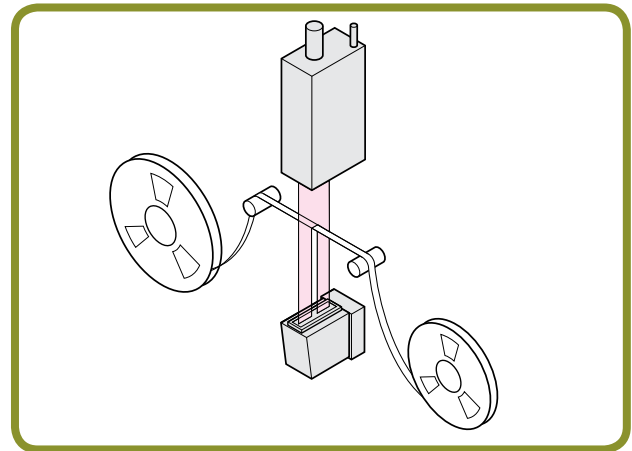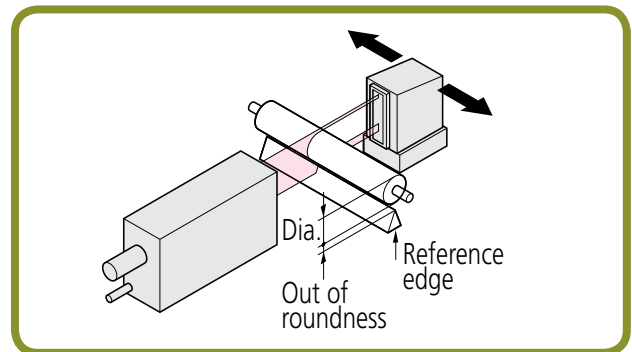# Mitutoyo

LSM-503S
Standard Measuring

● **General-purpose type with a measurement range of 0.3mm to 30mm.**
● **Provides high accuracy with a linearity of ±1.0μm over the entire measurement range and ±(0.6+0.1ΔD)μm in the narrow range.**
● **Excellent repeatability of ±0.1μm**

SPECIFICATIONS

Model	LSM-503S
Order No. (Laser only)	544-536
Package No. (Laser w/LSM 6200 display)	64PKA119
Acceptable standard of laser	IEC, FDA
Measuring range	0.3 - 30mm (.012" - 1.18")
Resolution (selectable)	0.00002 - 0.1mm (.000001" - .005")
Repeatability*1	±.11μm (±3.9μinch)
Linearity at 20°C*2 — Entire range	±1.0μm (±40μinch)
Linearity at 20°C*2 — Narrow range	±(0.6+0.1ΔD)μm
Positional error*3	±1.5μm (±60μinch)
Measuring region*4	10 x 30mm (.4" x 1.18")
Scanning rate	3200 scans/s
Laser wavelength	650nm, Visible*5
Laser scanning speed	226m/s (8900″/s)
Operating temperature	0°C - 40°C
Operating humidity	35 - 85% RH (with no condensation)
Water/Dust protection grade	Conforming to IP64*6
Mass	Emission unit: 1.1kg (2.42lbs.), Reception unit: 0.6kg (1.32lbs.), Base: 0.5kg (1.1lbs.), Signal cable: 0.5kg (1.1lbs.)

*1: Determined by the value for ±2σ at the measurement of ø10mm 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."
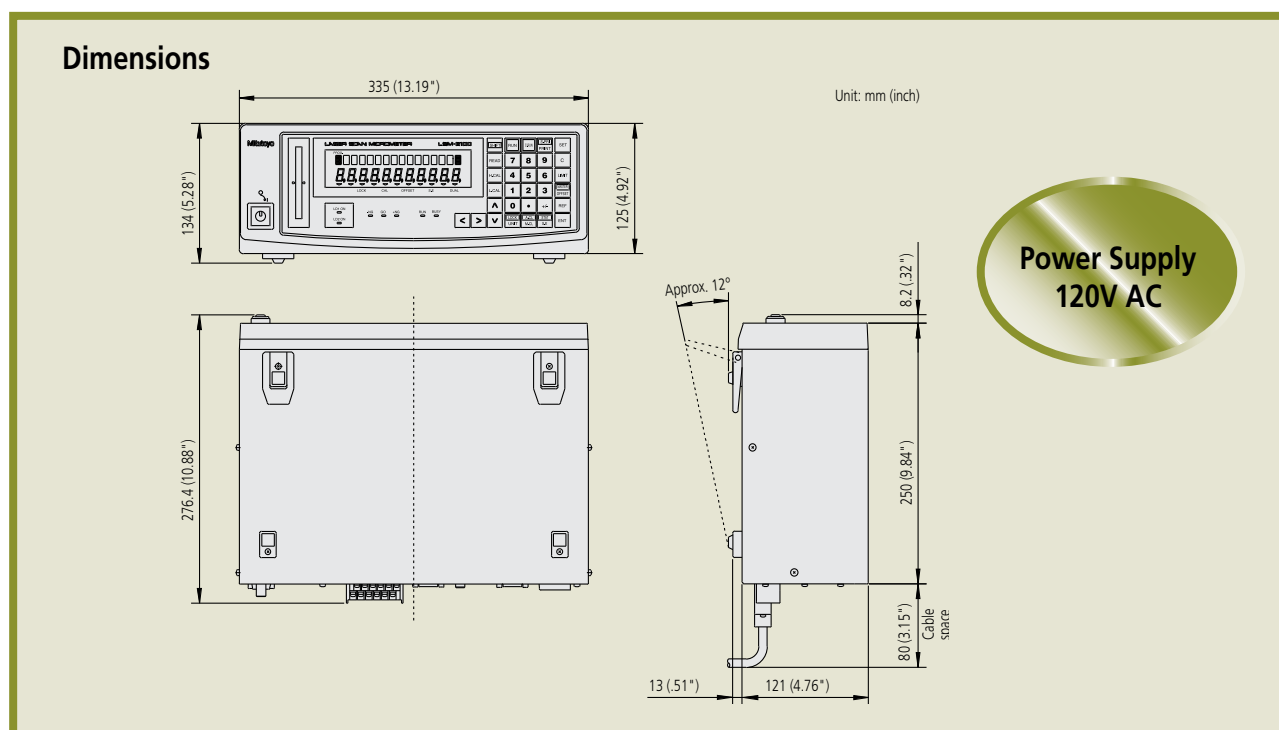*5: FDA Class II/IEC Class 2 semiconductor laser for scanning (Maximum power: 1.3mW)
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

LSM-6200 display unit
(optional)

LSM-5200 display unit
(optional)
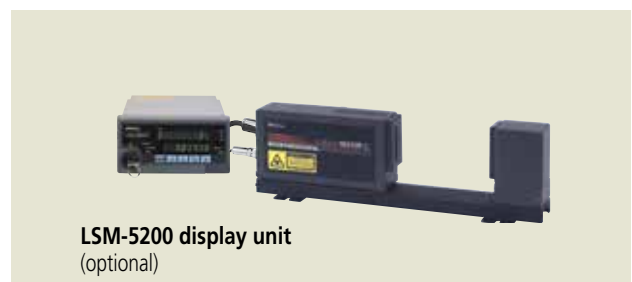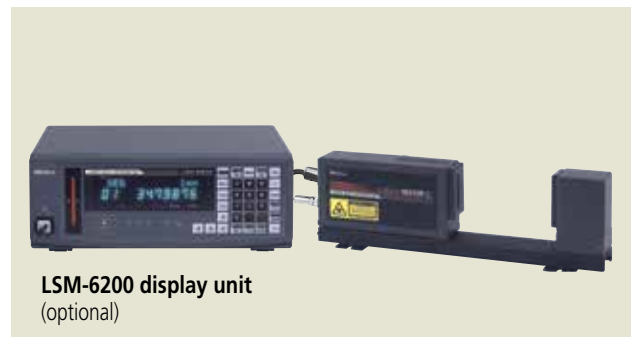
LSM-6200
Multi-function Display Unit

- 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 segment measurement (7 segments max.) or edge measurement (1 to 255 edges) can be selected.
- RS-232C and I/O-Analog interfaces are provided as standard.
- A statistical calculation function and abnormal data eliminating function are provided.

Dimensions

Unit: mm (inch)

335 (13.19")

134 (5.28")

125 (4.92")

276.4 (10.88")

Approx. 12°

8.2 (.32")

250 (9.84")

80 (3.15") Cable space

13 (.51")   121 (4.76")

Power Supply 120V AC

SPECIFICATIONS

Model	LSM-6200
Order No. (Order no. suffix denotes the AC power cord equipped.) 120V AC	**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/no-go 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	120V AC ±10%, 60Hz, 40VA
Data output (as standard)	Via RS-232C and I/O-Analog interfaces
Functions	(See page 30.)
Operating temperature	0°C - 45°C
Operating humidity	35 - 85% RH (with no condensation)
Mass	5kg (11lbs.)

*1: With the **LSM-500S** the measuring range will be set to between 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.

LSM-5200/6200/6900/9506 Functions

Measuring Setup Memory

The measuring setup can be registered as a program and saved (LSM-6200: 100 programs, LSM-6900: 10 programs, LSM-5200: 1 program). These programs can be recalled with a single operation.

Multiple Calibration Data Memory Function

This function allows storage of 10 types of calibration data. In this function mode, up to 10 sets of 10 programs are available in hand.
• 10 programs (a piece of calibration data) X 10 sets
* Only LSM-6200 has this function.

Drill/Endmill (odd number flute) diameter measurement

The diameter of drills or endmills that have an odd number of flutes can be measured by changing the parameter set up.

Reference bar
SEG1 (Min.)
SEG1+2 (Max.)
Odd number flute tool
D
D= [SEG1+2 (Max.)] - [SEG1 (Min.)]
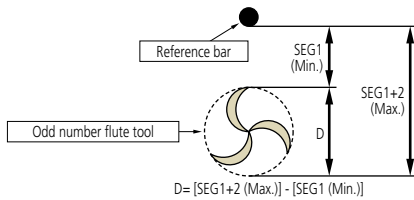
Automatic Workpiece Detection

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

Preset/Offset

Sets the currently 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 allowed for in calibration, 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 will be (zero-set/offset value) + (±mastering value). If a positive mastering value is specified, the displayed value for a workpiece diameter measurement will be greater than the actual value. If a negative value is specified, the displayed value will be smaller than the actual value.
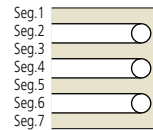
Sample Measurement

On a sample measurement the number of measurements will be defined (in the 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 on 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 (0.32ms) and 2048 (0.64sec). In the moving average mode, the number of scans can be set at one of seven steps between 32 (0.01sec) and 2048 (0.64sec), 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 diameter or width of an endless workpiece, such as wire or tape from a measurement that requires a long period.
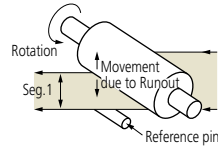
Measurement using Segment Specification

The following conventions are used to set up to the maximum of seven segments. However, if the transparent object measuring mode is set, no more than three segments can be set at one time.
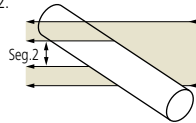
Seg.1
Seg.2
Seg.3
Seg.4
Seg.5
Seg.6
Seg.7

• The outside diameter of a wire or cylindrical workpiece can be measured by using Seg.2.

Seg.2

• The outside diameter of a large workpiece can be measured by using Seg.1 and Seg.5 in a dual-unit configuration. (only with LSM-6200).

Seg.1
D
Seg.5

• Measurement of spacing of two parallel pins (pitch measurement) Pitch = ((Seg.2+Seg.4)/2)+Seg.3
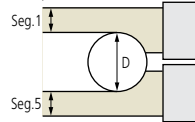
Workpiece 1
Seg.1
Seg.2
Seg.3
Seg.4
Seg.5
Workpiece 2
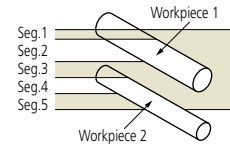
• The Runout of a revolving workpiece can be obtained by observing the variation in Seg.1 which is measured against a stationary reference pin.
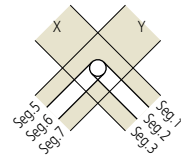
Rotation
Movement due to Runout
Seg.1
Reference pin

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

X
Y
Seg.5
Seg.6
Seg.7
Seg.1
Seg.2
Seg.3

Automatic Measurement using Edges

The edges created by scanning a workpiece can be used to program an LSM. A maximum of 127 workpiece features, and 127 of the spaces between these features, can be used, which involves a total of 255 edges. This is most useful for measuring such things as IC chip leads or connector pins that are approximately equally spaced. This method cannot be applied to transparent objects.

Laser scanning direction
Edge 1
Pin 1
Edge 2
Edge 3
Edge 4
Pin 2
Edge 5
Edge 6
Pin 3
Edge 7
Pin 126
Edge 253
Edge 254
Pin 127
Edge 255
Edge 256