke from the rest position.
This puts the spindle in the guaranteed accuracy region.

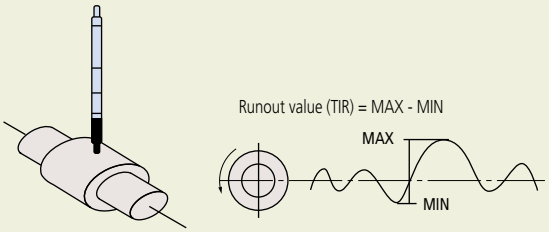
## Direction Changeover

The measuring direction of the gage spindle can be set to either plus (+) or minus (-) of count.




## MAX, MIN, TIR Settings

The display unit can hold the maximum (MAX) and minimum (MIN) values, and the run out value (TIR) during measurement.




## Tolerance Setting

Tolerance limits can be set in various display units for automatically indicating if a measurement falls within those limits.

## Open-collector Output

An external load, such as a relay or a logic circuit, can be driven from the collector output of an internal transistor which is itself controlled by a Tolerance Judgment result, etc.

## Digimatic Code

A communication protocol for connecting the output of measuring tools with various Mitutoyo data processing units. This allows output connection to a Digimatic Mini Processor **DP-1VA LOGGER** for performing various statistical calculations and creating histograms, etc.

## BCD Output

A system for outputting data in binary-coded decimal notation.

## RS-232C Output

A serial communication interface in which data can be transmitted bi-directionally under the EIA Standards. For the transmission procedure, refer to the specifications of each measuring instrument.

## CC-Link

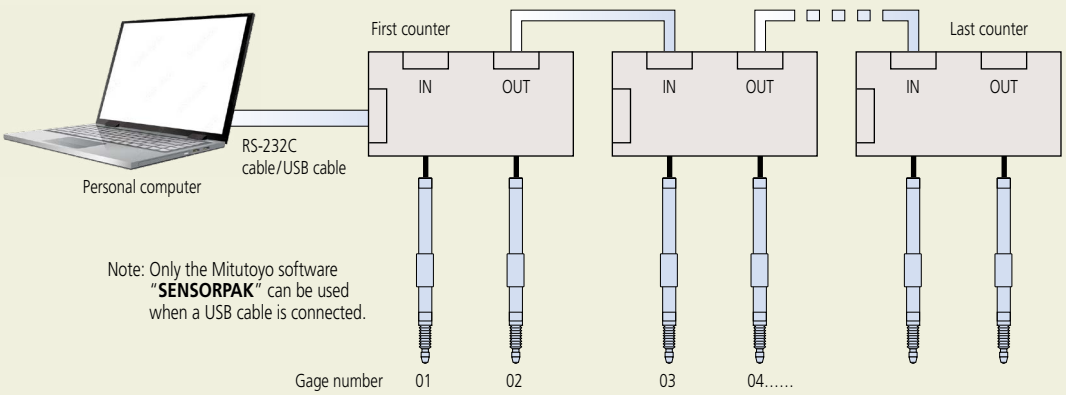
An abbreviation of Control & Communication Link, the new open field network developed by Mitsubishi Electric Corporation. It is a high-speed field network that allows for control and communication at the same time.

# RS Link Function

Multi-point measurement can be performed by connecting multiple **EH** counters with RS Link cables.

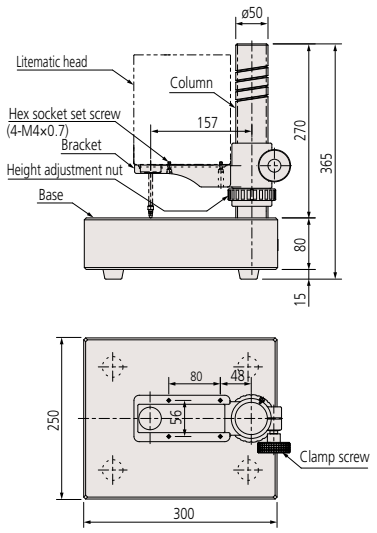
## RS Link for EH Counter

It is possible to connect a maximum of 10 counter units and handle up to 20 channels of multi-point measurement at a time.
For this connection use a dedicated RS Link cable **02ADD950** (0.5 m), **936937** (1 m) or **965014** (2 m).
(The overall length of RS Link cables permitted for the entire system is up to 10 m.)



## Optional Stand for VL-50S-B

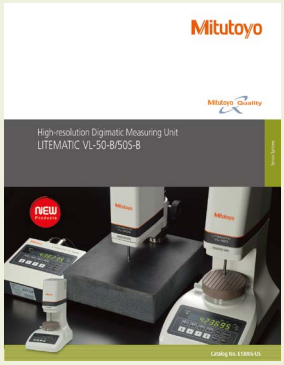
**957460** Unit: mm




## Optional Accessories

- Foot switch: **937179T**
- Dedicated stand: **957460***1
- SPC cable (1 m): **936937***2
- SPC cable (2 m): **965014***2
- VL weight part: **02AZE375***3
- Recommended contact points:
  Shell type: **101118** (Approx. 0.02 N)*4
  Carbide tipped spherical contact point, ø7.5:
  **120059** (Approx. 0.03 N)*4
  Carbide tipped spherical contact point, ø10.5:
  **120060** (Approx. 0.06 N)*4
  Carbide tipped needle contact point, ø0.45:
  **120066** (Approx. 0.01 N)*4

*1 Only **VL-50S** is available.
*2 Refer to page G-18 for details of the RS link.
*3 Not applicable to **VL-50-100-B** and **VL-50S-100-B**
*4 Values in parentheses indicate the measuring force of a 0.01 N model fitted with the respective optional points




Refer to the Litematic Brochure (**E13006-US**) for more details.

# VL-50-B/50S-B Litematic
# SERIES 318 — High-accuracy/resolution Measuring Machine

- With a measuring force of only 0.01 N, the Litematic is ideal for measuring easily deformed workpieces or high-accuracy components.
- For workpieces for which 0.01 N is insufficient, either the 0.15 N or 1 N model is recommended.
- The motor-driven spindle moves up/down and stops when the contact point touches the workpiece. Then the maximum, minimum and runout values are measured under a constant force.
- High resolution of 0.01 µm, and wide measuring range of 50 mm.
- Measuring system **VL-50-B**, integrated display type, and **VL-50S-B**, a separate display type, are available.
- The measuring table supplied with **VL-50-B** is ceramic, which is corrosion free, for easier maintenance and storage.
- The spindle is made of low thermal expansion material.

**318-221-10A**


**318-226-10A**


Shown with optional granite base, **957460**

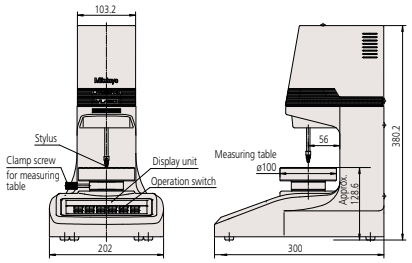
## SPECIFICATIONS

| Model | | VL-50-B | VL-50-15-B | VL-50-100-B | VL-50S-B | VL-50S-15-B | VL-50S-100-B |
|---|---|---|---|---|---|---|---|
| **Order No.** | | **318-221-10A** | **318-222-10A** | **318-223-10A** | **318-226-10A** | **318-227-10A** | **318-228-10A** |
| Measuring range | | 0 to 50 mm (0 to 2 in) | | | | | |
| Resolution | | 0.01/0.1/1.0 µm (0.0000005 in/0.000005 in/0.00005 in) | | | | | |
| Display unit | | 8 digits/14 mm (0.6 in) character height (without signs) | | | | | |
| Scale type | | Reflection type linear encoder | | | | | |
| Stroke | | 51.5 mm (2 in) (when using a standard contact point) | | | | | |
| Measuring accuracy (20 °C)*1 | | (0.5 + L/100) µm L=arbitrary measuring length (mm) | | | | | |
| Accuracy guaranteed temperature*2 | | 20±1 °C | | | | | |
| Repeatability*1 | | σ=0.05 µm | | | | | |
| Measuring force*1 | | 0.01 N | 0.15 N*3 | 1 N*3 | 0.01 N | 0.15 N*3 | 1 N*3 |
| Feed speed | Measurement | Approx. 2 mm/s (0.08 in/s) or 4 mm/s (0.16 in/s) (changeable by parameter) | | | | | |
| | Fast feed | Approx. 8 mm/s (0.3 in/s) | | | | | |
| Contact point | | ø3 mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: **901312** | | | | | |
| Measuring table | | ø100 (ceramic, grooved, removable) | | | — | | |
| Input | | Foot switch input (when optional foot switch is used) External Control | | | | | |
| Output | | Digimatic output/RS-232C output (changeable by parameter) | | | | | |
| Rating | Power consumption | Max. 18W (12V, 1.5A) | | | | | |
| Standard Accessories | | AC adapter: **357651**, Grounding wire: **09CAA985**, AC cable: **02ZAA010** Hex wrench (2 pcs. for fixing contact point and for removing fixing bracket) | | | | | |

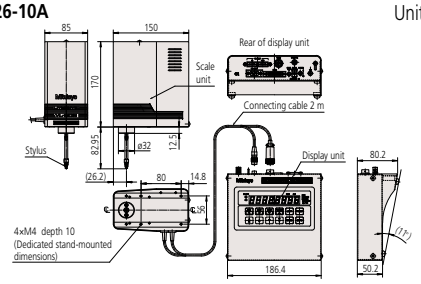
*1 Normal measurement using standard contact point.
*2 Under less temperature change, and hot or cold direct air flow should be avoided.
*3 0.15 N, 1 N types are factory-installed option.
Note: Motor life is approximately 100,000 operations, after which replacement is advisable.
This maintenance factor is particularly important to bear in mind when the machine is used frequently, such as on a production line.

## DIMENSIONS

**318-221-10A**




**318-226-10A** Unit: mm



# Mu-checker

## Display Unit (analog/digital) SERIES 519

- Switchable measurement ranges make the Mu-checker suitable for a range of applications, especially those that involve moderately fast-changing measurement values which suit the use of analog readout.
- Single touch zero-set function is standard.
- Two types of analog display are available and one digital type.

### Digital Mu-checker

## SPECIFICATIONS

| | Dual Input |
|---|---|
| Model | **M-562** |
| **Order No.** | **519-562A** |
| Type | Differential type digital Mu-Checker (2 connecting heads) |
| Display range | ±2.000 mm/±0.2000 mm/±0.08 in/±0.008 in |
| Resolution | 0.001 mm/0.0001 mm/0.00005 in/0.000005 in |
| Differential mode | ±A, ±B, ±A±B |
| Measurement mode | ABS/CMP |
| Analog output | ±1 V at full-scale reading |
| Digital output | Digimatic code out |
| External dimensions | 134 (W) ×183 (D) ×208 (H) mm |
| Mass | Approx. 2.6 kg |
| Power input | AC adapter 100, 120, 220, 240 V AC 50/60 Hz |
| Probe | Various probes (refer to pages G-21 and G-22) |

Digital Mu-checker

### Analog Mu-checker

## SPECIFICATIONS

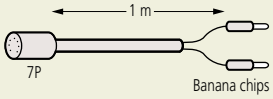
| | Dual Input | Single Input |
|---|---|---|
| Model | **M-554** | **M-553** |
| **Order No.** | **519-554A** | **519-552A** |
| Type | Differential type (one/two probes required) | Standard type (one probe required) |
| Display range | ±5 µm/±15 µm/±50 µm/±150 µm/±500 µm/±1500 µm ±0.00015 in/±0.0005 in/±0.0015 in/±0.005 in/±0.015 in/±0.05 in | ±5µm/±15µm/±50µm/±150µm/±500µm/±1500µm ±.00015"/±.0005"/±.0015"/±.005"/±.015"/±.05" |
| Graduation | 0.1 µm/0.5 µm/1 µm/5 µm/10 µm/50 µm 0.000005 in/0.00001 in/0.00005 in/0.0001 in/0.0005 in/0.001 in | 0.1µm/0.5µm/1µm/5µm/10µm/50µm .000005"/.00001"/.00005"/.0001"/.0005"/.001" |
| Differential mode | ±A, ±B, ±A±B | ±A |
| Display accuracy (linearity) | ±1% of full-scale reading | |
| Analog output | ±1.0 V at full-scale reading | |
| Analog output accuracy | Within ±0.1% of full-scale reading (excluding probe) | |
| Zero-setting adjustment range | ±15%/FS (error: ±0.2%/FS) | |
| External dimensions | 134 (W) ×183 (D) ×208 (H) mm | |
| Mass | 2.4 kg | |
| Power input | AC adapter 100, 120, 220, 240 V AC 50/60 Hz | |
| Probe | Various probes (refer to pages G-21 and G-22) | |

Standard type

Differential type

### Optional Accessories

- SPC Cable for connecting digital Mu-checker (**936937**)
Used for connecting to the Digimatic mini-processor.
(Not suitable for analog Mu-checkers)
- Output cable A (**934795**)
Used for connecting to external devices, such as data recorders, etc.




- Analog, limit out (7P) connector (**529035**)
Used for output to external data recorders, sequencers, etc.

## Lever/Cartridge Probe Heads
## SERIES 519 — Electronic Micrometer

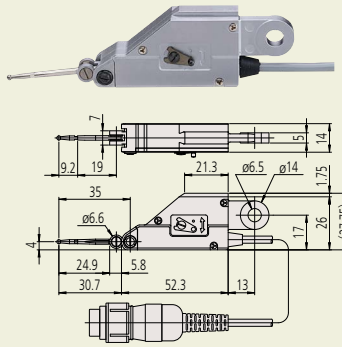
### Common specifications
- Connection: Half-bridge
- Cable length: 2 m
- Connector type: MAS-5100 (DIN5P) or equivalent

## SPECIFICATIONS
### Lever heads

| Model | MLH-521 | MLH-522 | MLH-326 | MLH-327 |
|---|---|---|---|---|
| **Order No.** | **519-521** | **519-522** | **519-326** | **519-327** |
| Measuring range (mm) | ±0.5 | | | |
| Stroke (mm) | ±0.6 | | | ±0.65 |
| Measuring force (N) | Approx. 0.2 | Approx. 0.02 | Approx. 0.15 | |
| Linearity (%) | ±0.3 | | | ±0.5 |
| Stylus support | Pivot bearing | Pivot bearing | Parallel-leaf spring | Pivot bearing |

Note: A ø2 mm ball-ended stylus is supplied as standard with all probes.

**519-521**
**MLH-521**

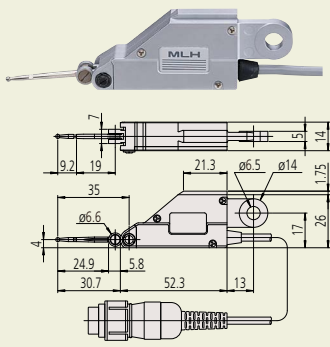





- Interchangeable styli:
  ø1: **520940** (Standard accessory)
  ø2: **520939** (Standard equipment)
  ø3: **520938** (Standard accessory)

Unit: mm

**519-522**
**MLH-522**

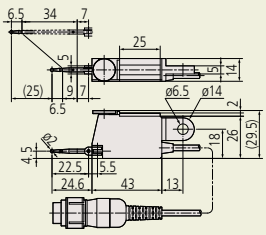





- Interchangeable styli:
  ø1: **520940** (Standard accessory)
  ø2: **520939** (Standard equipment)
  ø3: **520938** (Standard accessory)

Unit: mm

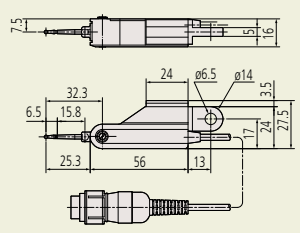
**519-326**
**MLH-326**


- Interchangeable styli:
  ø1: **102824** (Optional)
  ø2: **102825** (Standard equipment)
  ø3: **102826** (Optional)
- Extension bar
  L=9 mm (Standard equipment)
  L=34 mm (When a bar for extending the distance to the stylus tip is supplied)

Unit: mm

**519-327**
**MLH-327**

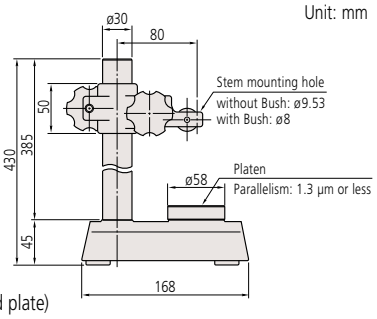

- Interchangeable styli:
  ø1: **102824** (Optional)
  ø2: **102825** (Standard equipment)
  ø3: **102826** (Optional)

Unit: mm

### Transfer Stand

**519-109-10**
(with a serrated plate)

Unit: mm




### Main Specifications

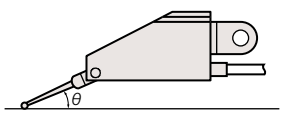
| Order No. | Effective transfer range (mm) | Fine adjustment range (mm) | Mounting hole (mm) |
|---|---|---|---|
| **519-109-10** | 0 - 320 | 1 | Without Bush: ø9.53<br>With Bush: ø8 |

### Note on stylus angle

If the stylus of a pivot bearing type probe makes an angle with a workpiece surface, as in the figure, calibration should be performed for accurate measurement. Alternatively, the displayed value may be corrected by multiplying it by the appropriate correction factor as given in the table.

Model **519-326** does not need correction.

| Angle (θ) | Correction factor |
|---|---|
| 0° | 1.00 |
| 10° | 0.98 |
| 20° | 0.94 |
| 30° | 0.87 |
| 40° | 0.77 |
| 50° | 0.64 |
| 60° | 0.50 |

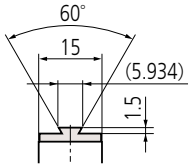



Display value × Correction factor = Corrected value

### Dimensions of dovetail plate on probe body

Enables mounting on a lever head mounting bracket or stem.

Unit: mm




G



Mitutoyo

# Mu-Checker

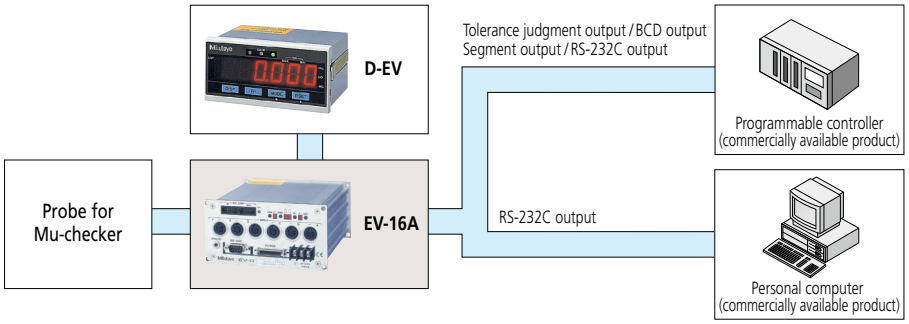
## EV-16A Counter
## SERIES 519 — 6-channel, No-display Type

- Up to six probes can be connected to one unit. Up to ten counters can be connected to one personal computer using the RS Link function to enable the configuration of a multi-point measurement system comprising a maximum of 60 gages.
- I/O outputs for RS-232C, BCD, tolerance judgment and segment output are available.
- Maximum, minimum and runout measurement between channels (in the same unit) is possible in addition to normal measurement on individual channels.


519-355
EV-16A

### SYSTEM CONFIGURATION

Mitutoyo probes, **EV-16A** counters and **D-EV** display units combined with commercial controllers and personal computers enable construction of a powerful, multi-channel system that can be built to meet the needs of almost any measurement application.




Unit: mm

### Main features

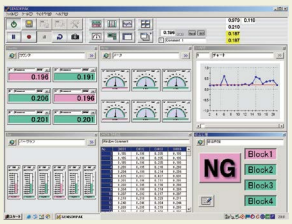
- External control (Zero-set, Preset etc.)
- Direction switching
- Error messaging
- Tolerance judgment output
- Each data output (RS-232C, BCD, segment)
- Peak measurement (maximum value, minimum value, runout) and arithmetic operation (addition, average, maximum value, minimum value, maximum width) between axes

### Optional Accessories

- Output connector: **02ADB440**
- D-EV External display unit*1: **02ADD400**
- SPC cable (0.5 m): **02ADD950**
- SPC cable (1 m): **936937**
- SPC cable (2 m): **965014**
- AC adapter: **357651**
- AC cable: **02ZAA010**
- Terminal connecting cable: **02ADD930**

*1 Refer to page G-25 for details of D-EV.

- **SENSORPAK**

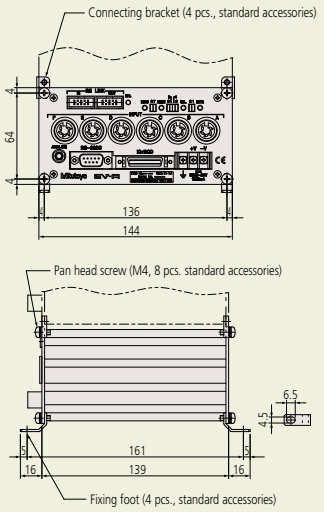



Note: Refer to page G-16 for more details.

### SPECIFICATIONS

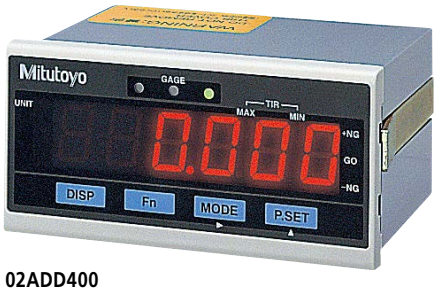
| Model | | EV-16A |
|---|---|---|
| **Order No.** | | **519-355** |
| Number of gage inputs | | 6 |
| Display range (mm) | | ±2.000, ±0.200 |
| Resolution (mm) | | 0.001, 0.0001 |
| Display processing | | 8 digits for parameters (display setting), 1 for error display |
| Error messaging | | Power supply voltage error, Gage error, etc. |
| External display | | Dedicated external display unit **D-EV** (optional) can be connected |
| Number of input switches | | 4 |
| Input switch function | | Measurement mode switching, Parameter settings |
| I/O | Tolerance judgment output | 1 to 6 gages (L1, L2, L3), open-collector |
| | BCD output | Parallel BCD output (positive/negative-true logic), open-collector |
| | Segment output | A function to enable only output from the terminal corresponding to the counting values, open-collector |
| | Control output | Normal operation signal (NOM), open-collector |
| | Control input | Output channel designation (segment, in BCD mode), presetting, peak value clear, range changeover (at segment output), holding counting value, open-collector or no-voltage contact signal (with/without contact point) |
| Interface | RS-232C | Measurement data output and control input, EIA RS-232C-compatible<br>Use cross cables for home position DTE (terminal definition) |
| | RS link | Max. connected units: 10<br>Connecting cable length: Max. 10 m (sum of link cable length)<br>Data transfer time: 1.1 sec./60 ch (when transmission rate is 19200 bps) |
| Power supply | Voltage | 12 to 24 V DC (Terminal block: M3) |
| | Consumption | 1 A |
| Operating temperature (humidity) ranges | | 0 to 40 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | | -10 to 50 °C (RH 20 to 80%, non-condensing) |
| External dimensions | | 144 (W) ×72 (H) ×139 (D) mm |
| Mass | | Approx. 1000 g |
| Standard accessories | | Fixing foot (4), connecting bracket (4), fixing screw M4×8 (8) |
| Applicable probes | | For probes, refer to pages G-21 and G-22. |

### DIMENSIONS



## D-EV
## Display Unit for the EV Counter

- Display unit for the **EV** counter.
- Connecting this display unit helps configuration of the **EV** counter.
- Able to display each gage measurement value and Go/No-go judgment result, total Go/No-go judgment result for all gages, setting details and errors.




**02ADD400**

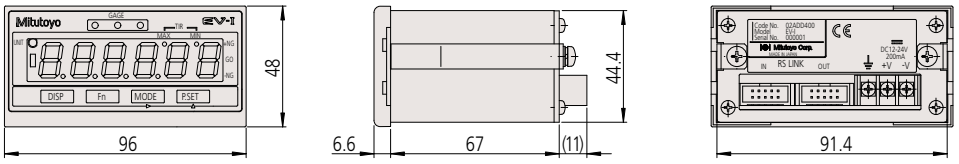
### Optional Accessories
- AC adapter: **357651**
- AC cable: **02ZAA010**
- Terminal connecting cable: **02ADD930**

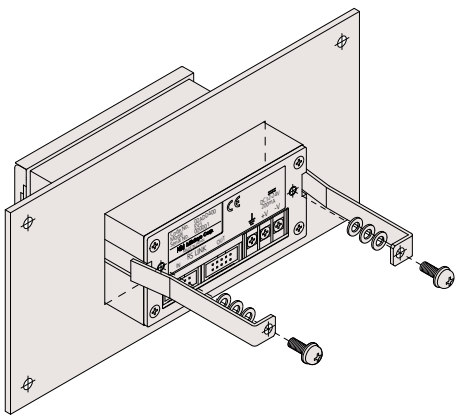
## SPECIFICATIONS

| Model | D-EV |
|---|---|
| **Order No.** | **02ADD400** |
| Number of connections | 1 **EV** counter per unit |
| Number of digits | Sign plus 6 digits (8 digits internal to **EV** counter) |
| LED display | Channel display (also for judgment result display): 3 (3-color LED)<br>Measurement mode display (current data, maximum value, minimum value, runout): 2<br>Status display: 1 (2 colors) |
| Operation switches | 4 |
| Function of operation switch | Channel switching, measurement mode switching (current data, maximum value, minimum value, runout), parameter setting, presetting, tolerance setting |
| Input/output | RS Link connectors: 1 each for IN, OUT |
| Error message | Overspeed, gage error etc. |
| Power supply | 12 to 24 V DC, 200 mA (Terminal block: M3) |
| Operating temperature (humidity) ranges | 0 to 40 °C (RH 20 to 80%, non-condensing) |
| Storage temperature (humidity) ranges | –10 to 50 °C (RH 20 to 80%, non-condensing) |
| External dimensions | 96 (W) ×48 (H) ×84.6 (D) mm |
| Mass | 150 g |

## DIMENSIONS

Unit: mm



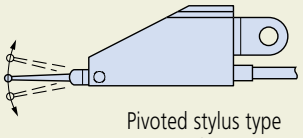



Need Service?

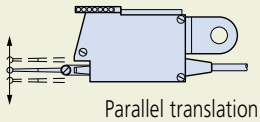
# Mu-checker

## Probe
A sensor that converts movement of a contact point, on a stylus or plunger, into an electrical signal.

## Lever probes
Lever probes are available in two types. The most common type uses a pivoted stylus so the contact point moves in a circular arc; this type is subject to cosine effect and, therefore, measurements may require linearity correction if the direction of measurement is much different to the direction of movement of the contact point. The less common type uses a parallel translation leaf-spring mechanism so contact point movement is linear; this type requires no correction.

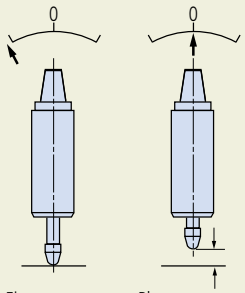


Pivoted stylus type
**519-521** (measuring direction can be switched with the up/down lever)
**519-522** (measuring direction is not switchable)



Parallel translation type
**519-326** (measuring direction can be switched with the upper dial)

## Pre-travel
The distance from first contact with a workpiece until the measurement indicator reads zero.




First contact. Plunger moves until the indicator reads zero.

## Measuring force
The force applied to the workpiece by the probe when the indicator registers zero. It is indicated in newtons (N).

## Digimatic code
A communication protocol for connecting the output of measuring tools with various Mitutoyo data processing units. This allows output connection to a Digimatic Mini Processor **DP-1VA LOGGER** for performing various statistical calculations and creating histograms, etc.

## Open-collector output
A direct connection to the collector of a driving transistor.

## Comparative measurement
A measurement method where a workpiece dimension is found by measuring the difference in size between the workpiece and a master gage that represents the nominal dimension.
This method is usually applied when the measurement to be made is greater than the measuring range of the instrument.

## Linearity
The ratio of proportionality between measuring system output and measured distance.
If this is not constant within acceptable limits then correction is required.

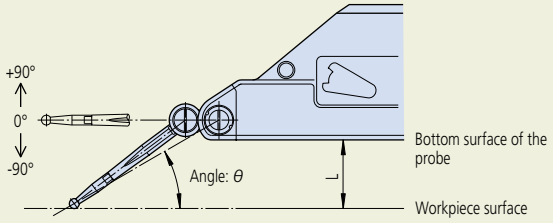
## 0 (zero) point
A reference point on the master gage in a comparative measurement.

## Sensitivity
The ratio of the electric micrometer output signal to the input signal to the amplifier. The sensitivity is normal if a value as expected from the given displacement is displayed.

## Tolerance setting
Tolerance limits can be set on the electronic micrometer to provide an automatic judgment as to whether a measured value falls within the tolerance.

## Lever-head angle
Before measurement, be sure to confirm that probe sensitivity adjustment has been completed.
Changing the probe angle will cause variation in the measured values.
Adjust the probe angle to obtain an optimum sensitivity before starting measurement. If it is difficult, adjust the sensitivity with the probe angle set to 0°, and after measurement, correct the measured values according to the actual probe angle (by multiplying the measured value by a correction factor).

**Tips** Correction using a correction factor may result in lower accuracy than when adjusting sensitivity with the actual probe angle.

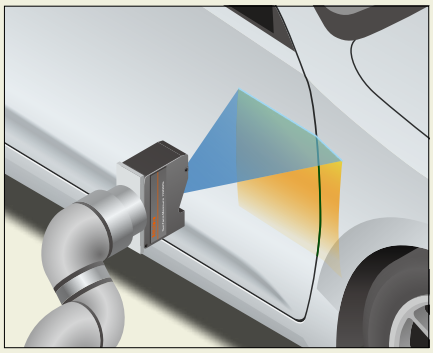



| Angle: $\theta$ | Distance from the workpiece surface: L * | Correction factor |
|---|---|---|
| 0° | — | 1.00 |
| 10° | Approx. 3.1 mm | Approx. 0.98 |
| 20° | Approx. 8.8 mm | Approx. 0.94 |
| 30° | Approx. 13.9 mm | Approx. 0.87 |
| 40° | Approx. 18.3 mm | Approx. 0.77 |
| 50° | Approx. 21.6 mm | Approx. 0.64 |
| 60° | Approx. 23.8 mm | Approx. 0.50 |

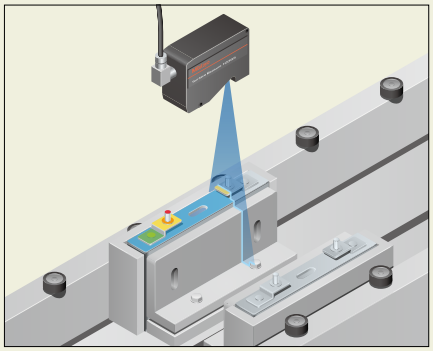
* Value when using a carbide probe with spherical diameter of ø2 that is installed before shipment. When using a ø1 (or ø3) carbide probe, subtract (or add) 1/2 of the difference in spherical diameter.

## APPLICATIONS

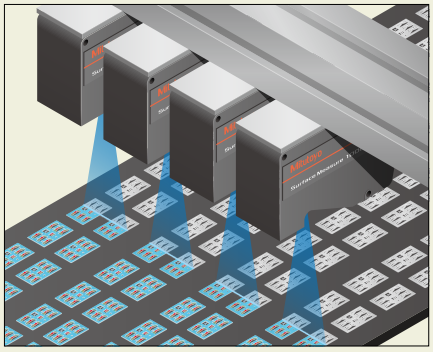
Automobile industry
**Panel gap inspection**



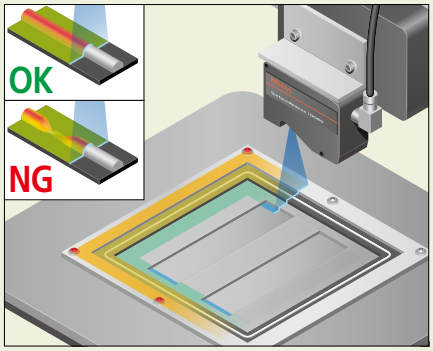
Electric vehicle battery industry:
**Cell assembly inspection**



Electrical and electronic industries
**Connector pin inspection**



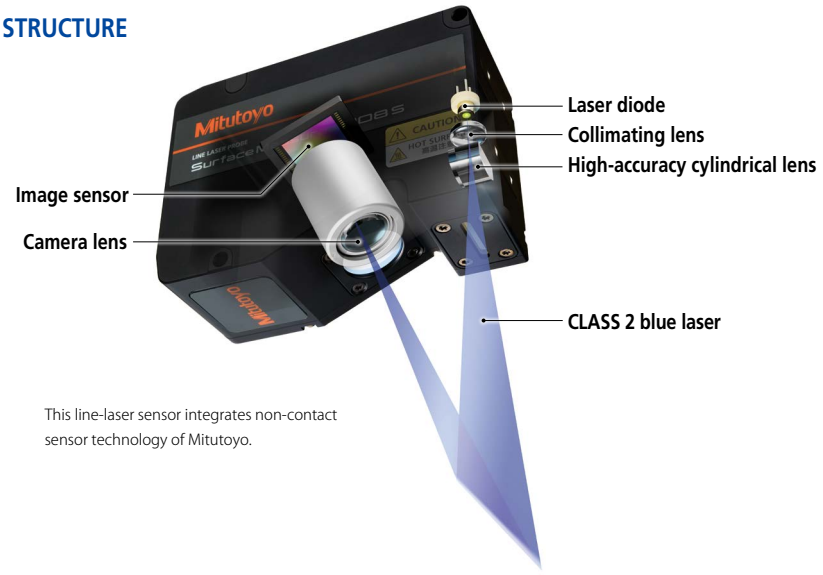
Electrical and electronic industries
**Adhesive inspection**



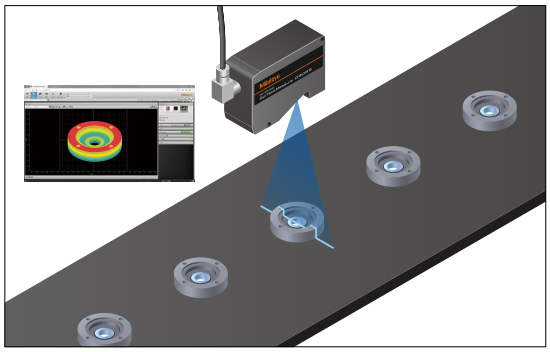

## SurfaceMeasure-S Series

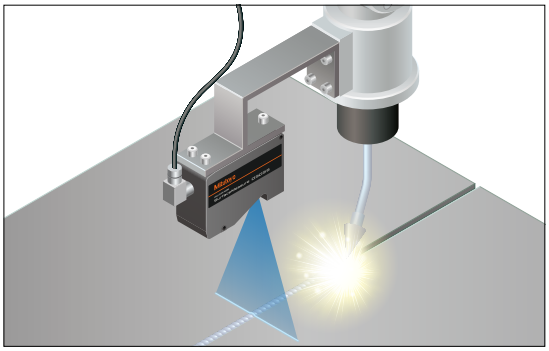
- The sensor itself is guaranteed for accuracy and has a Z-axis repeatability of 0.5 µm or less. It has also achieved the IP67 protection level, providing stable measurements.
- The SurfaceMeasure-S Series can obtain the profiles and three-dimensional shapes of measurement workpieces at high speed (a maximum frame rate of 10 kHz) and make an automatic judgement inside the sensor.
- It is also equipped with a parts matching function that allows the measurement tool to be applied throughout, regardless of the orientations of the parts being measured. Measurements can be taken without performing alignment.
- The software supports intuitive operation and is built into the sensor (software installation is not required), so you can use it immediately after mounting.

## PRODUCT STRUCTURE




This line-laser sensor integrates non-contact sensor technology of Mitutoyo.

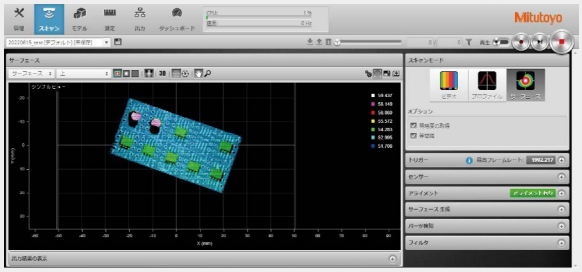




# Non-contact Sensors

## SOFTWARE

### Powerful interface with excellent operability and functionality

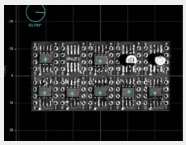


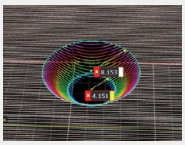
- Excellent operability simply by using a mouse
- Simple and intuitive interface
- Web browser-based, no need to install software
- Various built-in measurement tools
- 2D and 3D data can be obtained

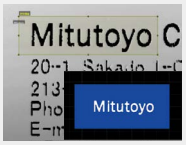
**Easy-to-configure measuring system**

### Measurement tool

A variety of measurement tools are available.

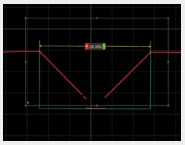

Pattern matching

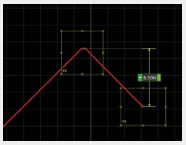

Countersink Hole



OCR


Gap & Flush


Groove


Size

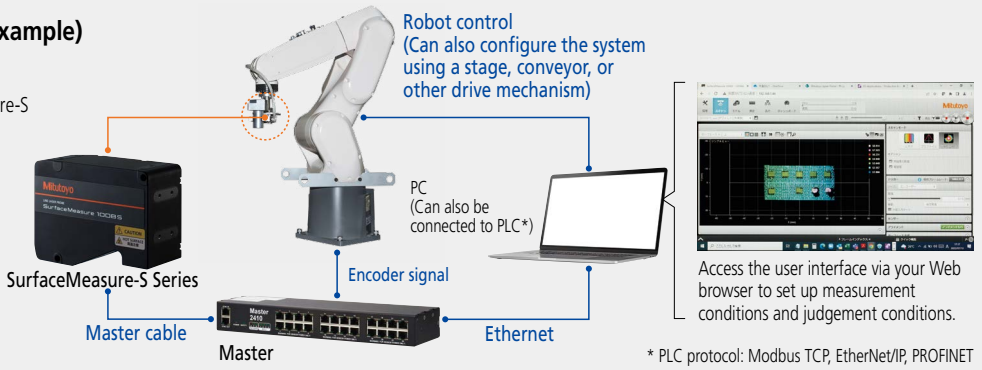
### Emulator

Using the emulator makes it possible to consider measurement conditions or make an analysis with obtained data even when offline.

## SYSTEM

### System configuration (example)

This is an example of the system configuration of the SurfaceMeasure-S Series. Various other system configurations are also available.




* PLC protocol: Modbus TCP, EtherNet/IP, PROFINET

Need Calibration?

IP67 G

# Non-contact Sensors




## SPECIFICATIONS

| Model | | 1008S | 0303S | 2929S |
|---|---|---|---|---|
| **Order No.** | | **553-100** | **553-110** | **553-120** |
| Maximum measuring width | | 100 mm | 32.5 mm | 292 mm |
| Measuring range | | 80 mm | 25 mm | 290 mm |
| Working distance | | 80 mm | 60 mm | 299.5 mm |
| Scanning error (1 σ) *1 | | 20 µm | 9 µm | 65 µm |
| Z axis repeatability | | 0.5 µm | 0.4 µm | 1.2 µm |
| Frame rate | | Max. 10 kHz | | |
| Laser class | EN / IEC | CLASS 2 | | |
| | | (IEC 60825-1:2014, EN 60825-1:2014+A11:2021) | | |
| | JIS | CLASS 2 (JIS C 6802: 2014) | | |
| Line laser | Laser medium | Semiconductor laser | | |
| | Wavelength | 405 nm (visible) | | |
| | Max. output | 2.2 mW | | |
| Mass | | 650 g | | 1480 g |
| Operating environment | Temperature | 0 °C to 40 °C | | |
| | Humidity | RH 20 to 80%, non-condensing | | |
| Storage environment | Temperature | -30 °C to 70 °C | | |
| | Humidity | RH 20 to 95%, non-condensing | | |
| IP code | | IP 67 *2 | | |
| Power supply (power consumption) | | 24 to 48 VDC (15 W) | | |

*1 Accuracy inspection environment: Temperature 20 °C ± 1 °C, Humidity 50%RH ± 10%RH
Measurement workpieces: Specified reference ball for inspection ( ϕ25 mm)
Inspection method: Determined by Mitutoyo-specified inspection method. The operating environment and the storage environment are different from the guaranteed accuracy environment.

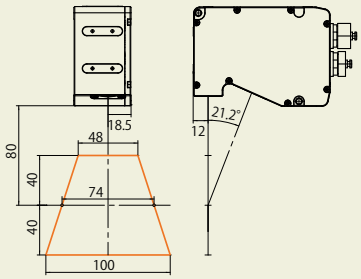
*2 Measuring accuracy may deteriorate if any water droplet or dust particle adheres to the optical path.

## DIMENSIONS

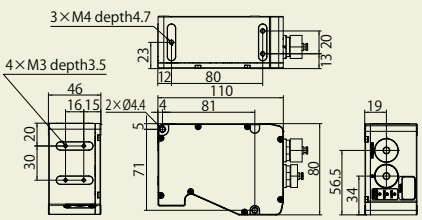
Unit: mm

### SurfaceMeasure1008S

Measuring range

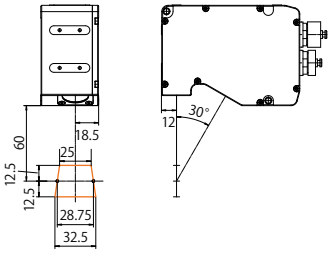



Mounting size

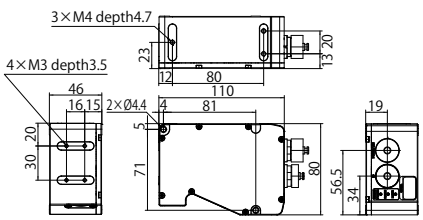



### SurfaceMeasure0303S

Measuring range

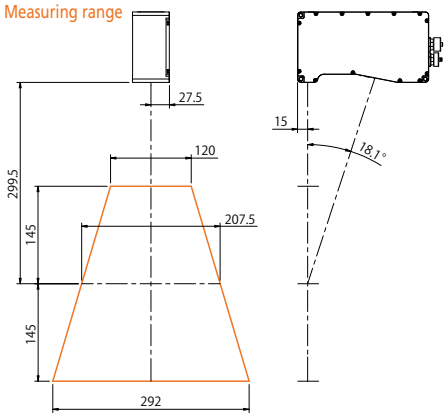



Mounting size

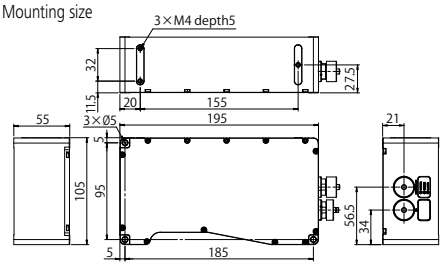



### SurfaceMeasure2929S

Measuring range




Mounting size

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# Non-contact Sensors


Master810


Master2410

## Sensor networking hub Master

Device used for distributing power to sensors and synchronizing the sensors in the multi-sensor system
Input: Power supply 24 to 48 V, Laser Enable input, Encoder input, External input

| Order No. | Product Name | Remarks |
|---|---|---|
| **02AQL401** | Master810 | Accepting a maximum of 8 sensors |
| **02AQL402** | Master2410 | Accepting a maximum of 24 sensors |

## Master cable

Cable for the connection between sensor and Master

| Specifications | |
|---|---|
| Sensor side | M16 connector (Straight or 90° upward-pointing can be selected) |
| Power supply side | RJ45 (Connect to Master) |
| Communication side | RJ45 (Ethernet connection) |

| Order No. | Product Name | Remarks |
|---|---|---|
| **02AQL373** | 2 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL374** | 5 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL375** | 10 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL376** | 15 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL377** | 20 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL378** | 25 m Power and Ethernet Master | 2×RJ45 ends |
| **02AQL391** | 2 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |
| **02AQL392** | 5 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |
| **02AQL393** | 10 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |
| **02AQL394** | 15 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |
| **02AQL395** | 20 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |
| **02AQL396** | 25 m Power and Ethernet Master 90deg | 2×RJ45 ends, 90° connector |

## Power and Ethernet cable

Cable to supply and control power without using the Master for the sensor

| Specifications | |
|---|---|
| Sensor side | M16 connector (Straight or 90° upward-pointing can be selected) |
| Power supply side | Flying lead |
| Communication side | RJ45 (Ethernet connection) |

| Order No. | Product Name | Remarks |
|---|---|---|
| **02AQL367** | 2 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL368** | 5 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL369** | 10 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL370** | 15 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL371** | 20 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL372** | 25 m Power and Ethernet | 1×Open wire end, 1×RJ45 end |
| **02AQL385** | 2 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |
| **02AQL386** | 5 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |
| **02AQL387** | 10 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |
| **02AQL388** | 15 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |
| **02AQL389** | 20 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |
| **02AQL390** | 25 m Power and Ethernet 90deg | 1×Open wire end, 1×RJ45 end, 90° connector |

## GoMax NX

Arithmetic unit to accelerate measurement processing without a PC

| Specifications | |
|---|---|
| NVIDIA module | Jetson Xavier NX |
| CPU | 6-core NVIDIA Carmel ARM v8.2 |
| GPU | Volta GPU, 384 CUDA core, 48 Tensor core |
| Memory | Onboard 8 GB LPDDR4 |
| Storage | Onboard 16 GB eMMc |
| I/O | 2-port Ethernet |
| Power supply | 12 to 24 V, Max. 15 W |
| Weight | 2.1 kg |
| Operating temperature | -15 to 55℃ |
| Mounting | DIN rail, wall mounting |

| Order No. | Product Name | Remarks |
|---|---|---|
| **02AQL420** | GoMax NX | Power plug type: B UL•CSA•PSE |

## I/O cable

Cable to connect the external I/O device to the sensor

| Specifications | |
|---|---|
| Sensor side | M16 connector (Straight or 90° upward-pointing can be selected) |
| I/O device side | Flying lead |
| Encoder input (2-phase square-wave signals Phase A, Phase B, Phase Z), Trigger input, Digital output, RS-485 output | |

Note: Sensors cannot be synchronized by the signals input to and output from each sensor through this cable.

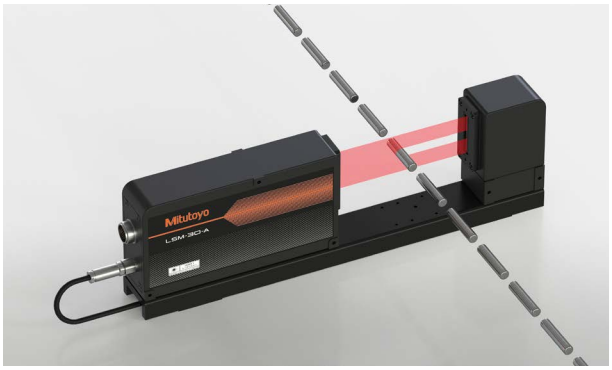
| Order No. | Product Name | Remarks |
|---|---|---|
| **02AQL361** | 2 m I/O | Open wire end |
| **02AQL362** | 5 m I/O | Open wire end |
| **02AQL363** | 10 m I/O | Open wire end |
| **02AQL364** | 15 m I/O | Open wire end |
| **02AQL365** | 20 m I/O | Open wire end |
| **02AQL366** | 25 m I/O | Open wire end |
| **02AQL379** | 2 m I/O 90deg | Open wire end, 90° connector |
| **02AQL380** | 5 m I/O 90deg | Open wire end, 90° connector |
| **02AQL381** | 10 m I/O 90deg | Open wire end, 90° connector |
| **02AQL382** | 15 m I/O 90deg | Open wire end, 90° connector |
| **02AQL383** | 20 m I/O 90deg | Open wire end, 90° connector |
| **02AQL384** | 25 m I/O 90deg | Open wire end, 90° connector |

## In-line, Non-contact Measuring System / Laser Scanning Micrometer

### APPLICATION

Catheter and magnetic wire measurements


Roller bearing measurements

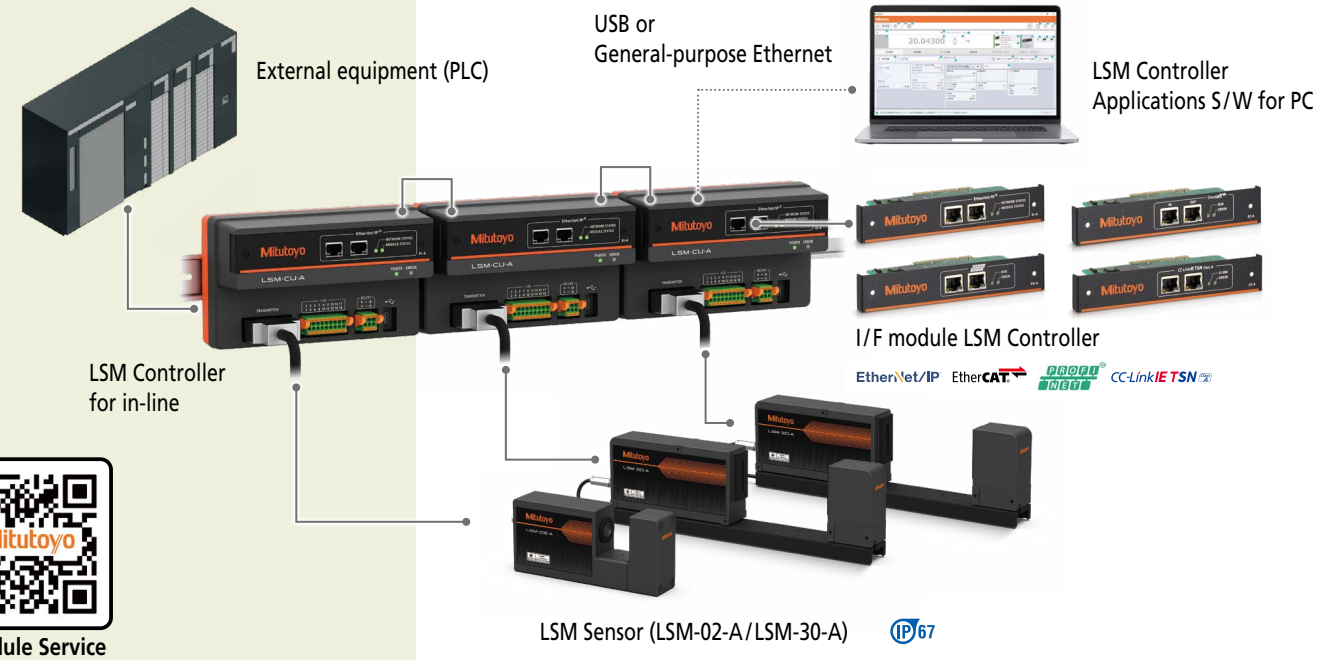



Simultaneous measurements of roller outer diameter and deflection


Film sheet thickness measurements

Note: The laser in the image is for illustrative purposes only.

### SYSTEM CONFIGURATION

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# Laser Micrometers

## Laser Scanning Micrometer


LSM-30-A LSM-02-A

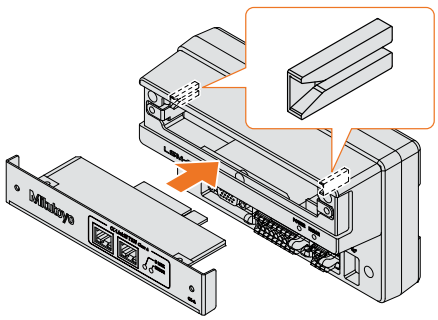
- Proven accuracy developed by one of the most reputable precision measurement instrument manufacturers.
  - Guaranteed repeatability of 2 $\sigma$
    **LSM-02-A** (ø1 mm): ±0.015 µm
    **LSM-30-A** (ø10 mm): ±0.06 µm
  - Guaranteed linearity:
    **LSM-02-A**: ±0.3 µm
    **LSM-30-A**: ±1.0 µm
- Compact body for **LSM-02-A,** ensuring versatile installation.
- **LSM-30-A** is a separable sensor with an emission/reception unit that can be used independently.
- Equipped with an ultra-fine wire measurement mode, capable of measuring outer diameters as small as 5 µm.
- **IP67** rated for durability.
- High-accuracy scanning facilitated by a precision motor.
- Scanning rate: **3,200** scans/s

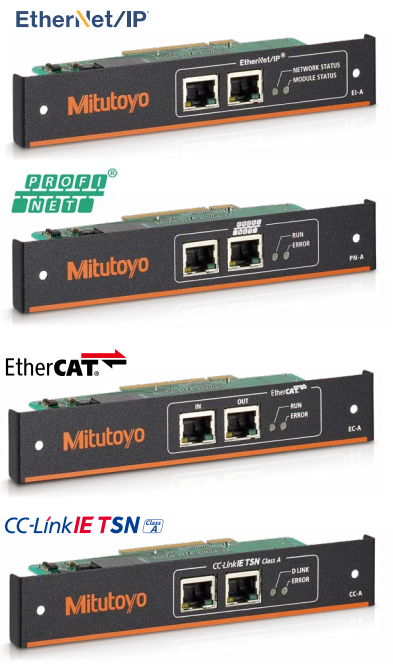

LSM-CU-A

- Compact, thin design to fit seamlessly into distribution boards or equipment.
- Entire unit, including the cable, can be stored within a 100 mm deep distribution board.
- Tool-free mounting on a DIN rail.
- Equipped with USB Type-C, I/O ports, and optional industrial interfaces.
- Standard configuration software included for user-friendly setup.
- Unit can be rotated 90 degrees for flexible layout options.

## I/F module

- Choose from four interface types to match your production line requirements.
- Controller design allows for module insertion without altering the layout.





## Optional Packages

| | |
|---|---|
| **64PKA299** | 2 mm LSM basic package |
| **64PKA300** | 2 mm LSM package with tablet |
| **64PKA301** | 30 mm LSM basic package |
| **64PKA302** | 30 mm LSM package with tablet |
| **64PKA303** | 40-90 mm dual LSM kit with tablet |
| **64PKA304** | 90-140 mm dual LSM kit with tablet |
| **64PKA305** | 140-180 mm dual LSM kit with tablet |
| **64PKA306** | 40-90 mm dual LSM kit with tablet |
| **64PKA307** | 90-140 mm dual LSM kit with tablet |
| **64PKA308** | 140-180 mm dual LSM kit with tablet |

## Optional Accessories

| | |
|---|---|
| **02AGD490** | Adjustable workstage - 544-124 |
| **02AGD270** | Workstage - 544-124 |
| **02AGD110** | Calibration gage set - 544-123 |
| **02AGD130** | Calibration gage set - 544-124 |
| **02AGD200** | Wire guiding pulley - 544-123 |
| **02AGQ450** | Air shield |
| **02AGQ452** | Laser beam stabilization shield |
| **02AGN780A** | 5m Extension signal cable |
| **02AGD420** | Additional V-block for 02AGD490 |
| **02AGD430** | Additional Stop for 02AGD490 |

Need Integration Help?

## SENSOR UNIT — COMPATIBLE WITH 544-121 CONTROLLER (NOT COMPAT. W/LSM-6200)

## SPECIFICATIONS

| Model | | LSM-02-A | LSM-30-A |
|---|---|---|---|
| **Order No.** | | **544-123** | **544-124** |
| Measuring range | | 0.005 to 2 mm<br>0.05 to 2 mm | 0.3 to 30 mm |
| Resolution | | 0.01 µm | 0.01 µm |
| Repeatability (2σ | Full range<br>Middle range | ø 2 mm: ±0.03 µm<br>ø 1 mm: ±0.015 µm | ø 30 mm:±0.09 µm<br>ø 10 mm:±0.06 µm |
| Linearity | | ±0.3 µm | Whole range: ±1.0 µm<br>Narrow range:±(0.6+0.1 ⊿ D) µm |
| Positional error | | ±0.4 µm | Full range (10×30): ±1.8 µm<br>Middle range (5×20): ±1.0 µm |
| Measuring region | | 1×2 [optical axis depth]×[scanning width] mm | 10×30 [optical axis depth]×[scanning width] mm |
| Number of scans for averaging | | 16 to 2048 scans | 1 to 2048 scans |
| Laser Class | | Semiconductor laser: CLASS 1 (Max. output: 1.0 mW, Laser wavelength: 650 nm) | |
| Scanning rate | | 3200 scans/s | |
| Laser scanning speed | | 76 m/s | 226 m/s |
| Protection level | | IP67 | |
| Distance between the emission unit and reception unit | | – | Standard: 130 mm, Max.: 350 mm |
| Operating environment | | Temperature: 0 °C to 40 °C, Humidity: 35%RH to 85%RH (non-condensing)<br>Altitude: 2000 m or less | |
| Storage temperature | | Temperature: -10 °C to 50 °C, Humidity: 35%RH to 85%RH (non-condensing) | |
| CE Marking/UKCA Marking | | EMC Directive: EN IEC 61326-1,<br>Immunity test requirements: Clause 6.2 Table 2<br>Emission limit: Class A<br>RoHS Directive: EN IEC 63000 | |
| Standard accessory | | Signal cable: **02AGQ190**<br>CD (User's Manual): **02AGQ039** | |

## CONTROLLER — COMPATIBLE WITH 544-123, 544-124 (NOT COMPAT. W/544-5XX)

## SPECIFICATIONS

| Model | | LSM-CU-A |
|---|---|---|
| **Order No.** | | **544-121 (mm/inch switchable type)** |
| Measuring functions | Segment mode | 1 to 7 (1 to 3, transparent) |
| | Edge mode | 1 to 255 |
| | Averaging method | Arithmetic average: from 1 to 2048, Moving average: from 32 to 2048 |
| | Functions | Transparent object measurement, Ultra-fine wire mode (LSM-02-A only), Simultaneous measurement of two items, Automatic workpiece detection, Outlier elimination, Judgment (lower limit/upper limit, multi-limit tolerance zone, target value and tolerance value), Dirt detection for protective glass, Sample measurement, Analog output, Parameter setting (Measurement condition): 20, Workpiece position, Calibration, Presetting, Offset, Statistical analysis, Calculation of two or more sets, Sensor model identification |
| Standard I/F | Indicator | [POWER] LED (green), [ERROR] LED (red) |
| | Signal cable connector | Mini D-Sub (15 pins) |
| | USB connector | Type-C |
| | I/O connector | Separate terminal block (18 pins) |
| | Power supply connector | Separate terminal block (6 pins) |
| Power supply | | DC+24 V±10%, 3.0 A or more |
| Operating temperature | | Temperature: 0 °C to 50 °C, Humidity: 20%RH to 80%RH (non-condensing)<br>Altitude: 2000 m or less |
| Storage temperature | | Temperature: -10 °C to 60 °C, Humidity: 20%RH to 80%RH (non-condensing) |
| Mass | | Approx. 550 g |
| CE Marking/UKCA Marking | | EMC Directive: EN IEC 61326-1,<br>Immunity test requirements: Clause 6.2 Table 2<br>Emission limit: Class A<br>RoHS Directive: EN IEC 63000 |
| Standard accessory | | Socket for I/O terminal block: **D800-396**, Socket for power supply terminal block: **D827-827**<br>Grounding wire (4 m): **02AGQ068**<br>CD (LSMPAK installer, User's Manual): **02NGA070** |

# Laser Micrometers

## INTERFACE UNIT

## SPECIFICATIONS

| Model | | LSM-EI-A | LSM-EC-A |
|---|---|---|---|
| **Order No.** | | **02AGQ300** | **02AGQ370** |
| Communication standards | | EtherNet/IP | EtherCAT |
| Interface | LED | NETWORK STATUS Indicator: Dual Color LED1 (red/green) | RUN Indicator: Single Color LED1 (green) |
| | | MODULE STATUS Indicator: Dual Color LED1 (red/green) | ERROR Indicator: Single Color LED1 (red) |
| | RJ45 connector | 2 channels | |
| Ethernet communication | Communication port | RJ45 × 2 | |
| | Communication speed | 100 Mbps Full duplex | |
| | Cable used | Cat.5e or more STP cable | |

| Model | | LSM-PN-A |
|---|---|---|
| **Order No.** | | **02AGQ350** |
| Communication standards | | PROFINET |
| Interface | LED | RUN Indicator: Dual Color LED1 (red/green) |
| | | ERROR Indicator: Dual Color LED1 (red/green) |
| | RJ45 connector | 2 channels |
| Ethernet communication | Communication port | RJ45 × 2 |
| | Communication speed | 100 Mbps Full duplex |
| | Cable used | Cat.5e or more STP cable |
| PROFINET function | PROFINET RT | Conformance class B PROFINET device<br>Media redundancy protocol (MRP) client<br>Multicast provider and subscriber |
| | Min. cycle time | 2 msec |
| | Maximum number of connections (ARs*1) | 2 |
| | Number of CRs*2 per connected controller | For cyclic data: 2, For parameter setting: 1 |

| Model | | LSM-CC-A |
|---|---|---|
| **Order No.** | | **02AGQ390** |
| Communication standards | | CC-Link IE TSN |
| Interface | LED | D Link: Dual Color LED1 (red/green) |
| | | ERROR: Single Color LED1 (red) |
| | RJ45 connector | 2 channels |
| Ethernet communication | Communication port | RJ45×2 |
| | Communication speed | 100 Mbps Full duplex |
| | Cable used | Cat 5e or more STP cable |
| CC-Link IE TSN function | CC-Link IE TSN | Class A remote station |
| | Min. cycle time | 1 msec |

*1 AR: Application Relation, Type of AR: Device Access
*2 CR: Communication Relation

EtherNet/IP


EtherCAT

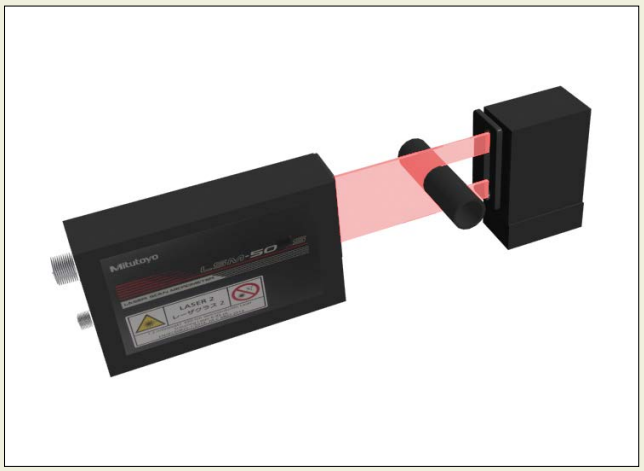

PROFINET


CC-Link IE TSN


Find Training

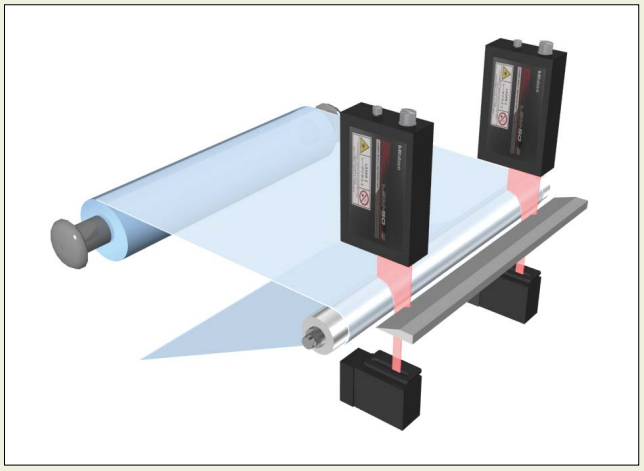
## Measurement Examples

Measurement of outside diameter of rubber roll



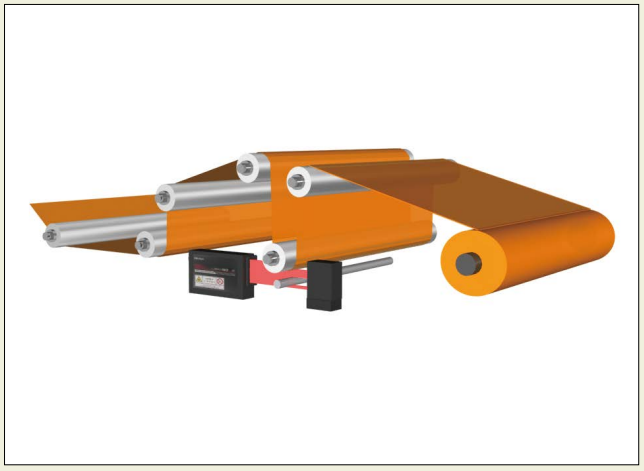
Simultaneous measurement of roller outside diameter and deflection

Measurement of uneven thickness of film or sheet (simultaneous measurement)

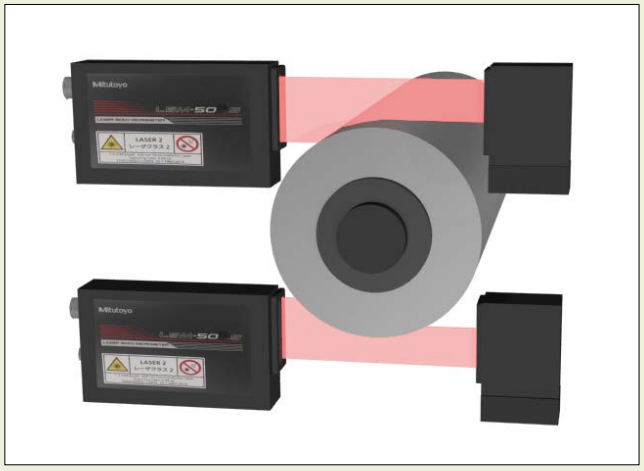


Measurement of gap between rollers

Measurement of film sheet thickness



Dual system for measuring a large outside diameter



# Laser Scan Micrometer

## LSM-500S Measuring Unit
## SERIES 544 — 5 µm to 2 mm Measuring Unit

- Capable of measuring down to 5 µm outside diameter.
- Provides ultra-high accuracy of ±0.3 µm over the entire measuring range (5 µm to 2 mm).

### SPECIFICATIONS

| **Order No.** (Laser only) | | **544-532** |
|---|---|---|
| **Package No.** (with LSM 6200 Display) | | **64PKA117** |
| Applicable laser standards | | IEC, FDA |
| User's manual | | English version |
| Measuring range | | .0002" to .080" (0.005 to 2mm)*1 |
| Resolution | | .000001" to .0005" (0.01 to 10µm) (selectable) |
| Repeatability*2 | | ±0.03µm |
| Accuracy (20°C)*3 | | ±0.3µm |
| Positional error*4 | | ±0.4µm |
| Measuring area*5 | | 1×2mm (0.005 to 2mm) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650nm (Visible) |
| Laser scanning speed | | 76m/s |
| Operating environment | Temperature | 0 to 40°C |
| | Humidity | RH 35 to 85% (no condensation) |
| Protection Level | | IP64*6 |

*1: The measuring range for the transparent object will be 0.05mm to 2mm. Please consult your local Mitutoyo office for objects smaller than 0.05mm. The measuring range will be 0.1mm to 2mm in the 1 to 255 edge measurement mode or when activating the automatic workpiece detection. If using the optional dual-connection unit for LSM-6200, the measuring range will be 0.05mm to 2mm.
*2: Determined by the value of ±2σ (σ: standard deviation) when measuring ø2mm at the interval of 0.32 sec. (average 1024 times).
*3: Center of the measuring range for cylindrical workpieces outside diameter.
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*5: The area given by [optical axis direction]×[scanning direction].
*6: If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.
Note: When using extra-fine line measurement function (FINE), guide messages for setting the following will not be displayed: dual-measurement, segment designation, automatic workpiece detection and group judgment.

### Optional Accessories

• Multifunctional display unit, **LSM-6200**:

| **Order No.** | Display type | Remarks |
|---|---|---|
| **542-072A** | English mm/in | English user's manual |

• Panel-mount type display unit, **LSM-5200**:

| **Order No.** | Remarks |
|---|---|
| **544-047** | English user's manual |

• Standard calibration gage set (ø0.1, ø2.0): **02AGD110**
• Guide pulley:**02AGD200**
• Air blower: **02AGD220**
• Extension signal cable (max. 15 m)

| **Order No.** | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |

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## LSM-501S Measuring Unit
## SERIES 544 — 50 µm to 10 mm Measuring Unit

- Provides ultra-high accuracy of ±0.5 µm over the entire measuring range (0.05 to 10 mm).
- The industry's first narrow-range accuracy performance in this measuring range of ±(0.3+0.1ΔD) µm is available for high-accuracy measurement.

### SPECIFICATIONS

| **Order No.** (Laser only) | | **544-534** |
|---|---|---|
| **Package No.** (Laser w/LSM 6200 display) | | **64PKA118** |
| Applicable laser standards | | IEC, FDA |
| User's manual | | English version |
| Measuring range | | .002" to .4" (0.05 to 10mm) |
| Resolution | | .000001" to .0005" (0.01 to 10µm) (selectable) |
| Repeatability*1 | | ±0.04µm |
| Accuracy*2 (20°C) | Whole range | ±0.5µm |
| | Small range | ±(0.3+0.1ΔD)µm*3 |
| Positional error*4 | | ±0.5µm |
| Measuring area*5 | | 2×10mm (ø0.05 to ø0.1mm) 4×10mm (ø0.1 to ø10mm) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650nm (Visible) |
| Laser scanning speed | | 113m/s |
| Operating environment | Temperature | 0 to 40°C |
| | Humidity | RH 35 to 85% (no condensation) |
| Protection Level | | IP64*6 |

*1: Determined by the value of ±2σ (σ: standard deviation) when measuring ø10mm at the interval of 0.32 sec. (average 1024 times).
*2: Center of the measuring range for cylindrical workpieces outside diameter.
*3: ΔD=Difference in diameter between the master gage and workpiece (Unit: mm)
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*5: The area given by [optical axis direction]×[scanning direction].
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

### Optional Accessories

• Multifunctional display unit, **LSM-6200**:

| **Order No.** | Display type | Remarks |
|---|---|---|
| **542-072A** | English mm/in | English user's manual |

• Panel-mount type display unit, **LSM-5200**:

| **Order No.** | Remarks |
|---|---|
| **544-047** | English user's manual |

• Standard calibration gage set (ø0.1, ø10.0): **02AGD120**
• Wire guiding pulley: **02AGD210**
• Adjustable workstage: **02AGD400**
• Air blower: **02AGD230**
• Workstage: 0**2AGD270**
• Extension signal cable (max. 15 m)

| Order No. | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |

• Extension relay cable

| Order No. | Cable length |
|---|---|
| **02AGC150A** | 1 m |

## Optional Accessories

• Multifunctional display unit, **LSM-6200**:

| Order No. | Display type | Remarks |
|---|---|---|
| **542-072A** | English mm/in | English user's manual |

• Panel-mount type display unit, **LSM-5200**:

| Order No. | Remarks |
|---|---|
| **544-047** | English user's manual |

• Standard calibration gage set (ø1.0, ø30.0): **02AGD130**
• Adjustable workstage: **02AGD490**
• Air blower: **02AGD240**
• Workstage: **02AGD270**
• Extension signal cable (max. 25 m)

| Order No. | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |
| **02AGN780D** | 20 m |

• Extension relay cable (max. 5 m)

| | |
|---|---|
| **02AGC150A** | 1 m |
| **02AGC150B** | 3 m |
| **02AGC150C** | 5 m |

## LSM-503S Measuring Unit SERIES 544 — 0.3 mm to 30 mm Measuring Unit

• Ensures ±1.0 µm accuracy over the entire measuring range (0.3 to 30 mm).
• The industry's first narrow-range accuracy performance in this measuring range of ±(0.6+0.1ΔD) µm is available for high-accuracy measurement.

## SPECIFICATIONS

| **Order No.** (Laser only) | | **544-536** |
|---|---|---|
| **Package No.** (Laser w/LSM 6200 display) | | **64PKA119** |
| Applicable laser standards | | IEC, FDA |
| User's manual | | English version |
| Measuring range | | .012" to 1.18" (0.3 to 30mm) |
| Resolution | | .000001" to .005" (0.02 to 100µm) (selectable) |
| Repeatability*1 | | ±0.11µm |
| Accuracy*2 (20°C) | Whole range | ±1.0µm |
| | Small range | ±(0.6+0.1ΔD)µm*3 |
| Positional error*4 | | ±1.5µm |
| Measuring area*5 | | 10×30mm (0.3 to 30mm) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650nm (Visible) |
| Laser scanning speed | | 226m/s |
| Operating environment | Temperature | 0 to 40°C |
| | Humidity | RH 35 to 85% (no condensation) |
| Protection Level | | IP64*6 |

*1: Determined by the value of ±2σ (σ: standard deviation) when measuring ø30mm at the interval of 0.32 sec. (average 1024 times).
*2: Center of the measuring range for cylindrical workpieces outside diameter.
*3: ΔD=Difference in diameter between the master gage and workpiece (Unit: mm).
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*5: The area given by [optical axis direction]×[scanning direction].
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

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## Optional Accessories

• Multifunctional display unit, **LSM-6200**:

| Order No. | Display type | Remarks |
|---|---|---|
| **542-072A** | English mm/in | English user's manual |

• Panel-mount type display unit, **LSM-5200**:

| Order No. | Remarks |
|---|---|
| **544-047** | English user's manual |

• Standard calibration gage set (ø0.1, ø60.0): **02AGD140**
• Adjustable workstage: **02AGD520**
• Air blower: **02AGD250**
• Extension signal cable (max. 25 m)

| Order No. | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |
| **02AGN780D** | 20 m |

• Extension relay cable (max. 5 m)

| | |
|---|---|
| **02AGC150A** | 1 m |
| **02AGC150B** | 3 m |
| **02AGC150C** | 5 m |

## LSM-506S Measuring Unit SERIES 544 — 1 mm to 60 mm Measuring Unit

• Ensures ±3 µm accuracy over the entire measuring range (1 to 60 mm).
• The industry's first narrow-range accuracy performance in this measuring range of ±(1.5+0.5ΔD) µm is available for high-accuracy measurement.

## SPECIFICATIONS

| **Order No.** (Laser only) | | **544-538** |
|---|---|---|
| **Package No.** (Laser w/ LSM 6200 display) | | **64PKA120** |
| Applicable laser standards | | IEC, FDA |
| User's manual | | English version |
| Measuring range | | .040" to 2.36" (1 to 60mm) |
| Resolution | | .000002" to .005" (0.05 to 100µm) (selectable) |
| Repeatability*1 | | ±0.36µm |
| Accuracy*2 (20°C) | Whole range | ±3µm |
| | Small range | ±(1.5+0.5ΔD)µm*3 |
| Positional error*4 | | ±4µm |
| Measuring area*5 | | 20×60mm (1 to 60mm) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650nm (Visible) |
| Laser scanning speed | | 452m/s |
| Operating environment | Temperature | 0 to 40°C |
| | Humidity | RH 35 to 85% (no condensation) |
| Protection Level | | IP64*6 |

*1: Determined by the value of ±2σ (σ: standard deviation) when measuring ø60mm at the interval of 0.32 sec. (average 1024 times).
*2: Center of the measuring range for cylindrical workpieces outside diameter.
*3: ΔD=Difference in diameter between the master gage and workpiece (Unit: mm)
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*5: The area given by [optical axis direction]×[scanning direction].
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

# Laser Scan Micrometer

## LSM-512S Measuring Unit
## SERIES 544 — 1 mm to 120 mm Measuring Unit

- Ensures ±6 µm accuracy over the entire measuring range (1 to 120 mm).
- The industry's first narrow-range accuracy performance in this measuring range of ±(4.0+0.5ΔD) µm is available for high-accuracy measurement.

With signal cable (5 m)
**02AGN770A**

## SPECIFICATIONS

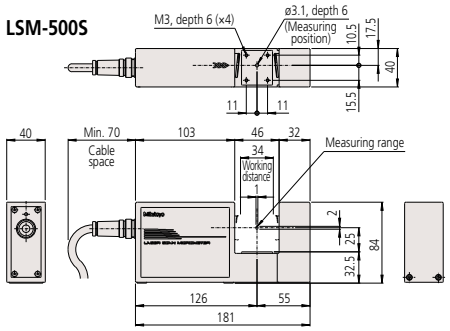
| **Order No.** (Laser only) | | **544-540** |
|---|---|---|
| **Package No.** (Laser w/ LSM 6200 display) | | **64PKA121** |
| Applicable laser standards | | IEC, FDA |
| User's manual | | English version |
| Measuring range | | .040" to 4.72" (1 to 120mm) |
| Resolution | | .000005" to .005" (0.1 to 100µm) (selectable) |
| Repeatability*1 | | ±0.85µm |
| Accuracy*2 (20°C) | Whole range | ±6µm |
| | Small range | ±(4.0+0.5ΔD)µm*3 |
| Positional error*4 | | ±8µm |
| Measuring area*5 | | 30×120mm (1 to 120mm) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650nm (Visible) |
| Laser scanning speed | | 904m/s |
| Operating environment | Temperature | 0 to 40°C |
| | Humidity | RH 35 to 85% (no condensation) |
| Protection level | | IP64*6 |

*1: Determined by the value of ±2σ (σ: standard deviation) when measuring ø120mm at the interval of 0.32 sec. (average 1024 times).
*2: Center of the measuring range for cylindrical workpieces outside diameter.
*3: ΔD=Difference in diameter between the master gage and workpiece (Unit: mm)
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*5: The area given by [optical axis direction]×[scanning direction].
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

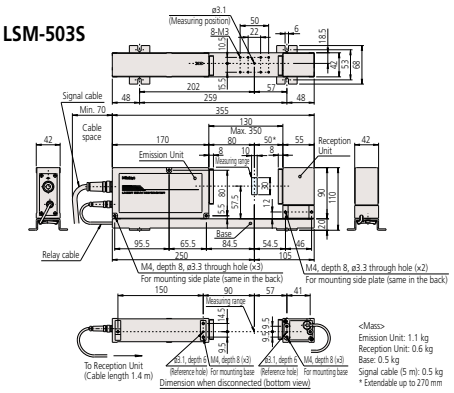
## DIMENSIONS

Unit: mm

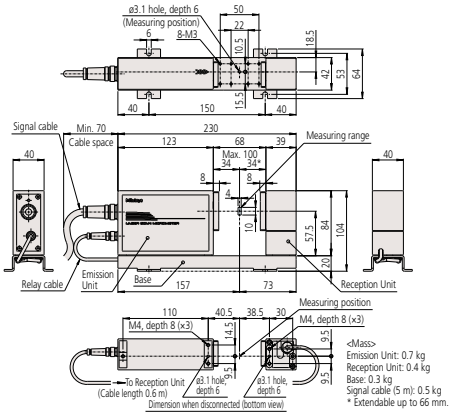
### LSM-500S



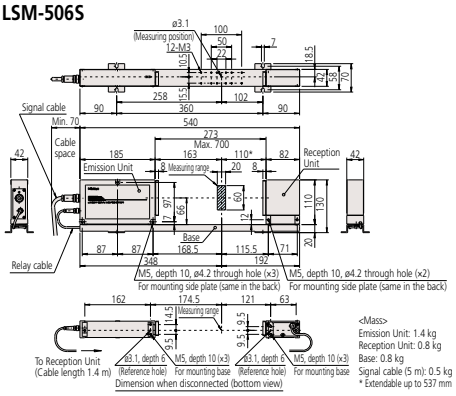

### LSM-503S




### LSM-501S




### LSM-506S




## Optional Accessories

- Multifunctional display unit, **LSM-6200**:

| **Order No.** | Display type | Remarks |
|---|---|---|
| **542-072A** | English mm/in | English user's manual |

- Panel-mount type display unit, **LSM-5200**:

| **Order No.** | Remarks |
|---|---|
| **544-047** | English user's manual |

- Heavy Duty Adjustable Workstage: **K542965**
- Standard calibration gage set (ø20.0, ø120.0): **02AGD150**
- Air blower: **02AGD260**
- Extension signal cable (max. 25 m)

| **Order No.** | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |
| **02AGN780D** | 20 m |

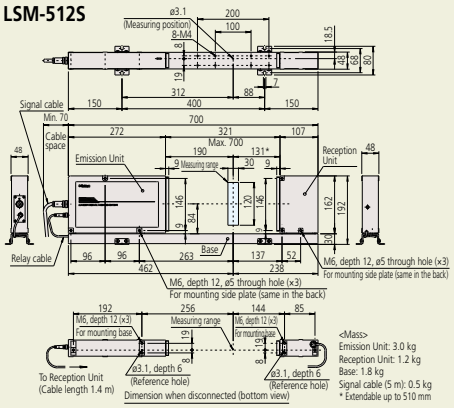
- Extension relay cable (max. 5 m)

| | |
|---|---|
| **02AGC150A** | 1 m |
| **02AGC150B** | 3 m |
| **02AGC150C** | 5 m |

## DIMENSIONS

Unit: mm

### LSM-512S




Find a Distributor

# Laser Scan Micrometer

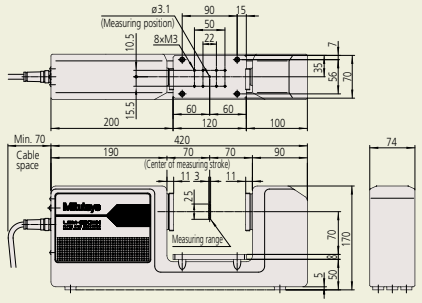
## Optional Accessories

- Standard calibration gage set (ø1.0, ø25.0): **02AGD180**
- Workstage: **02AGD270**
- Adjustable workstage: **02AGD280**
- Digimatic code output unit (2-ch): **02AGC840**
- 2nd I/O analog interface unit: **02AGC880**
- BCD interface unit: **02AGC910**
- Printer & cable set (120V AC C-type plug): **02AGD600B**
- Printing paper TP411-28CL / 1Pack = 10pc: **223663**
- Foot switch: **937179T**

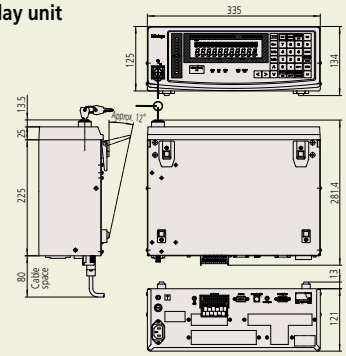
## DIMENSIONS

Unit: mm

**Measuring Unit**



**Display unit**



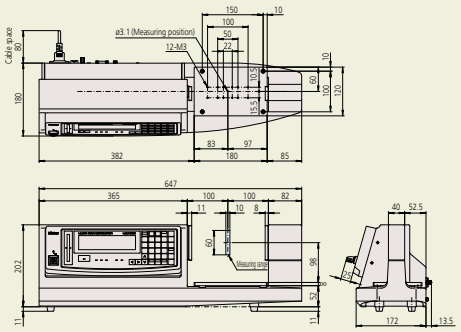
## Optional Accessories

- Standard calibration gage set (ø1.0, ø60.0): **02AGD170**
- Adjustable workstage
  Horizontal stroke 200 mm: **02AGD370**
  Horizontal stroke 300 mm: **02AGD680**

Center support*: **02AGD580**
Adjustable V-block*: **02AGD590**
SPC output cable (1m): **936937**
USB input tool for spreadsheets: **264-020**
(SPC cable also required)
Footswitch: **937179T**
*Use with an adjustable workstage.

## DIMENSIONS

Unit: mm



*1 Determined at the level of ±2σ (σ: standard deviation) when measuring ø60 mm in the interval of 0.32 sec. (average 512 times).
*2 Applies at the center of the measuring range when measuring outside diameters.

## LSM-6902H Measuring Unit and 6900 Display
## SERIES 544 — 0.1 mm to 25 mm High Accuracy

- Demonstrates the best repeatability available in the 25 mm class.
- The ultra-precise scanning motor enables the highest measurement accuracy to be realized.
- Thanks to excellent linearity, an accuracy of ±0.5 µm over the entire measuring range and a higher accuracy of ±(0.3+0.1ΔD) µm over a narrow range are guaranteed.
- The optimal solution for measuring the outside diameter of pin gages or plug gages.

**LSM-6902H**

## SPECIFICATIONS

| Model | | LSM-6902H |
|---|---|---|
| **Set Order No.** | | **544-499-1A** |
| Measuring unit | | |
| Type | | inch/mm |
| Applicable standards | | IEC, FDA |
| Measuring range | | 0.1 to 25 mm (0.004 to 1.0 in) |
| Resolution | | 0.01 to 10 µm (selectable) (0.000001 to 0.0005 in) |
| Repeatability*1 | Whole range | ±0.045 µm (±0.0000018 in) (ø25 mm) |
| | Narrow range | ±0.03 µm (±0.0000012 in) (ø10 mm) |
| Linearity*2 (20 °C) | Whole range | ±0.5 µm (±0.000020 in) |
| | Narrow range | ±(0.3+0.1ΔD) µm ±(0.000012+0.01ΔD) inch*5 |
| Positional error*3 | | ±0.5 µm (±0.000020 in) |
| Measuring region*4 | | ±1.5 mm×25 mm (±0.006×1.0 in) |
| Scanning rate | | 3200 scans/s |
| Laser wavelength | | 650 nm (Visible) |
| Laser scanning speed | | 226 m/s |
| Operating environment | Temperature | 0 to 40 °C |
| | Humidity | RH 35 to 85% (non-condensing) |

*1 ±2σ values (σ being the standard deviation) for when ø25 mm and ø10 mm samples are measured for 1.28 seconds (2048 scans on average, 2 samples).
*2 The value at the center of the measuring range.
*3 An error in outside diameter measurement due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*4 The region defined by [optical axis depth]×[scanning width].
*5 ΔD=Difference in diameter between the master gage and workpiece (Unit: mm).

Display unit

| | |
|---|---|
| Display | 16-digit plus 11-digit fluorescent display, and guide message LED |
| Segment | 1 to 7 (1 to 3, transparent) or 1 to 255 edges |
| Averaging times | Arithmetic average: 2 to 2048 scans.<br>Moving average: 32 to 2048 scans. |
| Judgment | Selection from "target value + tolerance", "lower tolerance + upper tolerance", or "7 classes multilimit tolerance zone". |
| Measurement mode | Standby, Single measurement, Continuous measurement |
| External dimensions | 335 (W) ×134 (H) ×250 (D) mm |
| Power supply | 100 to 240 VAC ±10% 30 W 50/60 Hz |
| Standard I/F | RS-232C, Analog I/O |
| Optional I/F | Digimatic code output unit (2-ch),<br>2nd I/O analog I/F, BCD I/F |
| Operating environment | 0 to 40 °C, RH 35 to 85% (non-condensing) |
| Others | Nominal setting, sample setting, suppression of unnecessary digits, transparent object measurement, automatic measurement in edge mode, output timer, abnormal data elimination, SHL change, group judgment, simultaneous measurement, statistical processing, mastering, buzzer function, automatic workpiece detection (dimension/position), zero-set/offset<br>Note: In the case of dual measuring-unit connection, extra-fine line measurement and some of the communication commands are not available |

## LSM-9506 Integrated Display/Measuring Unit
## SERIES 544 — 0.5 mm to 60 mm High Accuracy

- High accuracy of ±2.5 µm, integrated display unit with many functions equivalent to the multi-function display unit. (Some functions may be unavailable.)

## SPECIFICATIONS

| Model | | LSM-9506 |
|---|---|---|
| **Order No.** | | **544-116-1A** |
| Type | | inch/mm |
| Measuring range | | 0.02 to 2.36 in/0.5 to 60 mm |
| Resolution | | 0.000002 to 0.005 in/0.00005 to 0.1 mm |
| Repeatability*1 | | ±0.6 µm (±0.00003 in) |
| Linearity*2 (20 °C) | | ±2.5 µm (±0.0001 in) |
| Positional error*3 | Optical axis direction | ±2.5 µm (±0.0001 in) |
| | Scanning direction | ± (2.0+L/10) µm<br>L: Displacement between workpiece center and optical axis center |
| Measuring region*3 | | ±5×60 mm (±0.2×2.36 in) |
| Scanning rate | | 1600 scans/s |
| Laser wavelength | | 650 nm (Visible)*4 |
| Laser scanning speed | | 226 m/s (8900 in/s) |
| Display unit | | 16-digit dot matrix (upper column) +7 segment 11-digit (lower column), guidance LEDs |
| Standard interface | | RS-232C, Digimatic code output unit (1-ch) |
| Optional interface | | No |
| Power supply | | AC120 V ±10%, 25 W, 40VA, 60 Hz |
| Operating environment | | 0 to 40 °C, RH 35 to 85% (non-condensing) |

*3 An error in outside diameter measurement due to variation in workpiece position either in the optical axis direction or in the scanning direction.
*4 FDA Class II (544-116-1A)/IEC Class 2 (All models except 544-116-1A) semiconductor laser for scanning (Maximum power: 1.0 mW)
*5 To denote your AC power cable add the following suffixes to the order No.: D for CEE, DC for CCC, E for BS, F for SAA, K for KC, C and No suffix are required for PSE.

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Mitutoyo

# Laser Scan Micrometer

## LSM-6200 Display Unit
## SERIES 544 — Multi-function Type

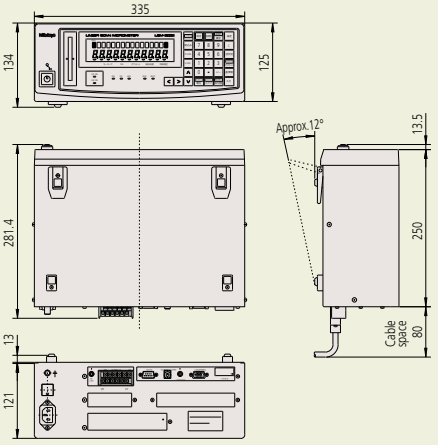
- Multi-function display for LSM500S series.
- Capable of statistical analysis such as: average, maximum value, minimum value, range (max. to min.).
- Segment measurement (7 points) or edge measurement (1 to 255 edges) can be selected.
- A function to eliminate abnormal values is standard.
- 100 tolerance values, preset values, or settings can be stored.
- Multiple communication formats are available

### SPECIFICATIONS

| Model | LSM-6200 |
|---|---|
| **Order No.** | **544-072A** |
| Type | inch/mm |
| Display | 16-digit dot matrix (upper) and 11-digit 7-segment (lower) |
| Segment | 1 to 7 (1 to 3, transparent) or 1 to 255 edges*1 |
| Averaging times | Arithmetic average: per 2 to 2048/Moving average: per 32 to 2048 (Arithmetic average is per 16 to 2048 when using **544-532**) |
| Judgment | Selection from "target value+tolerance", "lower tolerance + upper tolerance", or "7 classes multi-limit tolerance zone". |
| Measurement mode | Standby, Single measurement, Continuous measurement |
| Statistical analysis | Maximum, Minimum, Average, Dispersion, $\sigma$ (S.D) |
| Size | 335 (W) ×134 (H) ×250 (D) mm |
| Power supply | 100 to 240 V AC ±10%, 45 W, 50/60 Hz |
| Standard I/F | RS-232C, Analog I/O |
| Optional I/F | Digimatic code output unit (2-ch), 2nd I/O analog I/F, BCD I/F |
| Operating environment | 0 to +40 °C, RH 35 to 85% (non-condensing) |
| Other functions | Nominal setting, sample setting, selection of unnecessary digits, transparent object measurement*2, measurement of odd fluted parts, automatic measurement in edge mode, output timer, abnormal data elimination, SHL change, group judgment, simultaneous measurement, statistical processing, mastering, buzzer function, automatic workpiece detection (dimension/position)*1, zero-set/offset, dual measurement (optional) |

### DIMENSIONS

Unit: mm




### Optional Accessories

- Serial cable (RS-232C null): **12AAA807**
- Footswitch: **937179T**
- Extension Signal Cables: **02AGN780A, B, C, D**
- Digimatic output card: **02AGC840**
- Dual Input Card: **02AGP150**
- BCD output: **02AGC910**
- 2nd analog output card: **02AGC880**
- Printer: **02AGD600B**

## LSM-5200 Display Unit
## SERIES 544 — Panel-mount Type

- A compact controller which could be used for multi-unit system configurations.
- A panel-mount type display unit designed for the **LSM500S** Series.
- Analog I/O and RS-232C is standard.

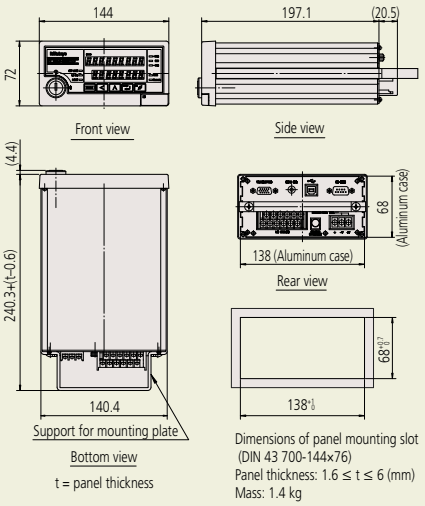
### SPECIFICATIONS

| Model | LSM-5200 |
|---|---|
| **Order No.** | **544-047** (power supply not included) |
| Display | 9-digit (upper) and 8-digit (lower) 7-segment |
| Segment | 1 to 7 (1 to 3, transparent) or 1 to 255 edges |
| Averaging method | Arithmetic average: from 4 to 2048; Moving average: from 32 to 2048 (Arithmetic average is from 16 to 2048 when using **LSM-500S**.) |
| Judgment | Selecting from "target value±tolerance value" or "lower limit/upper limit". |
| Measurement mode | Standby, Single measurement, Continuous measurement |
| Statistical analysis | Calculation result is output via USB or RS-232C. |
| External dimensions | 144 (W) ×72 (H) ×197.1 (D) mm |
| Power supply | 24 V DC±10%, 1.3 A or more |
| Standard I/F | USB2.0, RS-232C, I/O analog |
| Operating temperature (humidity) ranges | 0 to 40 °C, RH 35 to 85% (non-condensing) |
| Storage temperature (humidity) ranges | –20 to 70 °C, RH 35 to 85% (non-condensing) |
| Other functions | Measurement of odd fluted parts, simultaneous measurement, nominal setting, sample setting, selection of unnecessary digits, transparent object measurement<br>Automatic workpiece detection (dimension/position detected)*1, abnormal data elimination, mastering, statistical processing (when using USB, RS-232C), output timer, automatic measurement in edge mode, presetting<br>Note that every function is limited in its combination possibilities. See the user manual for details. |
| Mass | 1.4 kg |

Note 1: For USB communication with a PC, a dedicated device driver is required. For details, contact your nearest M³ Solution Center.

### DIMENSIONS

Unit: mm



## Optional Accessories
## SERIES 544 — Laser Scan Micrometer (Measuring Unit)

### Standard calibration gage set

- Standard gage set suitable for calibration of Laser Scan Micrometers.
- Nominal gage diameters (1 to 160 mm) are as given in Specifications.

### SPECIFICATIONS

| For calibrating models | | LSM-6902H | LSM-500S | LSM-501S | LSM-503S | LSM-506S | LSM-512S | LSM-9506 |
|---|---|---|---|---|---|---|---|---|
| Set No. | | 02AGD180 | 02AGD110 | 02AGD120 | 02AGD130 | 02AGD140 | 02AGD150 | 02AGD170 |
| Configuration (Order No.) | Stand | 02AGD181 | 02AGD111 | 02AGD121 | 02AGD131 | 02AGD141 | 02AGD151 | 02AGD171 |
| | Gages | ø1: 02AGD920<br>ø25: 02AGD963 | ø0.1: 958200<br>ø2 : 958202 | ø0.1: 958200<br>ø10: 229317 | ø1: 02AGD920<br>ø30: 02AGD961 | ø1: 02AGD920<br>ø60: 02AGD962 | ø20: 229730<br>ø120: 234072 | ø1: 02AGD920<br>ø60: 02AGD962 |
| | Carrying case | 02AGD190 | 958203 | 958203 | 02AGD980 | 02AGD980 | 02AGD990 | 02AGD970 |

### Workstage

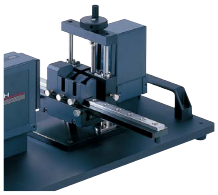
- Easy set-up and height adjustment enables high-precision measurement.

### SPECIFICATIONS

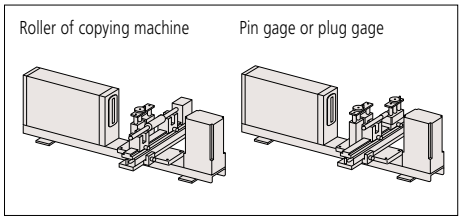
| Model | LSM-501S<br>LSM-503S<br>LSM-6902H |
|---|---|
| Order No. | 02AGD270 |

### Adjustable workstage

- Vertical/horizontal slide mechanism enables easy measurement of various workpiece diameters.
- Suitable for quality control of high-precision shafts, rollers, pin gages and similar.



### Measurement Examples



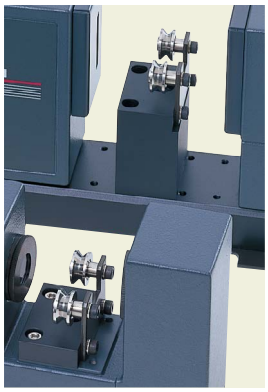

### Basic configuration

| Basic set | Order No. | Model | Standard Accessories | Measuring range (mm) | Horizontal stroke (mm) | Vertical stroke (mm) |
|---|---|---|---|---|---|---|
| 1) Main unit<br>2) V-block<br>3) Stop | 02AGD280 | LSM-6902H | V-block (**02AGD420**), 2 pcs.<br>Stopper (**02AGD430**), 1 pc. | 0.1 - 25 | 130 | 47 |
| | 02AGD400 | LSM-501S | | 0.05 - 10 | 130 | 32 |
| | 02AGD490 | LSM-503S | | 0.3 - 30 | 200 | 35 |
| | 02AGD520 | LSM-506S* | V-block A (**02AGD550**), 2 pcs. | 1 - 60 | 300 | 45 |
| | 02AGD370 | LSM-9506* | V-block B (**02AGD560**), 1 pc. | 0.5 - 60 | 200 | 45 |
| | 02AGD680 | | V-block C (**02AGD570**), 1 pc. | 0.5 - 60 | 300 | 45 |

* The stop is not included in the basic set for these models.
Note: Optional part for the adjustable workstage, such as center support, adjustable V-block (up/down) etc., are available.

### Guide pulley

- Used for supporting measurement of outside diameter of fine wire-like materials such as magnetic wire or fiber.



### SPECIFICATIONS

| Model | LSM-500S | LSM-501S |
|---|---|---|
| Order No. | 02AGD200 | 02AGD210 |

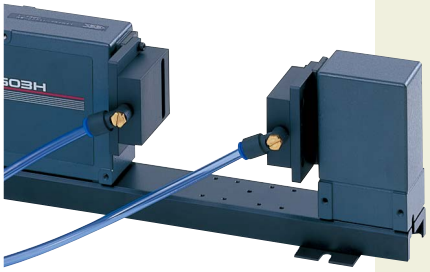
Note 1: Each measurement range is as follows:
**LSM-500S**: ø5 µm to ø1.6 mm
**LSM-501S**: ø50 µm to ø2 mm

Note 2: For calibration, the calibration gage set for **LSM-500S** (**02AGD110**) is required.

Got Questions?

# Laser Scan Micrometer

## Optional Accessories SERIES 544 — Laser Scan Micrometer (Measuring Unit)



### Air Shield

- Air blows from the air outlet installed on the laser section to clear dust adhering to the laser window.

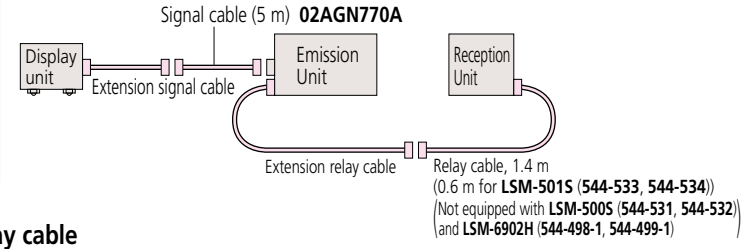
### SPECIFICATIONS

| Air supply unit | Air shield | Applicable models |
|---|---|---|
| 957608 | **02AGD220** | **LSM-500S (544-532)** |
| | **02AGD230** | **LSM-501S (544-534)** |
| | **02AGD240** | **LSM-503S (544-536)** |
| | **02AGD250** | **LSM-506S (544-538)** |
| | **02AGD260** | **LSM-512S (544-540)** |

Note: Air shield is supplied with 5 m air tube (Outside Diameter: 6 mm).

### Extension signal cable/Extension relay cable

- Extension signal cables are necessary when the measuring unit and display unit are separated in operation; Extension relay cables are necessary when the optical section is separated in operation.




### SPECIFICATIONS

**Extension signal cable**

| Order No. | Cable length |
|---|---|
| **02AGN780A** | 5 m |
| **02AGN780B** | 10 m |
| **02AGN780C** | 15 m |
| **02AGN780D** | 20 m |

**Extension relay cable**

| Order No. | Cable length |
|---|---|
| **02AGC150A** | 1 m |
| **02AGC150B** | 3 m |
| **02AGC150C** | 5 m |

Note 1: For **544-532**, **544-534**, the overall length of the signal cable and the extension signal cable is 20 m at a maximum.
Note 2: For **544-536**, **544-538**, **544-540**, **544-542** the overall length of the signal cable and the extension signal cable is 30 m at a maximum.
Note 3: The length of the relay extension cable is 5 m at a maximum.
Note 4: The maximum extension length of the signal cable and relay cable is 32 m in total.
Note 5: Cannot be used with **544-499-1A**.

## Optional Accessories SERIES 544 — Laser Scan Micrometer (Display Unit)

### Foot switch

- For **LSM-6200** (**544-071**, **544-072**), **LSM-6902H** (**544-498-1**, **544-499-1**) and **LSM-9506** (**544-116**).

**937179T**

## Optional Accessories Interface for LSM6200, 6902H

### BCD Interface

- Outputs measurement data in BCD output (7-digit) or HEX output.
- Data logic can be switched.
- Isolated I/O circuitry
- Available for **LSM-6200** (**544-072**) and **LSM-6902H** (**544-499-1**).

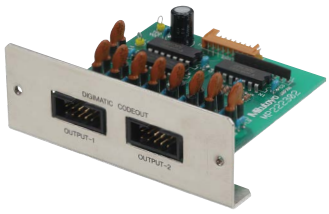
### SPECIFICATIONS

| Order No. | 02AGC910 |
|---|---|
| Standard Accessories | Connector (DDK) **57-30360** (**214188**) |

Talk to Sales

## Optional Accessories
## SERIES 544 — Laser Scan Micrometer (Display Unit)

### Digimatic code output unit



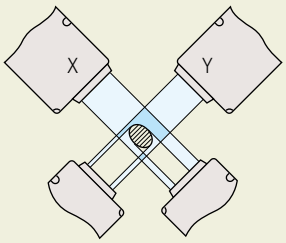
- 2-channel Digimatic code output
- In simultaneous measurement, measurement data are output as follows:
  Program No. 0 to No. 4 in OUTPUT-1
  Program No. 5 to No. 9 in OUTPUT-2 (10 programs operated)
- 10 pin MIL type connector.
- Output cable is not supplied.
  Connecting cable (optional) 1 m (936937)
- Available for **LSM-6200** (**544-071**, **544-072**) and **LSM-6902H** (**544-498-1**, **544-499-1**).

Note 1: Output is 6 digits of measurement data.
Note 2: Displaying 6th and 7th digit after the decimal point is not supported.

**SPECIFICATIONS**

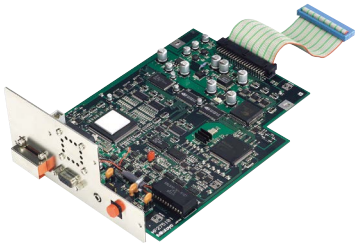
| Order No. | 02AGC840 |
|---|---|

**XY Measurement**




(X–Y): runout
(X+Y)/2: average
Note: XY requires 10 mm-interval.

### Dual connection unit



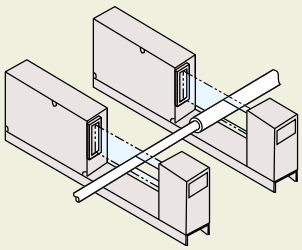
- Enables second unit connection to **LSM-6200** (**544-071**, **544-072**). (both units must be the same model)

  Note: Cannot be used for **LSM-6902H** (**544-498-1**, **544-499-1**).
- Depending on the layout of the two measuring units, large-diameter measurement, XY measurement, and parallel measurement are possible.
- Both of the measuring units and display units can be simultaneously operated.

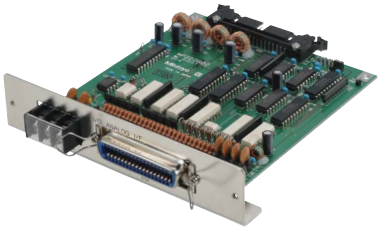
**SPECIFICATIONS**

| Order No. | 02AGP150 |
|---|---|

**Parallel Measurement**



### 2nd I/O analog I/F



- I/O, analog output.
- Simultaneous measurement is supported by two pairs of GO/NG judgment outputs.
- Available for **LSM-6200** (**544-071**, **544-072**) and **LSM-6902H** (**544-498-1**, **544-499-1**).

**SPECIFICATIONS**

| Order No. | 02AGC880 |
|---|---|
| Standard Accessories | Connector (DDK) **57-30360** (**214188**) |

### Cable for BCD and 2nd I/O simultaneous mount

- Both BCD (**02AGC910**) and 2nd I/O analog I/F (**02AGC880**) can be mounted on **LSM-6200** (**544-071**, **544-072**) and **LSM-6902H** (**544-498-1**, **544-499-1**) using this cable.

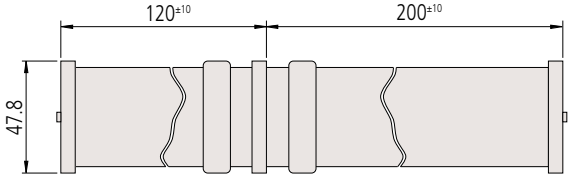
  Note: If using this cable, the dual connection unit (**02AGP150**) cannot be used.

**SPECIFICATIONS**

| Order No. | 02AGE060 |
|---|---|

**DIMENSIONS**

Unit: mm

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Mitutoyo

## Compatibility

Your Laser Scan Micrometer has been adjusted together with the ID Unit, which is supplied with the measuring unit. The ID Unit, which has the same code number and the same serial number as the measuring unit, must be installed in the display unit. This means that if the ID Unit is replaced the measuring unit can be connected to another corresponding display unit.

## The workpiece and measuring conditions

Depending on whether the laser is visible or invisible, the workpiece shape, and the surface roughness, measurement errors may result. If this is the case, perform calibration with a master workpiece which has dimensions, shape, and surface roughness similar to the actual workpiece to be measured.
If measurement values show a large degree of dispersion due to the measuring conditions, increase the number of scans for averaging to improve the measurement accuracy.

## Electrical interference

To avoid operational errors, do not route the signal cable and relay cable of the Laser Scan Micrometer alongside a high voltage line or other cables capable of inducing noise current in nearby conductors. Ground all appropriate units and cable shields.

## Connection to a computer

If the Laser Scan Micrometer is to be connected to an external personal computer via the RS-232C interface, ensure that the cable connections conform to the specification.

## Laser safety

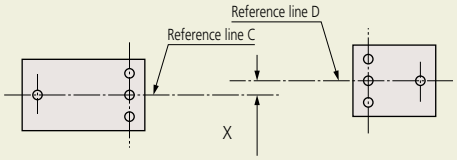
Mitutoyo Laser Scan Micrometers use a low-power visible laser for measurement. The laser is a CLASS 2 EN/IEC60825-1 device.
Warning and explanation labels, as shown below, are attached to the Laser Scan Micrometers as is appropriate.


## Re-assembly after removal from the base

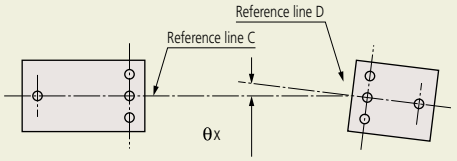
Observe the following limits when re-assembling the emission unit and reception unit to minimize measurement errors due to misalignment of the laser's optical axis with the reception unit.

**• Alignment within the horizontal plane**

a. Parallel deviation between reference lines C and D:
X (in the transverse direction)

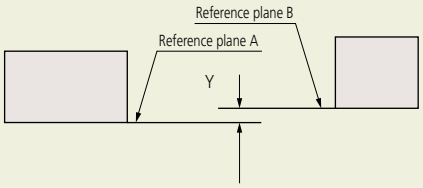



b. Angle between reference lines C and D: θx (angle)

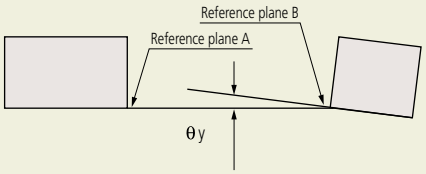



**• Alignment within the vertical plane**

c. Parallel deviation between reference planes A and B: Y (in height)




d. Angle between reference planes A and B: θy (angle)




**• Allowable limits of optical axis misalignment**

| Model | Distance between Emission Unit and Reception Unit | X and Y | θx and θy |
|---|---|---|---|
| LSM-501S | 68 mm (2.68 in) or less | within 0.5 mm (0.02 in) | within 0.4° (7 mrad) |
| | 100 mm (3.94 in) or less | within 0.5 mm (0.02 in) | within 0.3° (5.2 mrad) |
| LSM-503S | 130 mm (5.12 in) or less | within 1 mm (0.04 in) | within 0.4° (7 mrad) |
| | 350 mm (13.78 in) or less | within 1 mm (0.04 in) | within 0.16° (2.8 mrad) |
| LSM-506S | 273 mm (10.75 in) or less | within 1 mm (0.04 in) | within 0.2° (3.5 mrad) |
| | 700 mm (27.56 in) or less | within 1 mm (0.04 in) | within 0.08° (1.4 mrad) |
| LSM-512S | 321 mm (12.64 in) or less | within 1 mm (0.04 in) | within 0.18° (3.1 mrad) |
| | 700 mm (27.56 in) or less | within 1 mm (0.04 in) | within 0.08° (1.4 mrad) |
| LSM-516S | 800 mm (31.50 in) or less | within 1 mm (0.04 in) | within 0.09° (1.6 mrad) |