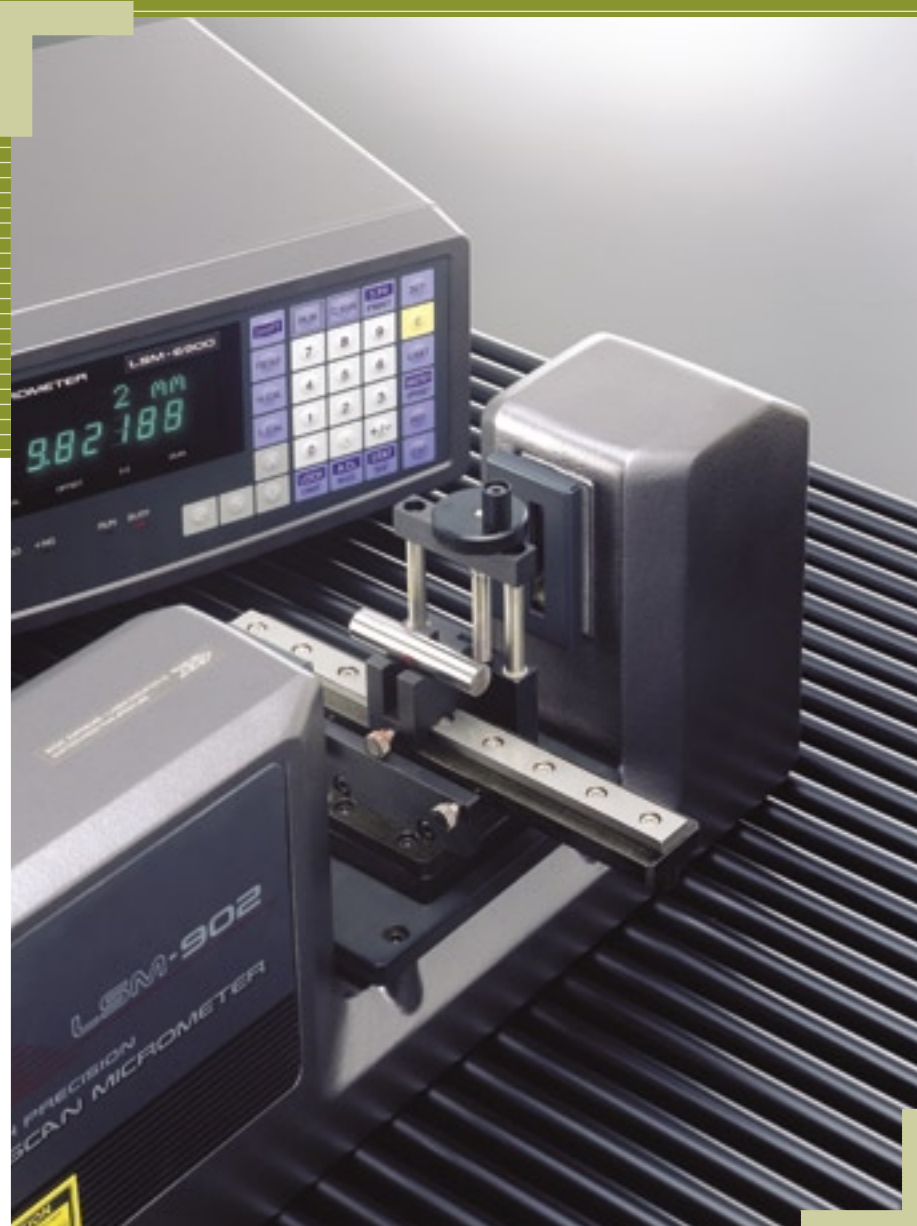


# LASER SCAN MICROMETER

Bulletin No. 1859-544



High speed scanning (3200 scans/sec) and high accuracy, non-contact measuring system



**Mitutoyo**

## Laser Scan Micrometers:

High speed scanning (3200 scans/sec) and high accuracy, non-contact measuring systems. The LSM features a very high scanning speed which enables inspection of small, high temperature or fragile workpieces even if they are in motion or vibrating.



### FEATURES

#### A variety of models seamlessly cover measurement ranges from .0002" (0.005mm) to 6.3" (160mm)

With a wide variety of models, LSM measurement can be utilized in diverse applications. The LSM-500S can measure ultra-fine wires as thin as .0002" (0.005mm) in diameter to a resolution of .000001" (0.00001mm), and the LSM-516S can measure cylindrical workpieces with a diameter as large as 6.3" (160mm). The LSM-9506 is a bench-top type model which has an integrated display section and measurement section, all in one unit.

#### Ultra-high speed 3200 scans/sec

The incorporation of a sixteen-face polygon mirror and a high-precision motor now makes high speed scanning of 3200 scans per second possible. This capability is ideal, for example, to take measurements on a production line that moves at high speed or to take measurements of workpieces that vibrate.

#### Certified accuracy over the entire measurement range

The specified high accuracy over the entire measurement range is certified by the "Traceability System to the International Standard", which Mitutoyo has established as a leading manufacturer of precision measurement tools and instruments.

#### Improved resistance to IP64-level environments

The measuring unit has been extensively improved to resist severe measurement environments. As a result, for example, it can also operate in a 113°F (45°C) environment. (IP64-level resistance is not guaranteed for the display unit and the LSM-9506.)

#### DIN-size compact panel-mounted display unit (LSM-5100, made-to-order model)

The LSM-5100 display unit is assembled in a compact DIN size, allowing it to be mounted in a panel. It is suitably sized for incorporation into a rack, etc., for use in production lines.

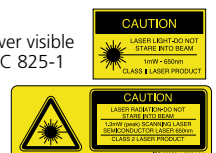
#### Standard I/O output, analog output and RS-232C output interfaces

The LSM-5100/6200/6900 has a standard I/O and analog output interfaces to connect it with an operation controller or PLC used in a production line. Also, every model has a standard RS-232C interface for connection to personal computers or printers.

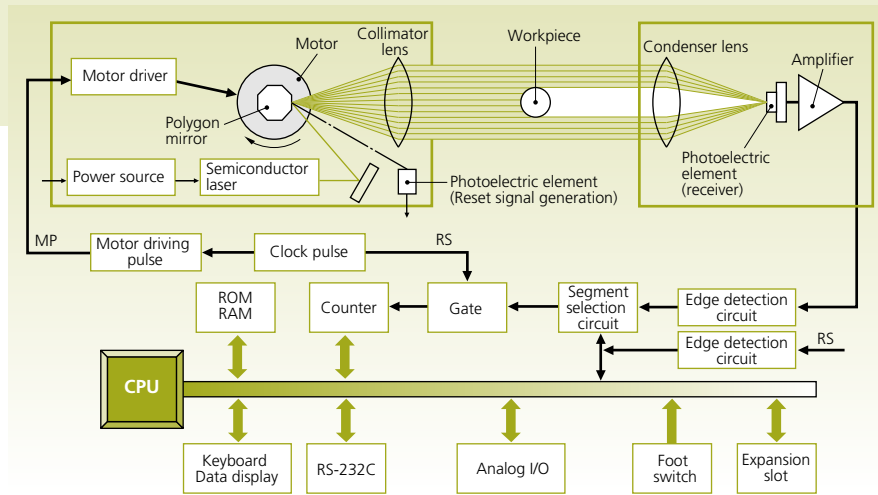
**Mitutoyo**

#### Laser safety precaution

Mitutoyo Laser Scan Micrometers use a low-power visible laser for measurement. The laser is a CLASS 2 IEC 825-1 device and a CLASS II 21 CDRH device. Warning and explanation labels, as shown right, are attached to the Laser Scan Micrometers as is appropriate.

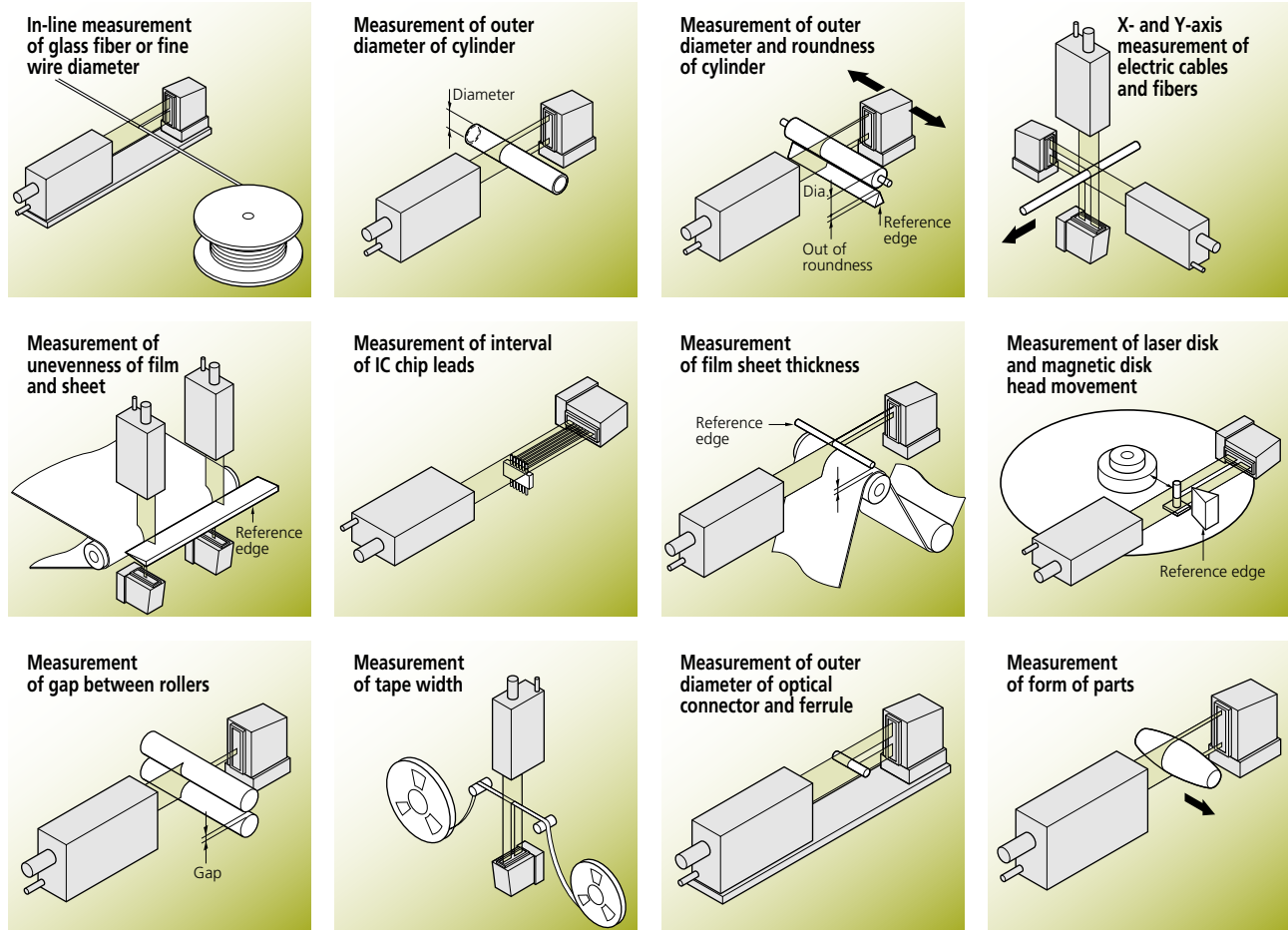


## PRINCIPLE



A laser beam emitted from the oscillator is directed at the polygon mirror which rotates at a high speed and is synchronized by clock pulses. The direction of the beam reflected by the mirror is changed via the collimator lens and aims straight at the workpiece. As the polygon mirror rotates, the horizontal laser beam travels across the receiver and, if it is not obstructed by a workpiece, reaches the receiver. The output voltage of the photoelectric element varies proportionally with the amount of light which reaches the photoelectric cell. The timed pulses generated during the beam obstruction by the workpiece represent the dimension of the workpiece.

## APPLICATIONS





# ALL MODELS OF LASER SCAN MICROMETER

## MEASURING UNITS

Appearance	Model	Laser Classification	Measuring range	Resolution (Selectable)	Refer to...
	LSM-902*	Visible (650nm), IEC Class 2/ FDA Class II	.0002" - .08" (0.1 - 25mm)	.000001" - .0005" (0.01μm - 10μm)	Page 6
	LSM-500S	Visible (650nm), IEC Class 2/ FDA Class II	.0002" - .08" (0.005 - 2mm)	.000001" - .0005" (0.01μm - 10μm)	Page 7
	LSM-501S	Visible (650nm), IEC Class 2/ FDA Class II	.002" - .4" (0.05 - 10mm) FDA Class II	.000001" - .0005" (0.01μm - 10μm)	Page 8
	LSM-503S	Visible (650nm), IEC Class 2/ FDA Class II	.012" - 1.18" (0.3 - 30mm)	.000001" - .005" (0.02μm - 100μm)	Page 9
	LSM-506S	Visible (650nm), IEC Class 2/ FDA Class II	.04" - 2.36" (1 - 60mm)	.000002" - .005" (0.05μm - 100μm)	Page 10
	LSM-512S	Visible (650nm), IEC Class 2/ FDA Class II	.04" - 4.72" (1 - 120mm)	.000005" - .005" (0.1μm - 100μm)	Page 11
	LSM-516S	Visible (650nm), IEC Class 2/ FDA Class II	.04" - 6.30" (1 - 160mm)	.000005" - .005" (0.1μm - 100μm)	Page 12
 With display unit	LSM-9506 Measuring unit - display unit one-piece structure for bench-top use	Visible (650nm), IEC Class 2/ FDA Class II	.02" - 2.36" (0.5 - 60mm)	.000002" - .005" (0.05μm - 100μm)	Pages 13

## DISPLAY UNITS

Appearance	Model	Type	Application	Interface units equipped	Refer to...
	LSM-6200 LSM-6900*	Multi-function type	Bench-top use	<ul style="list-style-type: none"> <li>• RS-232C</li> <li>• I/O</li> <li>• Analog output</li> </ul>	Pages 14
	LSM-5100** (made-to-order)	Compact type	Assembly/ bench-top use (DIN size)	<ul style="list-style-type: none"> <li>• RS-232C</li> <li>• I/O</li> <li>• Analog output</li> </ul>	Pages 15

\*LSM-902 and LSM-6900 are factory-set packages.

\*\*When connecting with the LSM-500S series, the scanning speed becomes 1600 scans/sec.

## OPTIONAL ACCESSORIES

Appearance	Order No.	Description	Application	Refer to...
	<b>02AGD110</b> <b>02AGD120</b> <b>02AGD180</b> <b>02AGD130</b> <b>02AGD140</b> <b>02AGD150</b> <b>02AGM300</b> <b>02AGD170</b>	Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set	LSM-500S LSM-501S LSM-902 LSM-503S LSM-506S LSM-512S LSM-516S LSM-9506	<b>Page 22</b>
	<b>02AGP150</b>	Dual-type add-on unit	LSM-6200	<b>Page 22</b>
	<b>02AGC840</b> <b>02AGC880</b> <b>02AGC910</b> <b>02AGC940</b>	Digimatic (SPC) codeout unit 2nd I/O & analog interface unit BCD interface unit GP-IB interface unit	LSM-6200/6900 LSM-6200/6900 LSM-6200/6900 LSM-6200/6900	<b>Pages 20 &amp; 21</b>
	<b>02AGN780A</b> <b>02AGN780B</b> <b>02AGN780C</b> <b>02AGN780D</b>	Extension signal cable 16' (5m) Extension signal cable 32' (10m) Extension signal cable 48' (15m) Extension signal cable 64' (20m)	Any model of LSM* Any model of LSM* Any model of LSM* Any model of LSM*	<b>Page 23</b>
	<b>02AGC150A</b> <b>02AGC150B</b> <b>02AGC150C</b>	Extension relay cable 3' (1m) Extension relay cable 9' (3m) Extension relay cable 16' (5m)	Any model of LSM** Any model of LSM** Any model of LSM**	<b>Page 23</b>
	<b>936937</b>	SPC cable 3' (1m)	LSM-6200/9506	<b>Page 23</b>
	<b>937179T</b>	Footswitch	LSM-6200/9506	<b>Page 23</b>
	<b>02AGD270</b> <b>02AGD400</b> <b>02AGD280</b> <b>02AGD490</b> <b>02AGD520</b> <b>02AGD370</b> <b>02AGD680</b> <b>02AGD440</b> <b>02AGD580</b> <b>02AGD450</b> <b>02AGD590</b>	Work stage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Center support Center support Adjustable V-block Adjustable V-block	LSM-501S/503S/902 LSM-501S LSM-902 LSM-503S LSM-506S LSM-9506 LSM-9506 LSM-501S/503S LSM-506S/9506 LSM-501S/503S LSM-506S/9506	<b>Page 26</b> <b>Pages 24 &amp; 25</b>
	<b>02AGD200</b> <b>02AGD210</b>	Wire guiding pulley Wire guiding pulley	LSM-500S LSM-501S	<b>Page 26</b>
	<b>02AGD220</b> <b>02AGD230</b> <b>02AGD240</b> <b>02AGD250</b> <b>02AGD260</b> <b>957608</b>	Air blow cover Air blow cover Air blow cover Air blow cover Air blow cover Air cleaner	LSM-500S LSM-501S LSM-503S LSM-506S LSM-512S Any model of LSM	<b>Page 23</b>
	<b>02AGD600B</b>	Thermal printer (120V AC)	Any model of LSM	<b>Page 23</b>

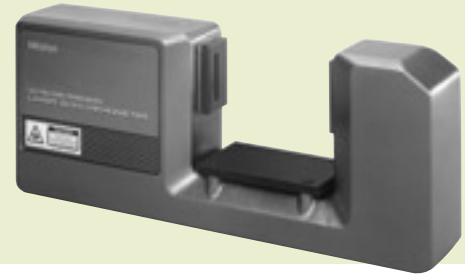
\* Except for LSM-902  
\*\* Except LSM-500S/902

MEASURING UNIT

# LSM-902

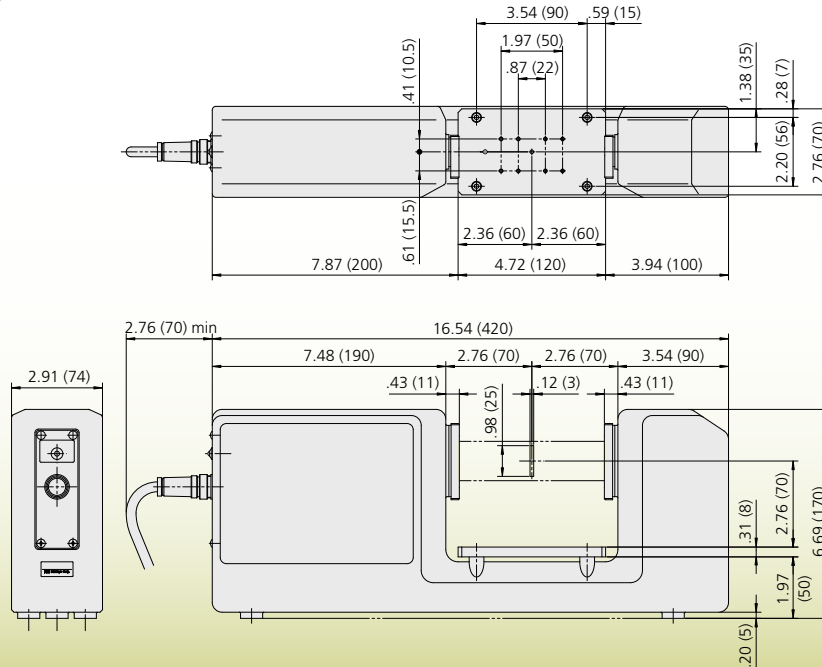
## Ultra-high Accuracy Measuring Unit

- Suitable for pin and plug gage measurements
- Wide measuring range of 0.04" to 01.0" (0.1mm to 25mm)
- Provides ultra-high accuracy with a linearity of ±0.5µm over the entire measurement range and ±(0.3+0.1ΔD)µm in the narrow range
- Ultra-high repeatability of ±0.05µm



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model (set model No.)	LSM-902 (LSM-902 and LSM-6900)
Order No.	120V AC 544-496A
Type	inch/mm
Acceptable standard of laser	FDA
Measuring range	.004" - 1.0" (0.1 - 25mm)
Resolution (selectable)	.000001" - .0005" (0.00001 - 0.01mm)
Repeatability*1	±1.9µinch (±0.05µm)
Linearity at Entire range	±20µinch (±0.5µm)
68°F (20°C)*2 Narrow range	±(0.3+0.1ΔD)µm *5
Positional error*3	±20µinch (±0.5µm)
Measuring region*4	.12" x .98" (3x25mm)
Number of scans	800 scans/s
Laser wavelength	650nm, Visible*6
Laser scanning speed	2204"/s (56m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Mass	Measuring unit: 13.2 lbs. (6.0kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: Determined by the value for ±2σ at the measurement of ø1.0" (ø25mm) workpiece with 1.28sec. interval (1024-time average).

\*2: At the center of the measuring region.

\*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.

\*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".

\*5: ΔD=Difference in diameter between the master gage and workpiece.

\*6: FDA Class II/IEC Class 2 semiconductor laser for scanning. (Maximum power: 1.5mW)

### OPTIONAL ACCESSORIES

**02AGD180** Calibration gage set  
ø1mm, ø25mm



**02AGD270** Basic Workstage

### Factory-set package



**LSM-902**  
(measuring unit)

(LSM-902 and LSM-6900 are Factory-set package)

MEASURING UNIT

# LSM-500S

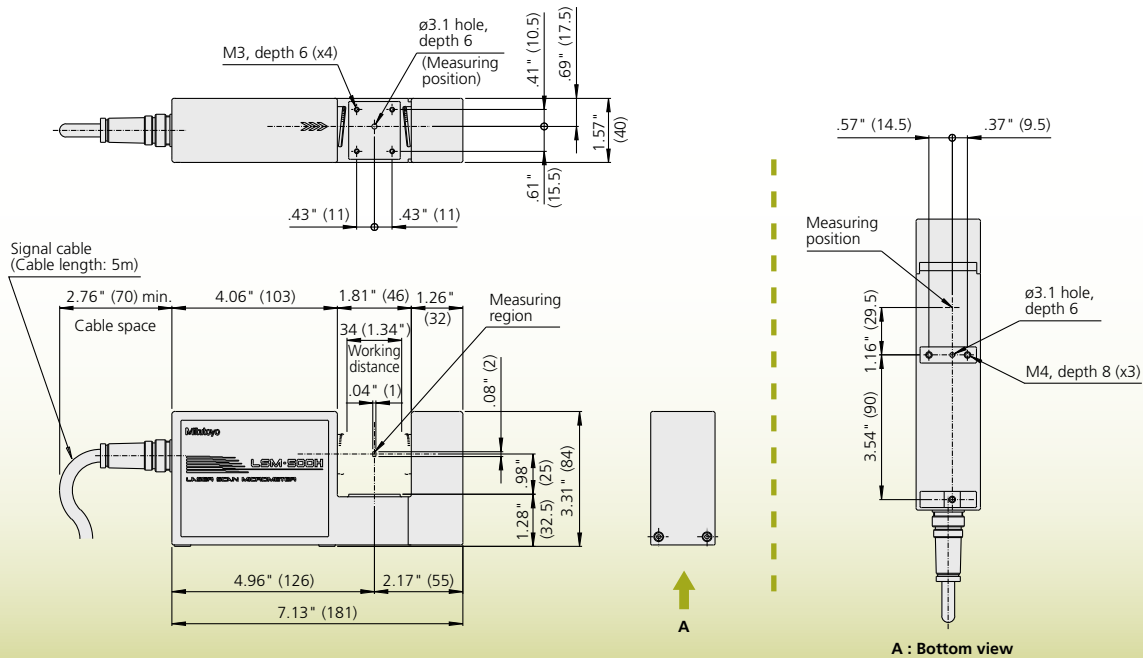
## Ultra-Fine Wire Measuring Unit

- Permits measurements starting from  $\varnothing 5\mu\text{m}$
- Provides ultra-high accuracy with a linearity of  $\pm 0.3\mu\text{m}$  over the entire measurement range ( $5\mu\text{m}$  to  $2\text{mm}$ )
- Ultra-high repeatability of  $\pm 0.03\mu\text{m}$



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-500S
Order No.	544-532
Acceptable standard of laser	FDA
Measuring range*1	.0002" - .08" (0.005 - 2mm)
Resolution (selectable)	.000001" - .0005" (0.00001 - 0.01mm)
Repeatability*2	$\pm 1.2\mu\text{inch}$ ( $\pm 0.03\mu\text{m}$ )
Linearity at 68°F (20°C)*3	$\pm 12\mu\text{inch}$ ( $\pm 0.3\mu\text{m}$ )
Positional error*4	$\pm 16\mu\text{inch}$ ( $\pm 0.4\mu\text{m}$ )
Measuring region*5	.04" x .08" (1x2mm)
Number of scans	3200 scans/s
Laser wavelength	650nm, Visible*6
Laser scanning speed	2992"/s (76m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*7
Mass	Measuring unit: 2.2 lbs. (1.0kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: If a workpiece is transparent or if the dual-type add-on unit that is an optional accessory for the LSM-6200 display unit is used, measurement range will be set to between .002" (0.05mm) to .08" (2mm). In addition, if the edge measurement is selected for 1 to 255 edges or if the automatic workpiece detecting function is on, measuring range will be set to between .004" (0.1mm) to .08" (2mm).  
 \*2: Determined by the value for  $\pm 2\sigma$  at the measurement of  $\varnothing 2\text{mm}$  workpiece with 0.32sec. interval (1024-time average).  
 \*3: At the center of the measuring region.  
 \*4: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*5: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
 \*6: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
 \*7: 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

**02AGD110** Calibration gage set  $\varnothing 0.1\text{mm}$ ,  $\varnothing 2.0\text{mm}$



**02AGD200** Wire guiding pulley

**02AGD220** Air blow cover

**957608** Air cleaner for air blow cover

**02AGN780A** Extension signal cable 16' (5m)

**02AGN780B** Extension signal cable 32' (10m)

**02AGN780C** Extension signal cable 48' (15m)

MEASURING UNIT

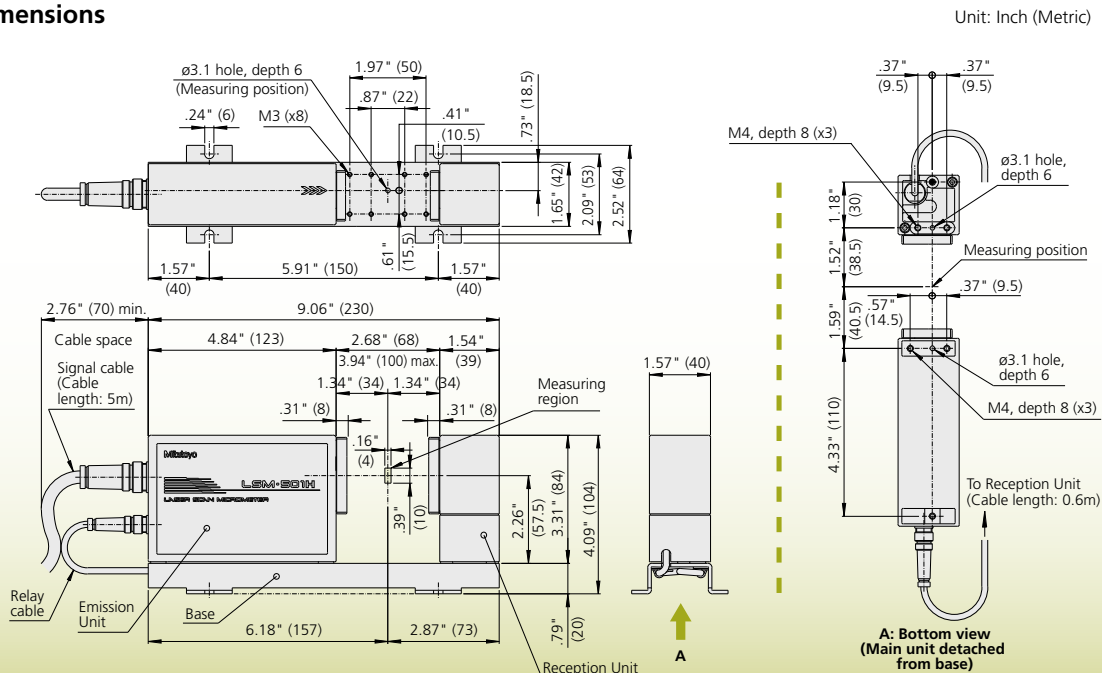
# LSM-501S

## Fine Wire Measuring Unit

- Provides ultra-high accuracy with a linearity of  $\pm 0.5\mu\text{m}$  over the entire measurement range .002" to .40" (0.05mm to 10mm) and  $\pm(0.3+0.1\Delta)\mu\text{m}$  in the narrow range
- Ultra-high repeatability of  $\pm 0.04\mu\text{m}$



### Dimensions



### SPECIFICATIONS

Model	LSM-501S
Order No.	544-534
Acceptable standard of laser	FDA
Measuring range	.002" - .4" (0.05 - 10mm)
Resolution (selectable)	.000001" - .0005" (0.00001 - 0.01mm)
Repeatability*1	$\pm 1.5\mu\text{inch}$ ( $\pm 0.04\mu\text{m}$ )
Linearity at Entire range	$\pm 20\mu\text{inch}$ ( $\pm 0.5\mu\text{m}$ )
68°F (20°C)*2 Narrow range	$\pm(0.3+0.1\Delta)\mu\text{m}$
Positional error*3	$\pm 20\mu\text{inch}$ ( $\pm 0.5\mu\text{m}$ )
Measuring region*4	.08" x .4" at $\phi 0.002$ " - .004" (2 x 10mm at $\phi 0.05$ - 0.1mm) .16" x .4" at $\phi 0.004$ " - .4" (4 x 10mm at $\phi 0.1$ - 10mm)
Number of scans	3200 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	4448"/s (113m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*6
Mass	Emission unit: 1.54 lbs. (0.7kg), Reception unit: .88 lbs. (0.4kg), Base: .66 lbs. (0.3kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: Determined by the value for  $\pm 2\sigma$  at the measurement of  $\phi .40$ " ( $\phi 10\text{mm}$ ) workpiece with 0.32sec. interval (512-time average).  
\*2: At the center of the measuring region.  
\*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
\*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
\*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
\*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

**02AGD120** Calibration gage set  
 $\phi 0.1\text{mm}$ ,  $\phi 10\text{mm}$



- 02AGD210** Wire guiding pulley
- 02AGD270** Basic workstage
- 02AGD400** Adjustable workstage
- 02AGD440** Center support\*
- 02AGD450** Adjustable V-block\*
- 02AGD230** Air blow cover
- 957608** Air cleaner for air blow cover
- 02AGC150A** Extension relay cable 3' (1m)
- 02AGN780A** Extension signal cable 16' (5m)
- 02AGN780B** Extension signal cable 32' (10m)
- 02AGN780C** Extension signal cable 48' (15m)

\*Use with an adjustable workstage.



MEASURING UNIT

# LSM-503S

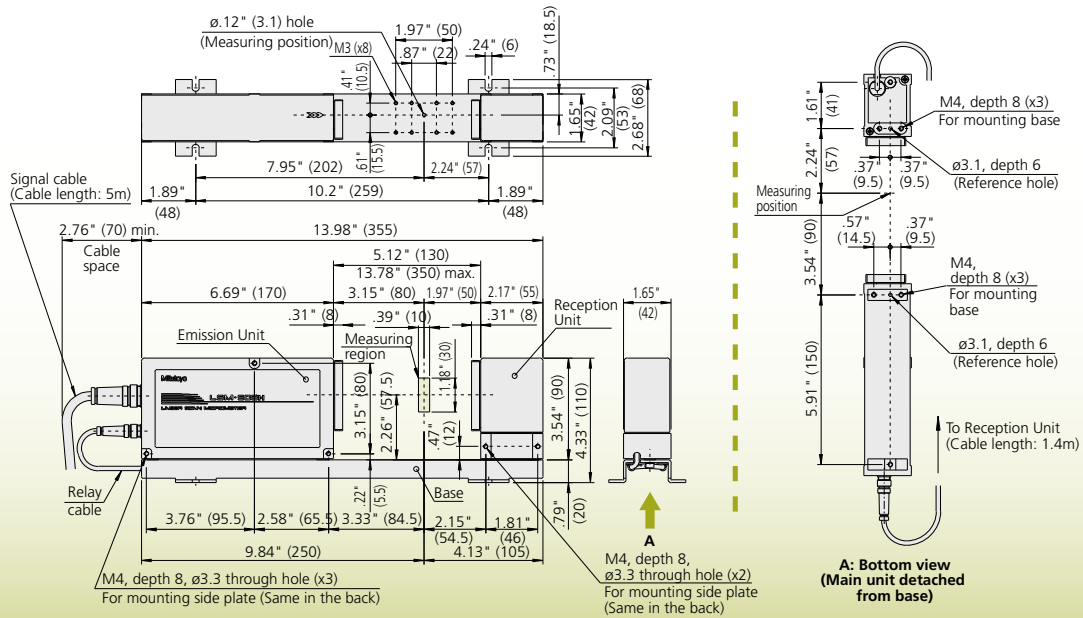
## Standard Measuring Unit

- General-purpose type with a measurement range of .01" to 1.18" (0.3mm to 30mm)
- Provides high accuracy with a linearity of  $\pm 1.0\mu\text{m}$  over the entire measurement range and  $\pm(0.6+0.1\Delta D)\mu\text{m}$  in the narrow range
- Excellent repeatability of  $\pm 0.1\mu\text{m}$



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-503S
Order No.	544-536
Acceptable standard of laser	FDA
Measuring range	.012" - 1.18" (0.3 - 30mm)
Resolution (selectable)	.000001" - .005" (0.00002 - 0.1mm)
Repeatability*1	$\pm 3.9\mu\text{inch}$ ( $\pm 0.1\mu\text{m}$ )
Linearity at Entire range	$\pm 40\mu\text{inch}$ ( $\pm 1.0\mu\text{m}$ )
68°F (20°C)*2 Narrow range	$\pm(0.6+0.1\Delta D)\mu\text{m}$
Positional error*3	$\pm 60\mu\text{inch}$ ( $\pm 1.5\mu\text{m}$ )
Measuring region*4	.4" x 1.18" (10 x 30mm)
Number of scans	3200 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	8897"/s (226m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*6
Mass	Emission unit: 2.42 lbs. (1.1kg), Reception unit: 1.32lbs. (0.6kg), Base: 1.1 lbs. (0.5kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: Determined by the value for  $\pm 2$  at the measurement of  $\phi 1.18"$  ( $\phi 30\text{mm}$ ) workpiece with 0.32sec. interval (1024-time average).  
 \*2: At the center of the measuring region.  
 \*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
 \*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
 \*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

**02AGD130** Calibration gage set  
 $\phi 1\text{mm}$ ,  $\phi 30\text{mm}$



- 02AGD270** Basic workstage
- 02AGD490** Adjustable workstage
- 02AGD440** Center support\*
- 02AGD450** Adjustable V-block\*
- 02AGD240** Air blow cover
- 957608** Air cleaner for air blow cover
- 02AGC150A** Extension relay cable 3' (1m)
- 02AGC150B** Extension relay cable 9' (3m)
- 02AGC150C** Extension relay cable 16' (5m)
- 02AGN780A** Extension signal cable 16' (5m)
- 02AGN780B** Extension signal cable 32' (10m)
- 02AGN780C** Extension signal cable 48' (15m)
- 02AGN780D** Extension signal cable 64' (20m)

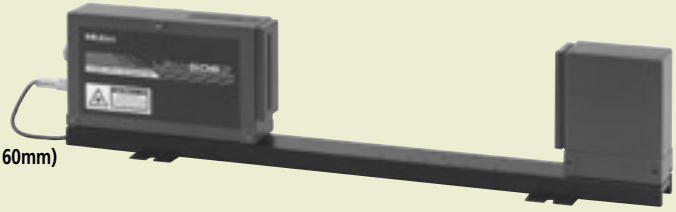
\*Use with an adjustable workstage.

MEASURING UNIT

# LSM-506S

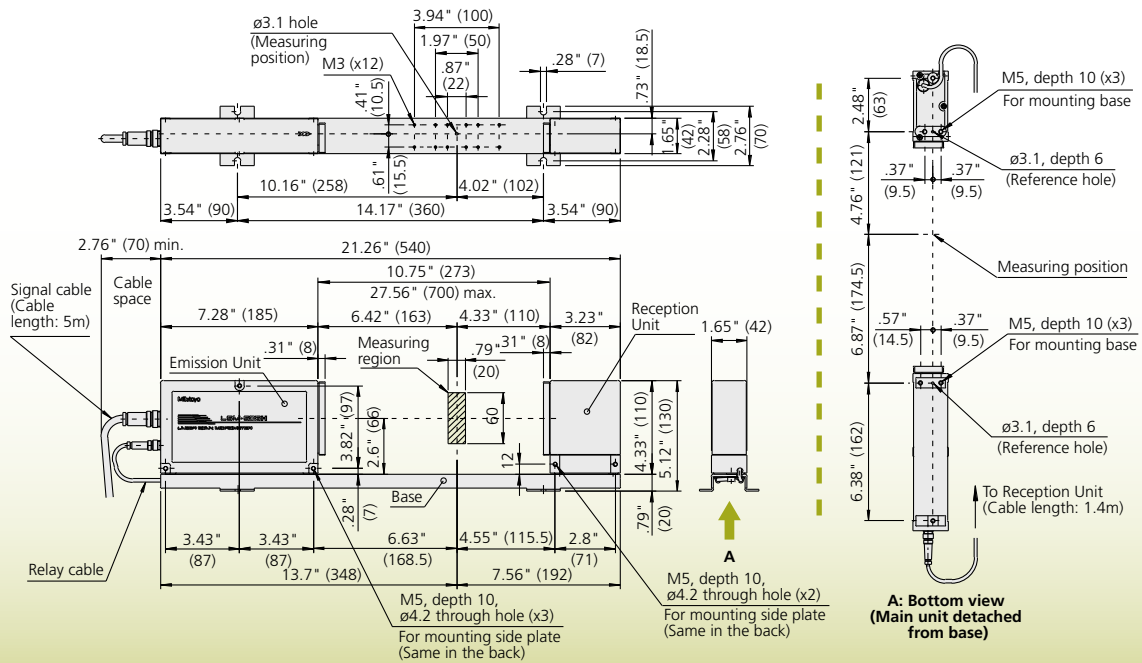
## Wide Range Measuring Unit

- General-purpose type with a measurement range of .04" to 2.36" (1mm to 60mm)
- Provides high accuracy with a linearity of  $\pm 3\mu\text{m}$  over the entire measurement range and  $\pm(1.5+0.5\Delta D)\mu\text{m}$  in the narrow range
- Excellent repeatability of  $\pm 0.36\mu\text{m}$



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-506S
Order No.	544-538
Acceptable standard of laser	FDA
Measuring range	.04" - 2.36" (1 - 60mm)
Resolution (selectable)	.000002" - .005" (0.00005 - 0.1mm)
Repeatability*1	$\pm 14\mu\text{inch}$ ( $\pm 0.36\mu\text{m}$ )
Linearity at Entire range	$\pm 120\mu\text{inch}$ ( $\pm 3\mu\text{m}$ )
68°F (20°C)*2 Narrow range	$\pm(1.5+0.5\Delta D)\mu\text{m}$
Positional error*3	$\pm 160\mu\text{inch}$ ( $\pm 4\mu\text{m}$ )
Measuring region*4	.8" x 2.36" (20 x 60mm)
Number of scans	3200 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	17795"/s (452m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*6
Mass	Emission unit: 3.08 lbs. (1.4kg), Reception unit: 1.76 lbs. (0.8kg), Base: 1.76 lbs. (0.8kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: Determined by the value for  $\pm 2\sigma$  at the measurement of  $\phi 2.36"$  ( $\phi 60\text{mm}$ ) workpiece with 0.32sec. interval (1024-time average).  
 \*2: At the center of the measuring region.  
 \*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
 \*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
 \*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

**02AGD140** Calibration gage set  
 $\phi 1\text{mm}$ ,  $\phi 60\text{mm}$



**02AGD520** Adjustable workstage

**02AGD580** Center support\*

**02AGD590** Adjustable V-block\*

**02AGD250** Air blow cover

**957608** Air cleaner for air blow cover

**02AGC150A** Extension relay cable 3' (1m)

**02AGC150B** Extension relay cable 9' (3m)

**02AGC150C** Extension relay cable 16' (5m)

**02AGN780A** Extension signal cable 16' (5m)

**02AGN780B** Extension signal cable 32' (10m)

**02AGN780C** Extension signal cable 48' (15m)

**02AGN780D** Extension signal cable 64' (20m)

\*Use with an adjustable workstage.

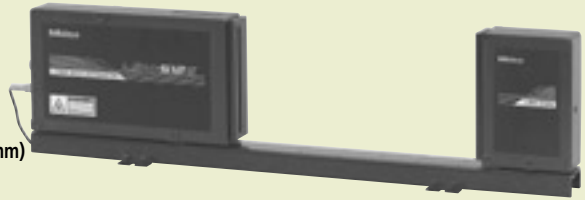


MEASURING UNIT

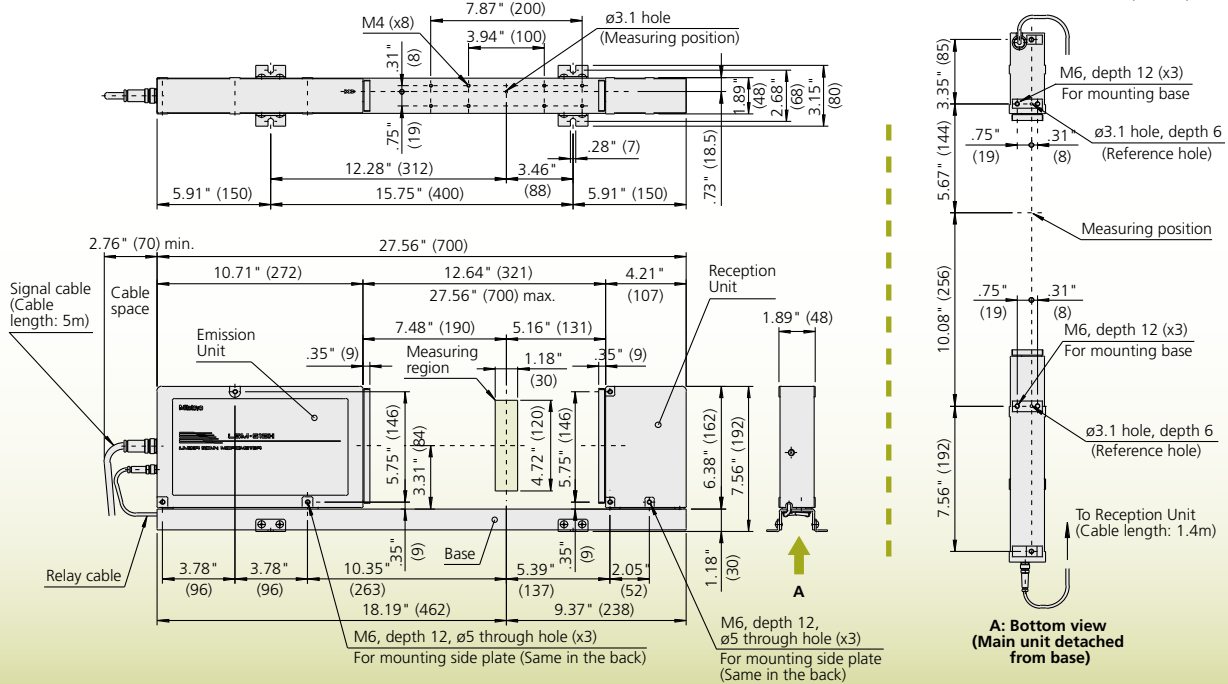
# LSM-512S

## Ultra Wide Range Measuring Unit

- General-purpose type with a wide measurement range of .04" to 4.72" (1mm to 120mm)
- Provides high accuracy with a linearity of  $\pm 6\mu\text{m}$  over the entire measurement range and  $\pm(4.0+0.5\Delta D)\mu\text{m}$  in the narrow range
- Excellent repeatability of  $\pm 0.8\mu\text{m}$



### Dimensions



### SPECIFICATIONS

Model	LSM-512S
Order No.	544-540
Acceptable standard of laser	FDA
Measuring range	.04" - 4.72" (1 - 120mm)
Resolution (selectable)	.000005" - .005" (0.0001 - 0.1mm)
Repeatability*1	$\pm 32\mu\text{inch}$ ( $\pm 0.8\mu\text{m}$ )
Linearity at 68°F (20°C)*2	Entire range: $\pm 240\mu\text{inch}$ ( $\pm 6\mu\text{m}$ ) Narrow range: $\pm(4.0+0.5\Delta D)\mu\text{m}$
Positional error*3	$\pm 320\mu\text{inch}$ ( $\pm 8\mu\text{m}$ )
Measuring region*4	1.2" x 4.72" at $\phi .04$ " - 4.72" (30 x 120mm at $\phi 1$ - 120mm)
Number of scans	3200 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	35590"/s (904m/s)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*6
Mass	Emission unit: 6.6 lbs. (3.0kg), Reception unit: 2.64 lbs. (1.2kg), Base: 3.96 lbs. (1.8kg), Signal cable: 1.1 lbs. (0.5kg)

\*1: Determined by the value for  $\pm 2\sigma$  at the measurement of  $\phi 4.72$ " ( $\phi 120$ mm) workpiece with 0.32sec. interval (1024-time average).  
 \*2: At the center of the measuring region.  
 \*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
 \*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
 \*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

**02AGD150** Calibration gage set  
 $\phi 20$ mm,  $\phi 120$ mm



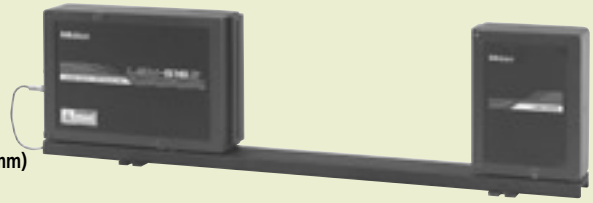
- 02AGD260** Air blow cover
- 957608** Air cleaner for air blow cover
- 02AGC150A** Extension relay cable 3' (1m)
- 02AGC150B** Extension relay cable 9' (3m)
- 02AGC150C** Extension relay cable 16' (5m)
- 02AGN780A** Extension signal cable 16' (5m)
- 02AGN780B** Extension signal cable 32' (10m)
- 02AGN780C** Extension signal cable 48' (15m)
- 02AGN780D** Extension signal cable 64' (20m)

MEASURING UNIT

# LSM-516S

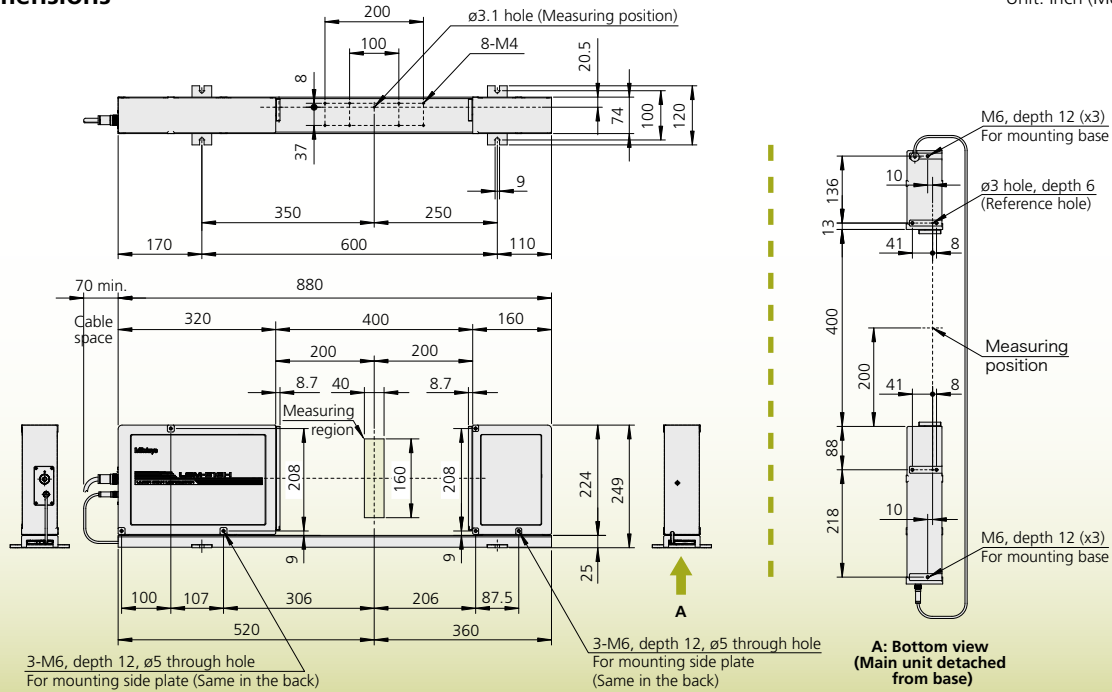
## Ultra Wide Range Measuring Unit

- General-purpose type with a wide measurement range of .04" to 6.30" (1mm to 160mm)
- Provides high accuracy with a linearity of  $\pm 7\mu\text{m}$  over the entire measurement range and  $\pm(4.0+2.0\Delta D)\mu\text{m}$  in the narrow range
- Excellent repeatability of  $\pm 1.4\mu\text{m}$



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-516S	
Order No.	544-542	
Acceptable standard of laser	FDA	
Measuring range	.04" - 6.30" (1 - 160mm)	
Resolution (selectable)	.000005" - .005" (0.0001 - 0.1mm)	
Repeatability*1	$\pm 55\mu\text{inch}$ ( $\pm 1.4\mu\text{m}$ )	
Linearity at 68°F (20°C)*2	Entire range	$\pm 276\mu\text{inch}$ ( $\pm 7\mu\text{m}$ )
	Narrow range	$\pm(4.0+2.0\Delta D)\mu\text{m}$
Positional error*3	$\pm 320\mu\text{inch}$ ( $\pm 8\mu\text{m}$ )	
Measuring region*4	1.57" x 6.30" at $\phi 0.04"$ - 6.30" (40 x 160mm at $\phi 1$ - 160mm)	
Number of scans	3200 scans/s	
Laser wavelength	650nm, Visible*5	
Laser scanning speed	23740"/s (603m/s)	
Operating temperature	32°F - 104°F (0°C - 40°C)	
Operating humidity	35 - 85% RH (with no condensation)	
Water/Dust protection grade	Conforming to IP64*6	
Mass	Emission unit: 6.6 lbs. (3.0kg), Reception unit: 2.64 lbs. (1.2kg), Base: 3.96 lbs. (1.8kg), Signal cable: 1.1 lbs. (0.5kg)	

\*1: Determined by the value for  $\pm 2\sigma$  at the measurement of  $\phi 6.30"$  ( $\phi 160\text{mm}$ ) workpiece with 0.32sec. interval (1024-time average).  
 \*2: At the center of the measuring region.  
 \*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".  
 \*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW).  
 \*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

**02AGM300** Calibration gage set  
 $\phi 20\text{mm}$ ,  $\phi 160\text{mm}$



- 02AGC150A** Extension relay cable 3' (1m)
- 02AGC150B** Extension relay cable 9' (3m)
- 02AGC150C** Extension relay cable 16' (5m)
- 02AGN780A** Extension signal cable 16' (5m)
- 02AGN780B** Extension signal cable 32' (10m)
- 02AGN780C** Extension signal cable 48' (15m)
- 02AGN780D** Extension signal cable 64' (20m)



DISPLAY UNIT

# LSM-9506

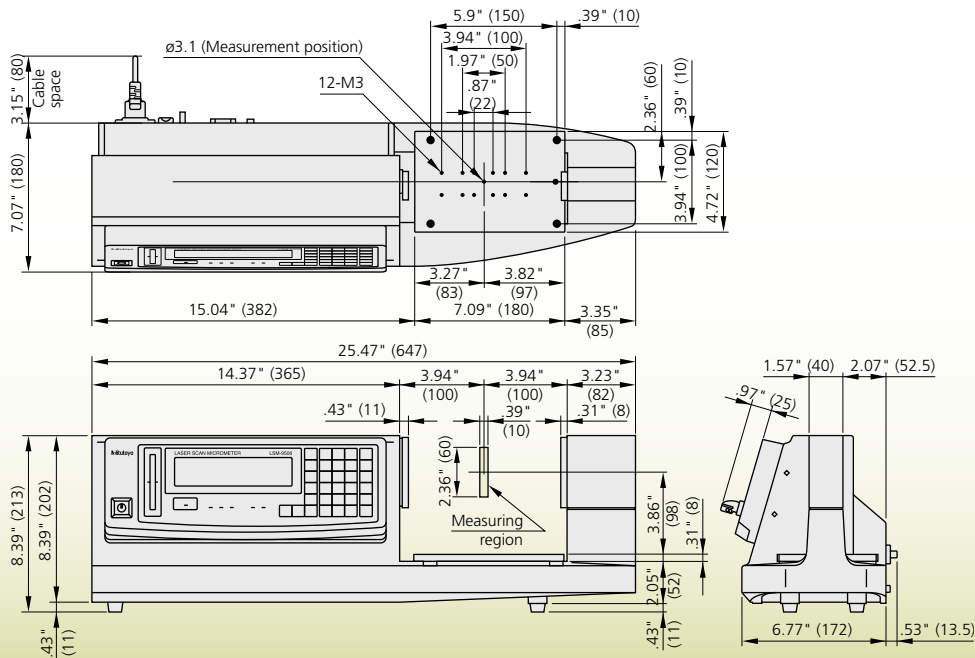
## Desktop Type with Display Unit

- With a design that integrates the display section and measuring section into one unit, it is best suited for bench-top measurement in an inspection room.
- A statistical calculation function is provided.
- Standard RS-232C interface and SPC output interface are provided as standard.



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-9506
Order No.	120V AC 544-116-1A
Type	inch/mm
Measuring range	.02" - 2.36" (0.5 - 60mm)
Resolution (selectable)	.000002" - .005" (0.000005 - 0.1mm)
Repeatability*1	±30µinch (±0.6µm)
Linearity at 68°F (20°C)*2	±10µinch (±2.5µm)
Positional error*3	In the optical axis direction: ±10µinch (±2.5µm) In the scanning direction: ±(.00008+L/10000)" (±(2.0+L/10µm))
Measuring region*4	.4" x 2.36" (10 x 60mm)
Number of scans	1600 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	8900"/s (226m/s)
Power supply	100 - 240V AC ±10%, 50/60Hz, 40VA
Data output	Via RS-232C interface, SPC (Digimatic) output port
Functions	(See page 15.)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Mass	28.6 lbs. (13kg)

\*1: Determined by the value for  $\pm 2\sigma$  at the measurement interval of 0.32 sec.

\*2: At the center of the measuring region.

\*3: An error due to workpiece shift either in the optical axis direction or in the scanning direction. L= Distance between the center of workpiece and the center of optical axis.

\*4: The area given by "measuring range on the optical axis" x "measuring range in the scanning direction".

\*5: FDA Class II 544-116-1A (Maximum power: 1.0mW).

### OPTIONAL ACCESSORIES

**02AGD140** Calibration gage set  
ø1mm, ø60mm



**02AGD680** Adjustable workstage

**02AGD580** Center support\*

**02AGD590** Adjustable V-block\*

**936937** SPC output cable 3' (1m)

**937179T** Footswitch

\*Use with an Adjustable workstage.

DISPLAY UNIT

# LSM-6200, LSM-6900

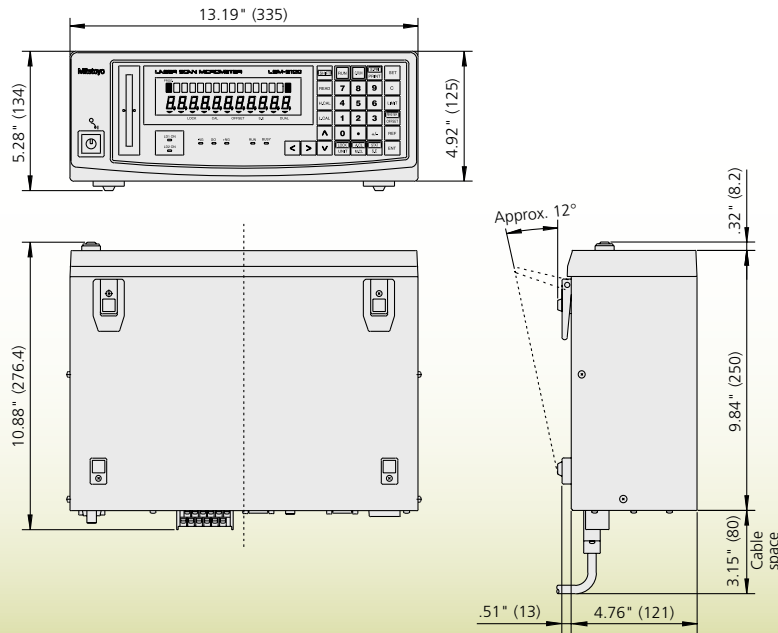
## Multi-function Type Display Unit



- With a dual-display design setup values can be continuously monitored. Also, two measurement value items can be displayed on the sub-display with the simultaneous measurement function.
- Either the segment measurement (7 segments max.) or edge measurement (1 to 255 edges) can be selected.
- The RS-232C interface and the I/O and analog interface are provided as standard.
- A statistical calculation function and abnormal data eliminating function are provided.

### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-6900 (for LSM-902 measuring unit)	LSM-6200
Order No.	544-496A (Set No.)	544-072A
Type	inch/mm	
Display	16-digit fluorescent tube (for measurement) & 11-digit fluorescent tube (sub display)	
Segment designation	Seg.1 to Seg.7 (Seg.1 - Seg.3 for transparent objects)	
Edge designation	1 to 255 edges can be detected*1	
Averaging times*2	Arithmetical average: per 1 to 2048, moving average: per 32 to 2048	
GO/±NG judgment	Nominal value ±tolerance setting, upper & lower limits setting, multi-limit setting	
Measurement mode	Waiting, single measurement, continuous measurement	
Statistical calculation	Maximum measurement (MAX), minimum measurement (MIN), mean, range (MAX-MIN), standard deviation (σ)	
Power supply	100 - 240V AC ±10%, 50/60Hz, 40VA	
Data output (as standard)	Via RS-232C interface, I/O & analog interface	
Functions	(See page 16 and 17.)	
Operating temperature	32°F - 104°F (0°C - 40°C)	
Operating humidity	35 - 85% RH (with no condensation)	
Mass	11 lbs. (5kg)	

\*1: For Australia

\*1: With the LSM-500S the measuring range will be set to between .004" to .08" (0.1 to 2mm) if the edge measurement is selected for 1 to 255 edges or if the automatic workpiece detecting function is on.

\*2: With the LSM-500S the number of scans will be limited to between 16 and 2048 for both the arithmetical and moving averages if the ultra-fine wire measurement function is on.

DISPLAY UNIT

# LSM-5100 made-to-order

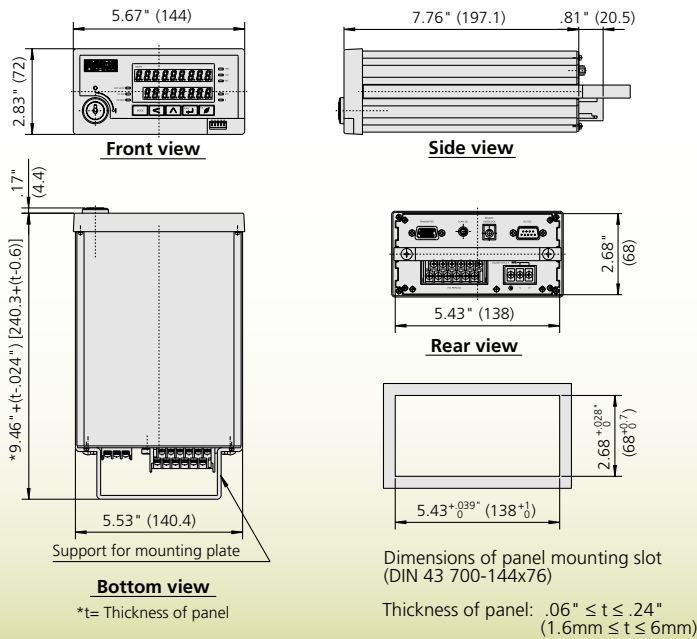
## Compact (Panel-mount) Type Display Unit

- Panel-mount type (with dimensions conforming to DIN standards) allows easy system integration.
- Capable of calculating mean, maximum, minimum, and range (maximum - minimum).
- Either the segment measurement (7 segments max.) or edge measurement (1 to 255 edges) can be selected.
- The RS-232C interface and the I/O and analog interface are provided as standard.
- The arithmetical average or moving average can be selected.
- GO/±NG judgment function.



### Dimensions

Unit: Inch (Metric)



### SPECIFICATIONS

Model	LSM-5100
Order No.	544-040
Type	inch/mm
Display	9-digit LED (for measurement) & 8-digit LED (sub display)
Segment designation	Seg.1 to Seg.7 (Seg.1 - Seg.3 for transparent objects)
Edge designation	1 to 255 edges can be detected*1
Averaging times*2	Arithmetical average: per 1 to 2048, moving average: per 32 to 2048
GO/±NG judgment	Nominal value ±tolerance setting, upper & lower limits setting
Measurement mode	Waiting, single measurement, continuous measurement
Statistical calculation	Available when connecting an external PC via the RS-232C interface
Power supply	+24V DC ±10%, 1A
Data output	Via RS-232C interface, I/O & analog interface
Functions	(See page 16 and 17.)
Operating temperature	32°F - 104°F (0°C - 40°C)
Operating humidity	35 - 85% RH (with no condensation)
Mass	3.08 lbs. (1.4kg)

\*1: With the LSM-500S the measuring range will be set to between .004" to .08" (0.1 to 2mm) if the edge measurement is selected for 1 to 255 edges or if the automatic workpiece detecting function is on.

\*2: With the LSM-500S the number of scans will be limited to between 16 and 2048 for both the arithmetical and moving averages if the ultra-fine wire measurement function is on.

\*Note: LSM-5100 display unit requires a factory adjusted LSM-500S measuring unit (made-to-order).  
When connecting with the factory adjusted LSM-500S measuring unit, the scanning speed becomes 1600 scans/sec.  
LSM-5100 display unit is not available with LSM-902.

# Display Unit

## LSM-5100/6200/6900/9506 Functions

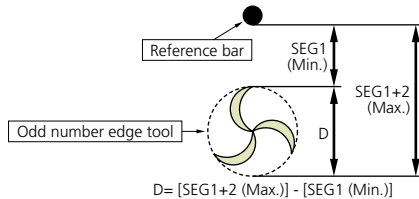
### Measuring Condition Memory

The measuring conditions can be registered as a program and saved (LSM-6200: 100 programs, LSM-6900: 10 programs, LSM-5100: 1 program). These programs can be recalled with a single operation.

### Drill/Endmill (odd number edge) outer-diameter measurement\*

\*Only for LSM-6200

The outer-diameter of drill/endmill (odd number edge) can be measured by using the max/min value function.



### Automatic Workpiece Detection

This function automatically starts measurement when a workpiece advances into the specified measuring area.

### Preset/Offset

Sets the current displayed measurement value to zero or a specified numeric value. This is useful, for example, if a difference in the diameters of a reference gage and a workpiece is to be obtained, or if a dimension of a workpiece that exceeds the measurement range of the LSM is to be measured.

### Mastering

For continuous processing of high-precision workpieces, fine-adjusting the preset or offset value is called "mastering". By specifying a mastering value the total correction amount will be (zero-set/offset value) + (±mastering value). If a positive mastering value is specified, the display value from a workpiece diameter measurement will be greater than the real one; if a negative value is specified, the displayed value will be smaller than the real one.

### Sample Measurement

On a sample measurement the number of measurements will be defined (in a range of 2 to 999) in advance. From this sample measurement various calculation results (mean, maximum, minimum, and range) can be derived. These measurements can be used for runout measurements of a revolving workpiece and simplified cylindricity measurements.

### Arithmetical Average/Moving Average

Arithmetical/moving average modes are provided to obtain the average of measurement values. On this type of LSM either of them can be specified before starting measurement. In the arithmetical average mode, the number of scans over which to take an averaging can be set at one of twelve steps between 1 (0.63 ms) and 2048 (1.28 sec). In the moving average mode the number of scans can be set at one of seven steps between 32 (0.02 sec) and 2048 (1.28 sec), and the measurement value will be updated every sixteen scans on and after the second measurement, irrespective of the specified number of scans for averaging. The latter mode is suitable for judging the trend in the diameters or widths of a seamless workpiece such as a wire or tape from a measurement that requires a long period.

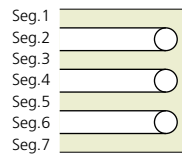
### External Trigger Signal Input\*

\*Not available for LSM-5100

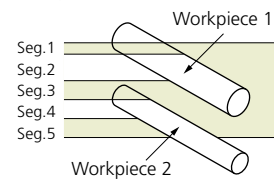
By inputting a contact signal through the footswitch connector at the rear panel of the LSM-6200/6900/9506, the measurement can be triggered.

### Segment Specification

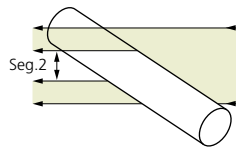
The following conventions are used to set a maximum of seven measuring sections. However, if the transparent object measuring mode is set, no more than three segments can be set at one time.



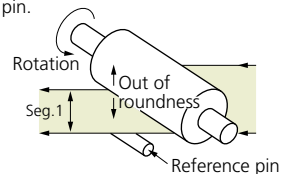
- Measurement of space between parallel pins (pitch measurement)  
Inner section: Use Seg.3.  
Outer section: Use Seg.2, Seg.3, and Seg.4 at one time.



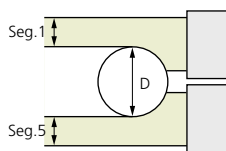
- If the outside diameter of a wire or cylindrical workpiece is measured, use Seg.2.



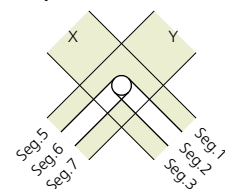
- If the runout of a revolving workpiece is measured, use Seg.1 in combination with the reference pin.



- If the outside diameter of a large workpiece is measured through dual-unit measurement, use Seg.1 and Seg.5 (only with LSM-6200).

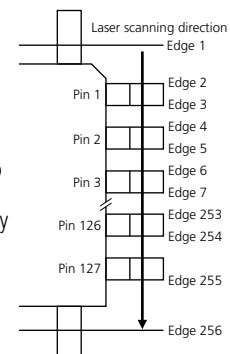


- If the dimensions in both X and Y directions min. distance of X/Y scanning section: .39" (10mm) are measured through dual-unit measurement, use Seg.2 and Seg.6 (only with LSM-6200).



### Automatic Measurement with Edge Specification

By specifying two separate points (edges) which exist within the measuring range on a workpiece, it is possible to display the distance between these two points. In this case, a maximum of 127 highlighted sections (edge to edge spaces) and 127 shaded sections (widths of workpiece projections) can be simultaneously designated as the object of measurement. This is useful for measuring such things as IC chip leads or connector pins that are arranged at even intervals. This function cannot be applied to transparent objects.





## Abnormal Data Elimination

If a piece of data significantly exceeds the tolerance limit because the workpiece or measuring unit is contaminated by a water droplet, oil droplet, or dust, the piece of data will be automatically removed by this function.

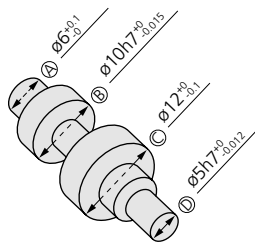
## Data Output Interval Setting

By setting an interval (between 1 to 999 seconds) to continuous measurement in advance, data output will take place at each specified period of time.

## Statistical Calculation

With this specification multiple measurements are taken from the same kind of workpieces, the statistical values are calculated from the measurement result, and quality evaluation is executed for each lot.

- Example of measuring a stepped cylinder with the use of statistical calculation function.



Measuring contents: Measure the dimensions numbered (A) to (D), perform tolerance judgment, and statistically process the resulting data for every ten samples defined as one lot.

P:0 +NG	6.1700
P:0 -NG	5.7340
STAT. DATA	
PROGRAM NO. = 0	(A)
N	10
$\bar{X}$	6.0045
MAX	6.0155
MIN	5.9970
R	0.0185
S.D	0.00600
STAT. DATA	
PROGRAM NO. = 1	(B)
N	10
$\bar{X}$	9.9890
MAX	9.9950
MIN	9.9775
R	0.0175
S.D	0.00538
STAT. DATA	
PROGRAM NO. = 2	(C)
N	10
$\bar{X}$	11.9485
MAX	11.9835
MIN	11.9145
R	0.0690
S.D	0.01900
STAT. DATA	
PROGRAM NO. = 3	(D)
N	10
$\bar{X}$	4.9950
MAX	5.0160
MIN	4.9595
R	0.0565
S.D	0.01485

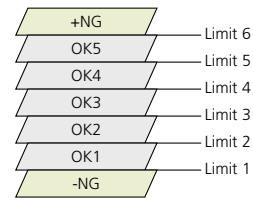
## Data Output

Every model has a standard RS-232C interface unit, allowing the data to be output to an external PC or printer. The LSM-5100/6200 has the standard I/O and analog output interface that allows the LSM to be connected to a sequencer, etc. The SPC (Digimatic Code) output interface is standard with the LSM-9506, allowing for easy construction of a quality control system. With the LSM-6200 additional means of data output, including the SPC, BCD, and GP-IB output interfaces, can be incorporated.

## Multi-Limit Judgment\*

\*Not available for LSM-5100

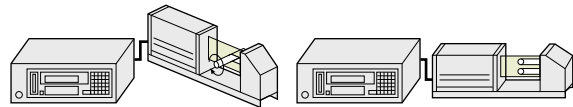
In addition to +NG, GO, and -NG judgment criteria limit values from Limit 1 to Limit 6 can also be set. If an optional 2nd I/O interface unit with analog signal output (02AGC880) is used with the LSM-6200/6900/9506, seven-step judgment signals can be output to external devices to support GO/NG judgment.



\*Not available for LSM-5100

## Simultaneous (Dual-Program) Measurement\*

It is possible to measure two items simultaneously with one Laser Scan Micrometer unit, and to output the data. This function can be used to simultaneously measure the outside diameter and runout width of a bar that is rotating, or to measure the outside diameters of two cylinders or wires at the same time.



## Restrictions Associated With the Particular Combination of Functions

Combinations of Functions	Edge specification		Transparent object measurement	Ultra-fine wire measurement*	Automatic workpiece detection	Abnormal data elimination	Sample measurement	Moving average	Group judgment**
	Manual measurement	Automatic measurement							
Edge specification	Manual measurement	—	—	—	●	●	●	●	●
	Automatic measurement	—	—	—	●	—	—	—	—
Transparent object measurement	—	—	—	●	●	●	●	●	●
Ultra-fine wire measurement*	—	—	●	—	—	●	●	●	●
Automatic workpiece detection	●	●	●	—	—	●	●	—	●
Abnormal data elimination	●	—	●	●	●	—	●	●	●
Sample measurement	●	—	●	●	●	●	—	●	●
Moving average	●	—	●	●	—	●	—	—	—
Group judgment**	●	—	●	●	●	●	—	—	—

●: Permitted combination, —: Combination that is not permitted

\*Function that is not provided for LSM-9506

\*\*Function that is not provided for LSM-5100

# Display Unit

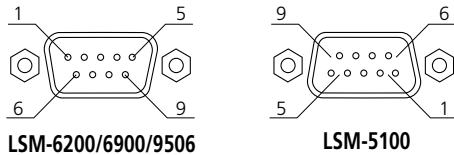
## LSM-5100/6200/6900/9506 Data I/O Specifications

### RS-232C Interface

Allows the LSM to communicate with external devices via RS-232C (conforming EIA standard) serial signals. Depending on the basic setup this interface can be used as a printer port.

#### Pin assignment of the connector

Matching plug: D-sub 9pin (female)



#### Communication specifications

Definition of device		DTE definition on the side of LSM
Data transmission method		All-duplex transmission
Synchronizing method		Start-stop system
Data transmission speed		1200, 2400, 4800, 9600, 19200, 38400bps
Data arrangement	Transmission code	ASCII
	Data length	7 or 8 bits
	Start bit	1 bit
	Parity check	Non, odd or even
	Delimiter	CR+LF, CR, LF

#### Commands

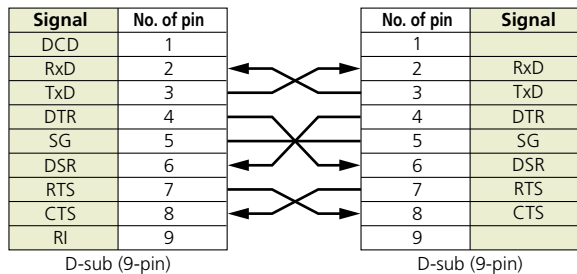
Various external commands, including those for setting measuring conditions, setting the measurement mode, starting measurement, and requesting statistical calculation, are supported. This allows the user to control the LSM from an external unit (e.g. PC) for purpose-oriented measurements.

#### Connections

(1) Connecting the RS-232C interface to a device specified as a terminal (DTE)

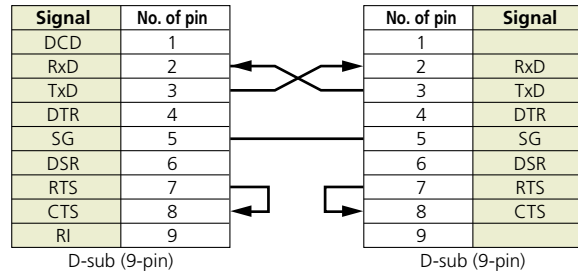
#### Example 1: Flow control method (handshake method controlled by CTS, DSR, DTR, and RTS signals)

PC (PC-AT compatible) specified as a terminal (DTE)      LSM-5100/6100/6900/9506 specified as a terminal (DTE)



#### Example 2: 3-Wire method (teletype protocol using TxD, RxD and SG)

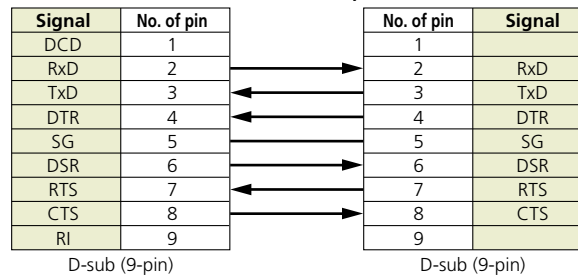
PC (PC-AT compatible) specified as a terminal (DTE)      LSM-5100/6100/6900/9506 specified as a terminal (DTE)



(2) Connecting the RS-232C interface to a device specified as a modem (DCE)

#### Example 1: Flow control method (handshake method controlled by CTS, DSR, DTR, and RTS signals)

Device specified as a modem (DCE)      LSM-5100/6100/6900/9506 specified as a terminal (DTE)



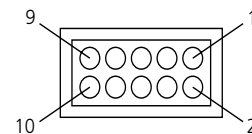
\*Not available for LSM-9506

### SPC (Digimatic) Data Output Port\*

- By connecting a Mitutoyo data processing unit, such as the DP-1VR, to this port using a dedicated cable, printouts and statistical processing of measurement values can be made.
- The dedicated cable is optional (1m: **936937**).

\* This output port is provided as a standard accessory only on the LSM-9506. To achieve SPC data output with the LSM-6200 use the optional Digimatic Codeout Unit (**02AGC840**).

#### Pin assignment of SPC data output port



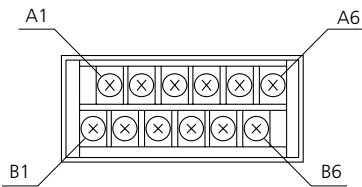
Pin No.	Signal name	I/O	Function
1	GND	—	Signal GND
2	DATA	OUT	Data out
3	CK	OUT	Data transmission clock
4	RD	OUT	Data read request
5	REQ	IN	Data output request
6, 7, 8, 9	I.C	—	Spare
10	F.G	—	Frame GND

\*Not available for LSM-9506

## I/O Interface with Analog Signal Output\*

Used to communicate with a PC, programmable controller, or relay circuitry by means of sequential signals. Since it can also capable of analog output, which may be used for feedback controls and continuous recording of workpiece deviations.

### External view of the connector



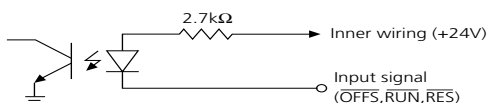
### Terminal names (of LSM-6200/6900)

Terminal	Signal	Function	I/O
A1	FG	Frame ground (Used for connecting the shielded wire of I/O signal cables)	—
A2	STS	Output of measurement condition (Turned out "H" level in the event of "Err-0")	OUT
A3	$\overline{GO}$	GO/NG judgment result output ( $\overline{GO}$ ) (Can be changed to strobe signal ( $\overline{STB}$ ) or measurement in-progress signal ( $\overline{ACK}$ ) output by the basic setup)	OUT
A4	$\overline{+NG}$	GO/NG judgment result output ( $\overline{+NG}$ )	OUT
A5	$\overline{-NG}$	GO/NG judgment result output ( $\overline{-NG}$ )	OUT
A6	GND	Digital ground (Common ground terminal of both output (A2 thru A5) and input (B4 thru B6))	—
B1	FG	Frame ground (Used for connecting the shielded wire of I/O signal cables)	—
B2	ALG	Analog voltage output	OUT
B3	0V	0V output of analog voltage output	OUT
B4	$\overline{OFFS}$	Offset input (Can be changed to (HOLD) by the basic setup)	IN
B5	$\overline{RUN}$	Input of trigger command for single-run measurement (Can be changed to a trigger for continuous-run measurement (with term specification))	IN
B6	$\overline{RES}$	Input of CLEAR command	IN

Note: The pin assignment of LSM-5100 may differ.

### Input/output equivalent circuit

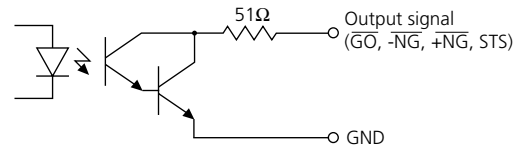
#### (1) Input circuit



- Input low-level signals between 0 and 1V. Generally drive this circuit with an open collector-type transistor.
- Maximum current drawn from the input signal is 12mA.

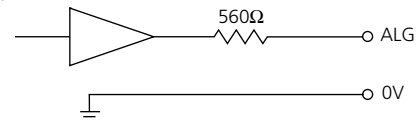
#### (2) Output circuit

##### 1. Control signal output



- Maximum rating of the output transistor is 30V, 50mA.

##### 2. Analog signal output



- The output voltage range is  $\pm 5V$ .
- The accuracy of the analog voltage output is 0.2% of full-scale range.
- This analog output should be connected to a device that has an input impedance of  $1M\Omega$  or greater. If the input impedance is low, the output accuracy will be reduced due to the internally provided resistance of  $560\Omega$ .

### Remote Interlock Connector

The Remote Interlock Connector is a terminal to turn the laser beam on and off. Since the supplied short-circuit pin is usually inserted in this terminal, the circuit is short-circuited. Insert an optional switch plug to externally control the LSM.

Laser emission ON: Short-circuit pin inserted  
Laser emission OFF: Short-circuit pin removed



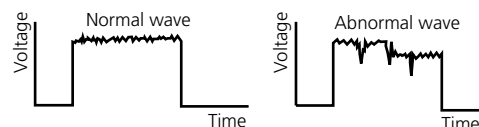
No.214938

### Scanning Signal Connector

The Scanning Signal Connector is a terminal to observe the waveform of the scanning laser which is incident to the reception chip in the measuring unit. Typically, this connector is used to align the emission unit and reception unit after they have been removed from the original base and then mounted on a different base.



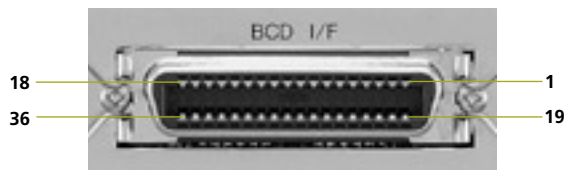
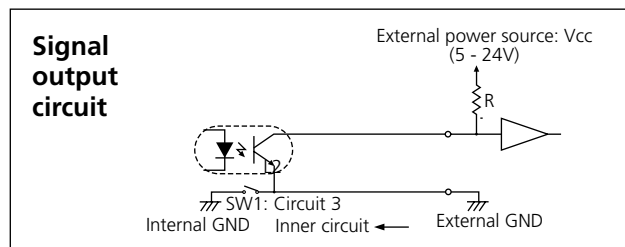
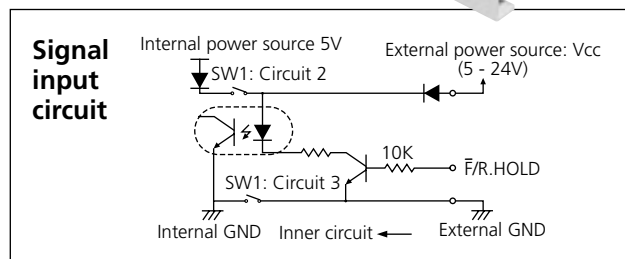
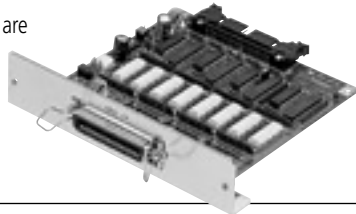
No.02AGC401



# Optional Interface Units for LSM-6200/6900

## BCD Interface Unit (02AGC910)

- Outputs a 7-digit BCD and a positive sign or negative sign.
- Switchable data logic.
- The input and output circuits are isolated.



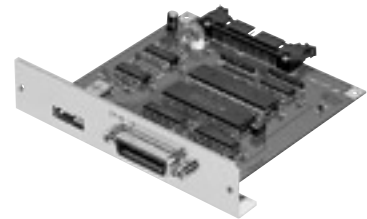
### Pin assignment of BCD Interface Unit

Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
1	$1 \times 10^0$	15	$4 \times 10^3$	29	Err.0 (Segment error)
2	$2 \times 10^0$	16	$8 \times 10^3$	30	HOLD (input)
3	$4 \times 10^0$	17	$1 \times 10^4$	31	F/R
4	$8 \times 10^0$	18	$2 \times 10^4$	32	STB (Strobe output)
5	$1 \times 10^1$	19	$4 \times 10^4$	33	EXT.Vcc (Ext. power)
6	$2 \times 10^1$	20	$8 \times 10^4$	34	+POLE (Polarity)
7	$4 \times 10^1$	21	$1 \times 10^5$	35	GND (Signal GND)
8	$8 \times 10^1$	22	$2 \times 10^5$	36	FG (Frame GND)
9	$1 \times 10^2$	23	$4 \times 10^5$		
10	$2 \times 10^2$	24	$8 \times 10^5$		
11	$4 \times 10^2$	25	$1 \times 10^6$		
12	$8 \times 10^2$	26	$2 \times 10^6$		
13	$1 \times 10^3$	27	$4 \times 10^6$		
14	$2 \times 10^3$	28	$8 \times 10^6$		

Applicable connector: 57-40360-D (Standard accessory)

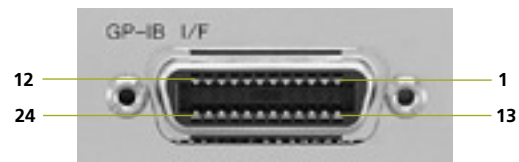
## GP-IB Interface Unit (02AGC940)

- Conforms to IEEE standard 488-1978.
- Can select a program, direct data output, and rewrite data from the external device.



### Specifications

Order No.	02AGC940
Interface functions	SH1, AH1, T6, L4, SR1, RL1, DT1
Transmission code	ASCII
1st delimiter	CR, LF, EOI, etc. (by DIP switch)
2nd delimiter	7
Cable length	6' (2m) or shorter
Output data	Measurement, GO/NG, error message
Commands	Offset, measurement start, measurement mode, partprogram change, statistical calculation, etc.



### Pin assignment of GP-IB Interface Unit

Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
1	DIO1	9	IFC	17	REN
2	DIO2	10	SRQ	18	GND
3	DIO3	11	ATN	19	GND
4	DIO4	12	F.G (Frame GND)	20	GND
5	EO1	13	DIO5	21	GND
6	DAV	14	DIO6	22	GND
7	NRFD	15	DIO7	23	GND
8	NDAC	16	DIO8	24	GND (Signal GND)

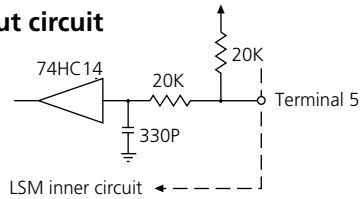
Applicable connector: IEEE-488 based connector

## Digimatic Codeout Unit (02AGC840)

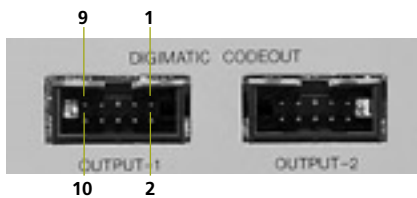
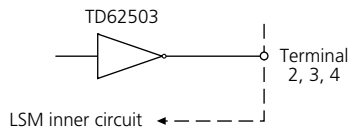
- Provides two channels of SPC (Digimatic) output.
- Outputs the following during simultaneous measurement: From OUTPUT1: Measured values by PRG.0 through PRG.4 From OUTPUT2: Measured values by PRG.5 through PRG.9
- The output cable (936937) is optional.



### Signal input circuit



### Signal output circuit

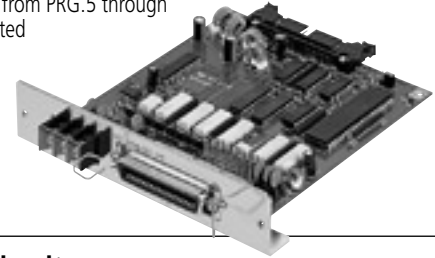


## Pin assignment of Digimatic Codeout Unit

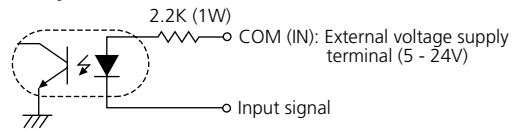
Pin No.	Signal name	I/O	Function
1	GND	—	Signal GND
2	DATA	OUT	Data out
3	CK	OUT	Data transmission clock
4	RD	OUT	Data read request
5	REQ	IN	Data output request
6, 7, 8, 9	I.C	—	Spare
10	F.G	—	Frame GND

## 2nd I/O Interface Unit with Analog Signal Output (02AGC880)

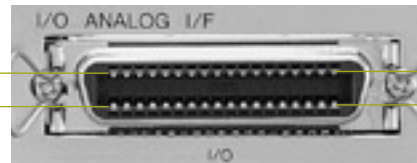
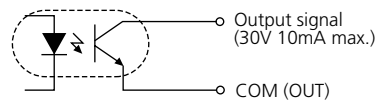
- Provided I/O capability and analog output for GO/±NG judgment.
- Provides two sets of GO/NG judgment result output. Fully compatible with simultaneous measurement, since measurement values from PRG.5 through PRG.9 will be outputted as analog signals.



### Signal input circuit



### Signal output circuit



## Pin assignment of 2nd I/O Interface Unit

Pin No.	Signal name	I/O	Pin No.	Signal name	I/O
1	+5V	(Internal power)	19	GND	(Internal power)
2	COM (IN)	(IN)	20	COM (IN)	(IN)
	PROG.0/b0	IN		PROG.1/b1	IN
	PROG.2/b2	IN		PROG.3/b3	IN
	PROG.4/PRG	IN	23	IC	(OUT)
	SHIFT	IN	24	PRINT	IN
7	RUN	IN	25	RESET	IN
8	A*(-NG)	OUT	26	A*(GO)	OUT
9	I.C	(OUT)	27	I.C	(OUT)
10	I.C	(OUT)	28	I.C	(OUT)
11	B*(-NG)	OUT	29	B*(GO)	OUT
12	B*(+NG)	OUT	30	I.C	OUT
13	I.C	(OUT)	31	I.C	(OUT)
14	A*(+NG)	OUT	32	A*(-NG)	OUT
15	A*(GO)	OUT	33	ACK	OUT
16	ERR.0	OUT	34	STB	OUT
17	COM (OUT)	(OUT)	35	COM (OUT)	(OUT)
18	CNT	OUT	36	FG	—

With a combined use of b0, b2, PRG, b1 and b3 maximum 100 patterns of program can be used.

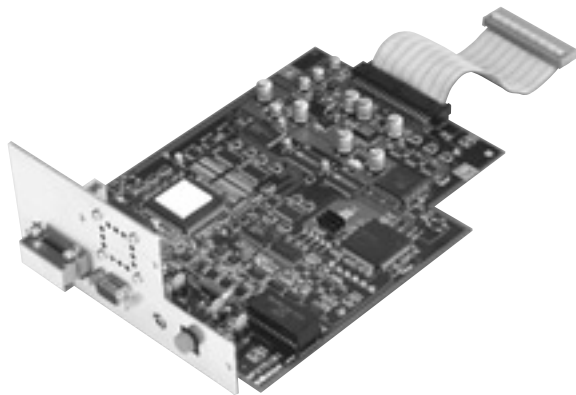
# Optional Interface Units for LSM-6200/6900

# Optional Accessories

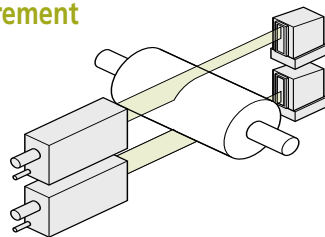
\*Not available for LSM-6900

## Dual-type Add-on Unit (02AGP150)\*

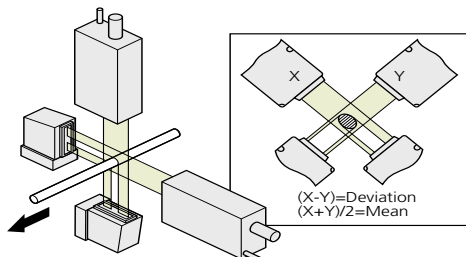
- Enables the second measuring unit to be connected to the display unit (this is possible only if the two measuring units are the same model).
- Depending on the layout of the two measuring units, large diameter measurement, XY measurement, and parallel measurement are possible.
- The sub-display of the LSM-6200 allows simultaneous measurement and display with two measuring units.



### Large-diameter measurement

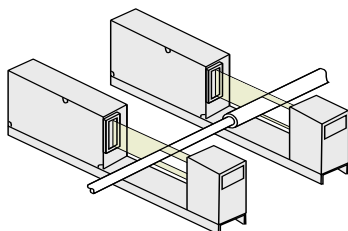


### X-Y measurement



Min. distance of XY scanning section: .40" (10mm)

### Parallel measurement



## Calibration Gage Sets

- The Calibration Gage Sets are a set of standard gages used for calibrating Laser Scan Micrometers. The indicated dimensional value is the result of one position in a single direction on each gage.



Order No.	Application	Components
02AGD110	LSM-500S	Ø.004" (Ø0.1mm) gage (958200) Ø.08" (Ø2mm) gage (958202) Gage stand (02AGD111) Set case (958203)
02AGD120	LSM-501S	Ø.004" (Ø0.1mm) gage (958200) Ø.40" (Ø10mm) gage (229317) Gage stand (02AGD121) Set case (958203)
02AGD180	LSM-902	Ø.04" (Ø1mm) gage (02AGD920) Ø1.0" (Ø25mm) gage (02AGD963)
02AGD130	LSM-503S	Ø.04" (Ø1mm) gage (02AGD920) Ø1.18" (Ø30mm) gage (02AGD961) Gage stand (02AGD131) Set case (02AGD980)
02AGD140	LSM-506S	Ø.04" (Ø1mm) gage (02AGD920) Ø2.36" (Ø60mm) gage (02AGD962) Gage stand (02AGD141) Set case (02AGD980)
02AGD150	LSM-512S	Ø.79" (Ø20mm) gage (229730) Ø4.72" (Ø120mm) gage (234072) Gage stand (02AGD151) Set case (02AGD990)
02AGM300	LSM-516S	Ø.79" (Ø20mm) gage (229730) Ø6.30" (Ø160mm) gage (02AGM303) Gage stand (02AGM320) Set case (02AGM310)
02AGD170	LSM-9506	Ø.04" (Ø1mm) gage (02AGD920) Ø2.36" (Ø60mm) gage (02AGD962) Gage stand (02AGD171) Set case (02AGD970)

# Optional Accessories

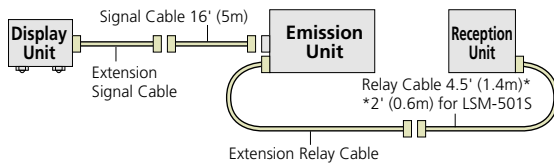
\*Not available for LSM-902

## Extension Signal Cables

- Used to extend the supplied signal cable if the measuring unit and display unit are placed apart from one another.

## Extension Relay Cables\*

- Used to extend the supplied relay cable if the emission unit and reception unit are placed apart from one another.



## Extension signal cables

Order No.	Cable length
<b>02AGN780A</b>	16' (5m)
<b>02AGN780B</b>	32' (10m)
<b>02AGN780C</b>	48' (15m)
<b>02AGN780D</b>	64' (20m)

## Extension relay cables

Order No.	Cable length
<b>02AGC150A</b>	3' (1m)
<b>02AGC150B</b>	9' (3m)
<b>02AGC150C</b>	16' (5m)

Note 1: The maximum length of the **LSM-500S/501S** signal cable is 64' (20m), and that of relay cable is 6' (2m). The maximum length of the signal cables and relay cables of models other than those mentioned above should be 98' (30m) or less and 16' (5m) or less, respectively.

Note 2: The total length of signal cables and relay cables should not be more than 104' (32m).



Extension signal cable

\*Not compatible with LSM-5100

## SPC Cable (936937)\*

- This cable is used to connect the LSM-9506 or the LSM-6200/6900 that incorporates an optional Digimatic Codeout Unit (**02AGC840**) to a Mitutoyo data processing unit, such as the DP-1VR.



\*Not compatible with LSM-5100

## Footswitch (937179T)\*

- By connecting the Footswitch to the LSM-6100/6900/9506 the user can externally direct single measurement.



937179T

## Air Blow Covers

- If using your LSM in a smoky or dusty environment, the Air Blow Cover helps to prevent the emission/reception window from being contaminated by blowing clean air out of the mouth provided on the measuring unit.

Order No.	Application
<b>02AGD220</b>	LSM-500S
<b>02AGD230</b>	LSM-501S
<b>02AGD240</b>	LSM-503S
<b>02AGD250</b>	LSM-506S
<b>02AGD260</b>	LSM-512S



- Air cleaner (**957608**) also required.

## Thermal Printer

- This printer can be connected to any LSM-5100, 6200, 6900 and 9506 model.
- Both measurement values and statistical calculation results can be printed (only with LSM-6200/6900/9506).
- Connection cable is supplied.

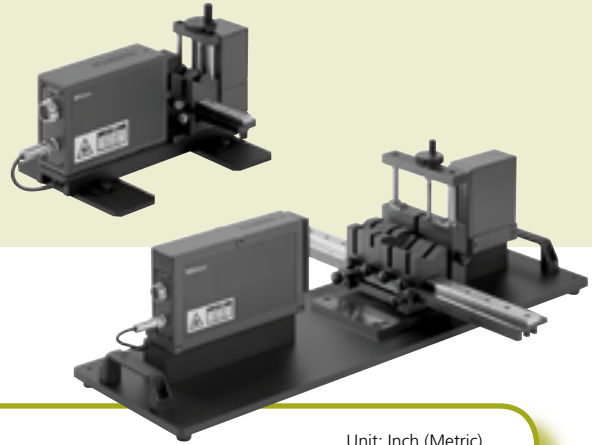


Order No.	02AGD600B (w/120V AC adapter)
Type	Thermal serial-dot printer
Digits per line	40 digits
Character	9x8 dot matrix
Data input	Via RS-232C interface
Printer life	500,000 lines
Operation temperature	32°F to 122°F (0°C to 50°C)
Power supply	Via AC adapter (100V AC, 50/60Hz)
Standard accessories	Printer paper (1 roll), AC adapter
Consumable item	Printer paper set (10-roll, <b>223663</b> )

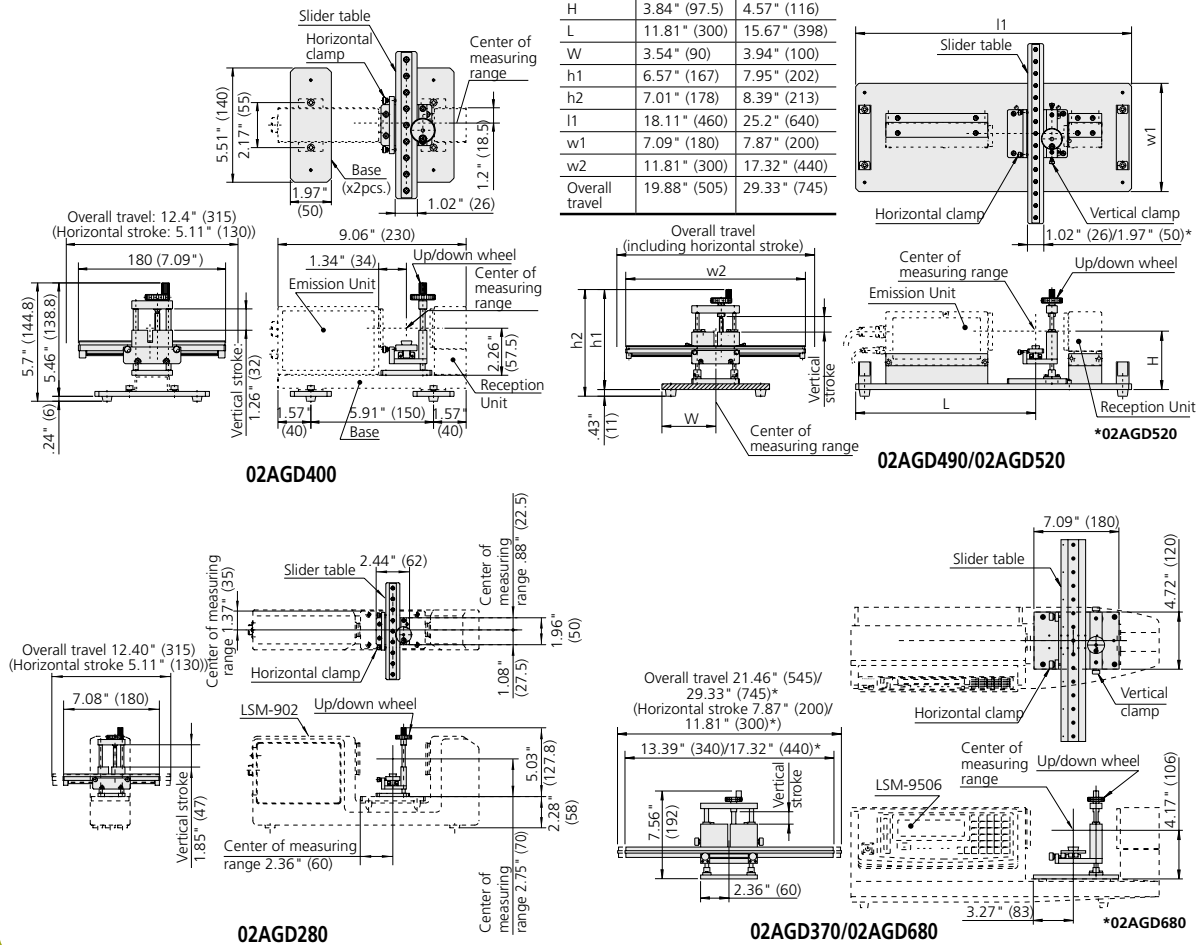
# Optional Accessories for Laser Scan Micrometer

## Adjustable Workstages

- Aids in measuring various workpiece diameters by means of the up/down and right/left slide mechanism.
- Optimum for quality control of precision shafts, rollers, pin gages, etc.



### Dimensions



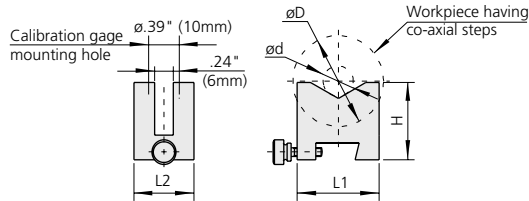
### Specifications

Order No.	02AGD400	02AGD280	02AGD490	02AGD520	02AGD370/02AGD680
Application	LSM-501S	LSM-902	LSM-503S	LSM-506S	LSM-9506
Horizontal stroke	5.12" (130mm)	5.12" (130mm)	7.87" (200mm)	11.81" (300mm)	7.87" (200mm)/11.81" (300mm)
Vertical stroke	1.26" (32mm)	18.50" (47mm)	1.38" (35mm)	1.77" (45mm)	1.77" (45mm)
Maximum workpiece load	1.1 lbs. (0.5kg)	1.1 lbs. (0.5kg)	4.4 lbs. (2.0kg)	11 lbs. (5.0kg)	4.4 lbs. (2.0kg)/11 lbs. (5.0kg)
Mass	2.2 lbs. (1.0kg)	1.8 lbs. (0.8kg)	10.78 lbs. (4.9kg)	21.34 lbs. (9.7kg)	8.4 lbs. (3.8kg)/10.56 lbs. (4.8kg)
Standard accessories	<ul style="list-style-type: none"> <li>•V-block (02AGD420) x 2pcs.</li> <li>•Workpiece stopper (02AGD430)</li> </ul>			<ul style="list-style-type: none"> <li>•V-block (02AGD550) x 2pcs.</li> <li>•V-block (02AGD560)</li> <li>•V-block (02AGD570)</li> </ul>	<ul style="list-style-type: none"> <li>•V-block (02AGD550) x 2pcs.</li> <li>•V-block (02AGD560)</li> <li>•V-block (02AGD570)</li> </ul>



# Optional Accessories for Laser Scan Micrometer

## V-Blocks

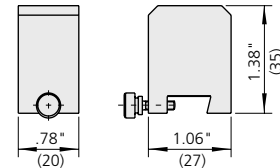


Order No.	02AGD420	02AGD550
ØD max.	1.18" (30)*	2.36" (60)
Ød max.	1.18" (30)*	2.36" (60)
D - d max.	.98" (25)**	1.18" (30)*
H	1" (25.5)	1.54" (39)
L1	1.06" (27)	1.97" (50)
L2	.79" (20)	1.18" (30)*
Mass	0.03kg	0.12kg
Calibration gages to be used	<ul style="list-style-type: none"> <li>• Ø0.1mm</li> <li>• Ø1mm</li> <li>• Ø10mm</li> <li>• Ø30mm</li> </ul>	<ul style="list-style-type: none"> <li>• Ø10mm</li> <li>• Ø30mm</li> </ul>

\*.39" (10) for LSM-5015  
 \*\*.98" (25) for LSM-902

Order No.	02AGD560	02AGD570
ØD max.	2.36" (60)	2.36" (60)
Ød max.	1.18" (30)	1.18" (30)*
D - d max.	1.97" (50)	1.97" (50)
H	1.77" (45)	1.77" (45)
L1	1.97" (50)	1.97" (50)
L2	1.18" (30)*	1.18" (30)*
Mass	0.15kg	0.15kg
Calibration gages to be used	<ul style="list-style-type: none"> <li>• Ø10mm</li> <li>• Ø30mm</li> <li>• Ø60mm</li> </ul>	<ul style="list-style-type: none"> <li>• Ø1mm</li> <li>• Ø10mm</li> <li>• Ø30mm</li> </ul>

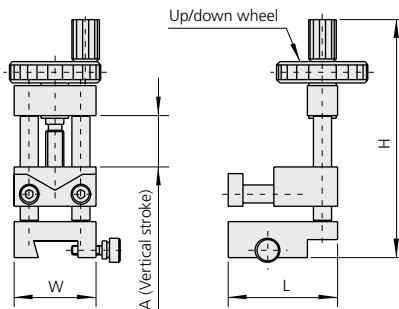
## Workpiece Stopper (02AGD430)



- Used with **02AGD400**, **02AGD280** or **02AGD490** adjustable workstage for positioning the workpiece.
- Mass: 0.05kg

## Adjustable V-Blocks

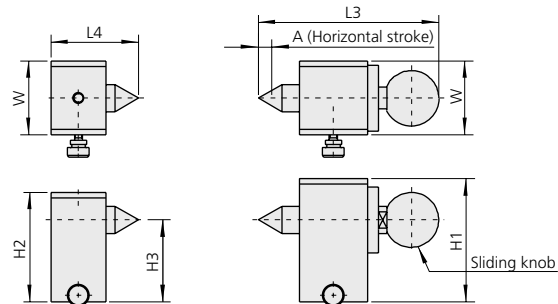
- Optional accessories for adjustable workstages.



Order No.	02AGD450	02AGD590
H	3.1" (78.8)	4.17" (105.8)
L	1.42" (36)	1.57" (40)
W	1.06" (27)	1.97" (50)

## Center Supports

- Optional accessories for adjustable workstages.



Order No.	02AGD440	02AGD580
H1	1.77" (45)	2.56" (65)
H2	1.57" (40)	2.36" (60)
H3	1.18" (30)	1.77" (45)
L1	.98" (25)	1.97" (50)
L2	.79" (20)	1.57" (40)
L3	2.60" (66)	4.19" (106.5)
L4	1.26" (32)	2.17" (55)
W	1.06" (27)	1.97" (50)

## Specifications

Order No.	02AGD450	02AGD590
Application	Adjustable workstage for LSM-501S ( <b>02AGD400</b> ), Adjustable workstage for LSM-902 ( <b>02AGD280</b> ), Adjustable workstage for LSM-503S ( <b>02AGD490</b> )	Adjustable workstage for LSM-506S ( <b>02AGD520</b> ), Adjustable workstage for LSM-9506 ( <b>02AGD680</b> )
Vertical stroke (A)	.79" (20mm)	1.38" (35mm)
Maximum workpiece diameter	1.18" (30mm)	2.36" (60mm)
Mass	.21 lbs. (0.1kg)	.44 lbs. (0.2kg)

## Specifications

Order No.	02AGD440	02AGD580
Application	Adjustable workstage for LSM-501S ( <b>02AGD400</b> ), Adjustable workstage for LSM-902 ( <b>02AGD280</b> ), Adjustable workstage for LSM-503S ( <b>02AGD490</b> )	Adjustable workstage for LSM-506S ( <b>02AGD520</b> ), Adjustable workstage for LSM-9506 ( <b>02AGD680</b> )
Point angle	60°	60°
Maximum workpiece length	4.33" (110mm) on <b>02AGD400/02AGD280</b> 9.06" (230mm) on <b>02AGD490</b>	12.4" (315mm) on <b>02AGD520</b> on <b>02AGD680</b>
Horizontal stroke (A)	.2" (5mm) or more	.39" (10mm) or more
Center point feeding force	1.1kgf	3.2kgf
Mass	.4 lbs. (0.18kg)	1.87 lbs. (0.85kg)

# Optional Accessories for Laser Scan Micrometer

## Workstage

- Aids in measuring shafts by means of the V-block mount and up/down mechanism.

Order No.	Application
<b>02AGD270</b>	LSM-501S LSM-503S LSM-902



## Wire Guiding Pulleys

- This is a jig for guiding a stable measurement of the outside diameter of fine linear object such as a magnet wire and fiber.



Order No.	Application	Maximum measuring dia.
<b>02AGD200</b>	LSM-500S	.063" (1.6mm)
<b>02AGD210</b>	LSM-501S	.079" (2mm)

Note: Use the calibration gage set (**02AGD110**) for the both types of Wire Guiding Pulleys.

# PRECAUTIONS

Observe the following precautions.

## Compatibility

Your Laser Scan Micrometer has been calibrated to 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.

## About a workpiece and measuring conditions

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

## Electrical interference

To avoid operation errors, do not route the signal cable and relay cable of the Laser Scan Micrometer along side a high-voltage line or other cable which may generate surge noise. Ground all appropriate units and cables.

## Connection with a computer

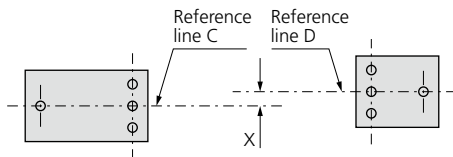
If the Laser Scan Micrometer is connected to an external personal computer via the RS-232C interface, conform the signal name and pin assignment of the cable connector.

## About re-assembly after removal from the base

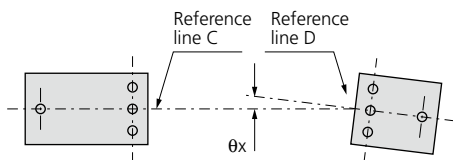
Observe the following procedure when re-assembling the emission unit and reception unit to minimize measurement errors due to misalignment of the laser's optical axis.

### (1) Alignment within a horizontal plane

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

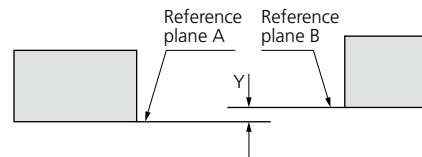


b. An angle is made between reference lines C and D:  $\theta_x$  (angle)

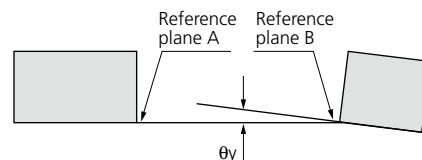


### (2) Alignment within a vertical plane

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



d. An angle is made between reference planes A and B:  $\theta_y$  (angle)



### (3) Allowable range of optical axis alignment

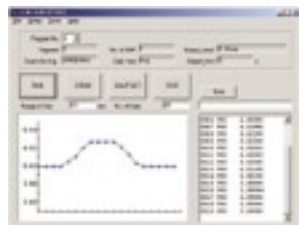
Model	Distance between Emission Unit and Reception Unit	X and Y	$\theta_x$ and $\theta_y$
LSM-501S	2.68" (68mm) or less	within .02" (0.5mm)	within 0.4° (7 mrad)
	3.94" (100mm) or less	within .02" (0.5mm)	within 0.3° (5.2 mrad)
LSM-503S	5.12" (130mm) or less	within .04" (1mm)	within 0.4° (7 mrad)
	13.78" (350mm) or less	within .04" (1mm)	within 0.16° (2.8 mrad)
LSM-506S	10.75" (273mm) or less	within .04" (1mm)	within 0.2° (3.5 mrad)
	27.56" (700mm) or less	within .04" (1mm)	within 0.08° (1.4 mrad)
LSM-512S	12.64" (321mm) or less	within .04" (1mm)	within 0.18° (3.6 mrad)
	27.56" (700mm) or less	within .04" (1mm)	within 0.08° (1.4 mrad)
LSM-516S	31.50" (800mm) or less	within .04" (1mm)	within 0.09° (1.6 mrad)



Part No. 02AGC830A

## QUICKTOOL

- QUICKTOOL is a free software that makes the troublesome key operation of LSM-6200 setting simple and easy. Please contact your Mitutoyo office.



Note: All information regarding our products (the illustrations, drawings, dimensional, performance and other technical data) contained in this pamphlet, is to be regarded as approximate average values. We reserve the right to make changes to the corresponding designs, dimensions and weights. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. The latest applicable version of our General Sales Policy will apply. Only quotations submitted by Mitutoyo or our approved distributors are valid.

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