Mitutoyo

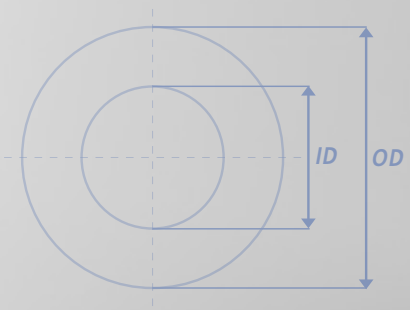
Non-Contact, Non-Destructive Laser Measurement System

Laser Scanning Internal Measurement Unit
LSIU-02/30/CU

Sensor Systems

NEW Products

IP67

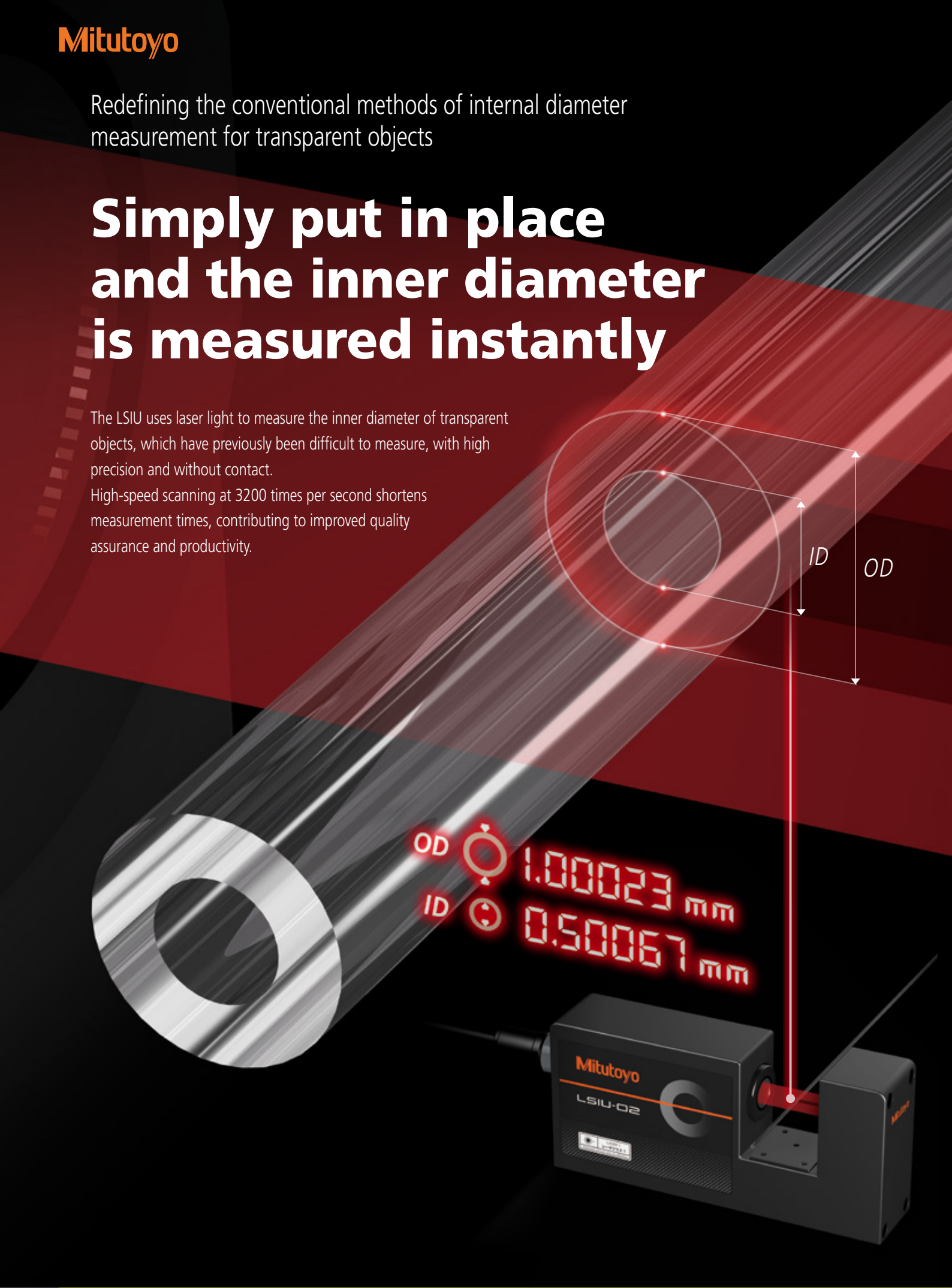


Mitutoyo

Redefining the conventional methods of internal diameter measurement for transparent objects

Simply put in place and the inner diameter is measured instantly

The LSIU uses laser light to measure the inner diameter of transparent objects, which have previously been difficult to measure, with high precision and without contact.
High-speed scanning at 3200 times per second shortens measurement times, contributing to improved quality assurance and productivity.



POINT 01

Measure without cutting or touching

By using laser light, the inner diameter can be measured without any damage. There is no need to cut the object to be measured, and any position can be measured efficiently.

POINT 02

Simultaneous measurement of inner and outer diameters

Simultaneous measurement of inner and outer diameters is possible, which is necessary for quality assurance. This reduces setup time and improves measurement efficiency.

POINT 03

Simply put in place and the measurement is performed instantly

There is no need for complicated manual work during measurement, high-speed scanning is performed using laser light. High-speed measurement is possible without the risk of operator error.

Application



Transparent pipe



Transparent tube

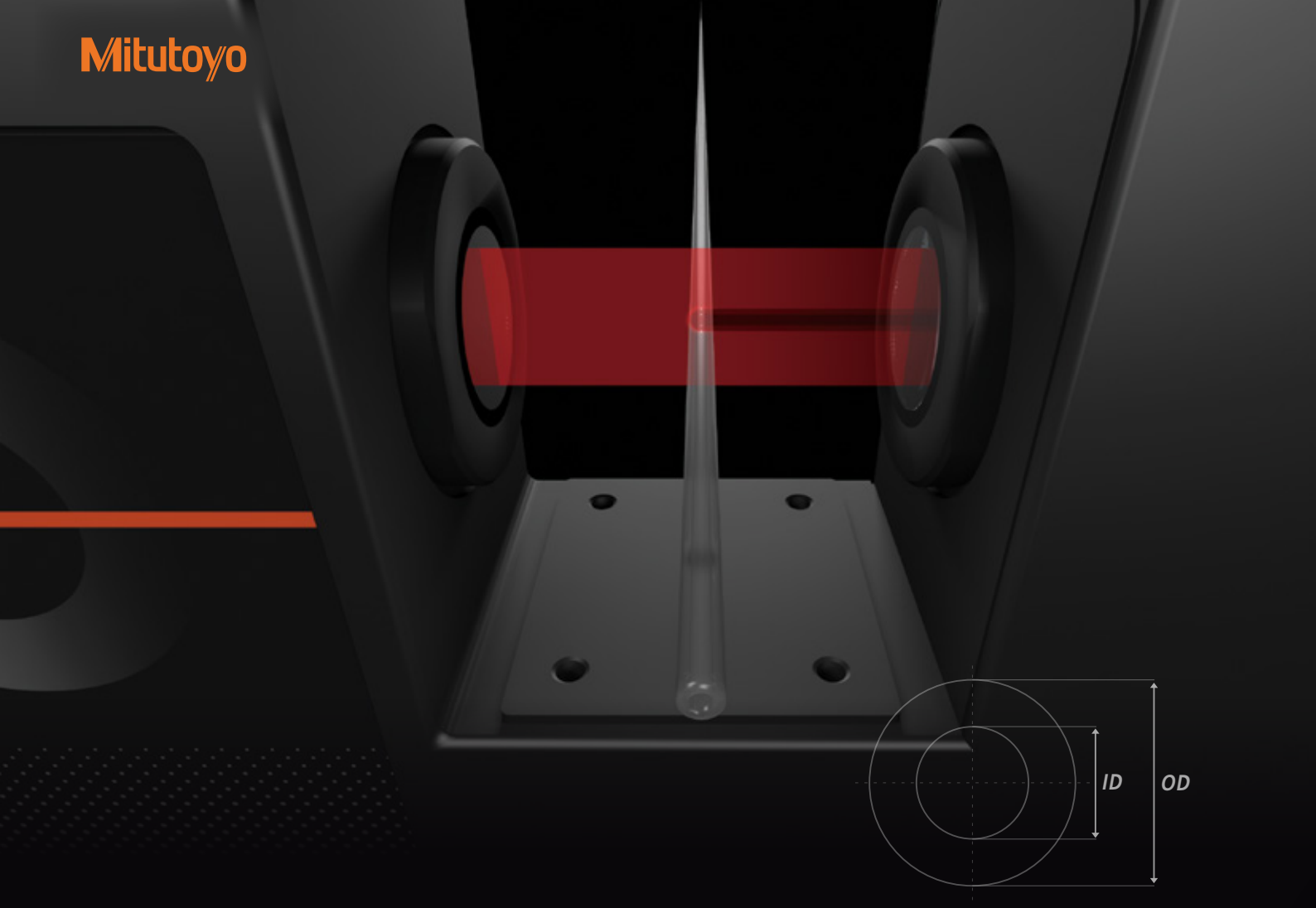
(Materials: glass, resin, vinyl, etc.)

Target Industry

Medical Device Industry

Telecommunications Industry

Manufacturing

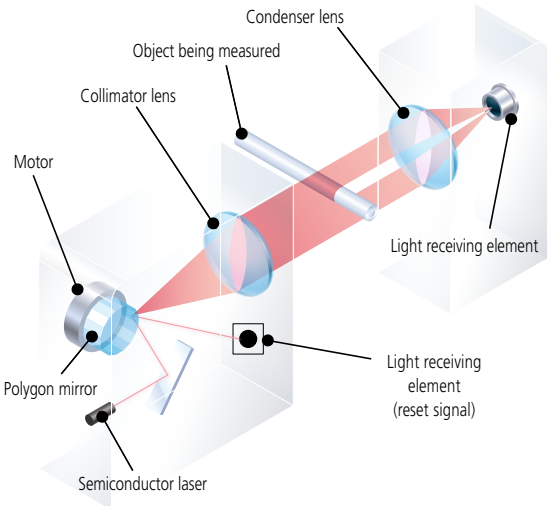


Measurement principle

The LSIU measures the inner and outer diameters of a transparent object by scanning a narrowly focused parallel laser beam across the transparent object to be measured.

As shown in the diagram on the right, the laser light emitted from the semiconductor laser is reflected by a polygon mirror rotating at high speed, then collimated by a collimator lens (f θ lens). At the same time, the laser beam diameter is narrowed to a minimum at the measurement position. The laser light acts as a parallel light source, scans the object to be measured at high speed, then is focused onto the light receiving element by a condenser lens.

The light receiving element generates an output voltage that corresponds to the brightness of the light as determined by where the laser light is blocked by the object being measured and where it passes through. The change in voltage is used to measure the inner and outer diameters of the object being measured.



Ideal Applications

We want to measure **without scratching** the surface of the object	Laser light enables high-precision measurement with **no scratching**
We want to measure only the inner diameter of a cut surface	Speedy inspection at **any position** with **no cutting**
We want to reduce the effort required for measurement of inner and outer diameters separately	Inner and outer diameters can be measured at the **same time with just one device**
We want to reduce operator errors and **work-hours**	**No complicated manual operations,** so anyone can perform the measurements
We want to measure **a small inner diameter that** cannot be measured with tools	Also supports **measurement of diameters less than 1 mm**







	LSIU	Measuring tool	Projector Microscope Image Measuring Instrument
Non-contact measurement	○	×	○
Non-destructive testing	○	△	×
Simultaneous measurement (inner diameter/outer diameter)	○	×	△
Measurement of non-transparent objects	×	○	○

○ Works best △ Works but restricted × Doesn´t work

PRODUCT LINE UP

IP67

Sensor Features

LSIU-30



LSIU-02



- **Simultaneous measurement of inner and outer diameters is now possible**
  - **LSIU-02** Outer diameter: **0.8** mm to **1.9** mm
    Inner diameter: **0.4** mm to **1.4** mm
  - **LSIU-30*** Outer diameter: **6.0** mm to **25.0** mm
    Inner diameter: **4.0** mm to **21.0** mm

  *There is a limit to the wall thickness.
  Please check the specifications section for details.

- **Excellent repeatability**
  - **LSIU-02** ±**0.4** µm
  - **LSIU-30*** ±**0.3** µm

  *The measurement range is limited.
  Please check the specifications section for details.

- **High-precision scanning using high-precision motors**
  - Laser scan rate: **3,200** times/second

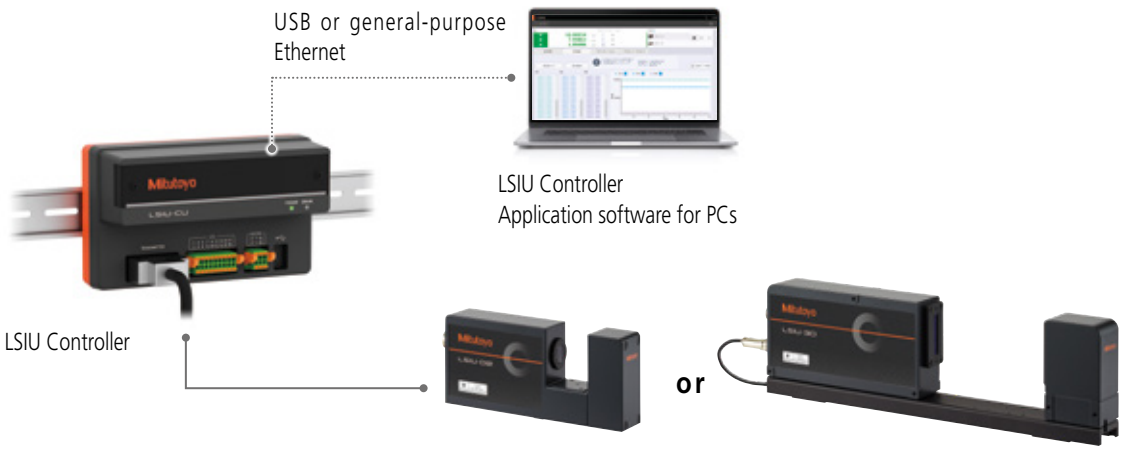
Controller Features

LSIU-CU



- **High-speed measurement by simply setting the object to be measured**
  - About **1** sample per second
- **IP67 environmental resistance**
- **Connects to USB Type-C port on computer (running dedicated software)**
- **Scan waveforms can be checked on an oscilloscope**

SYSTEM CONFIGURATION



SOFTWARE [LSIUPAK]

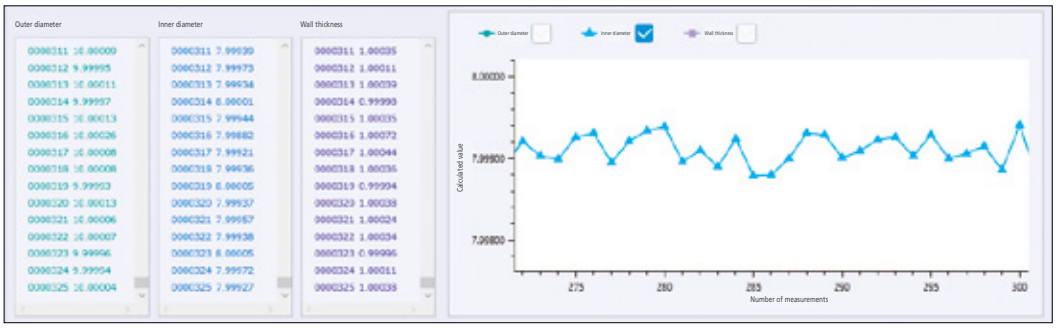
LSIUPAK is software that allows you to intuitively set LSIU measurement conditions (functions to be used, pass/fail criteria, etc.) and refractive index and perform calibration, etc.

Point 1

The outer diameter, inner diameter, and wall thickness are displayed simultaneously

In addition to displaying the inner diameter, it is also possible to simultaneously measure and display the outer diameter and wall thickness. The measurement history can be displayed in table and graph format, and data can also be saved.

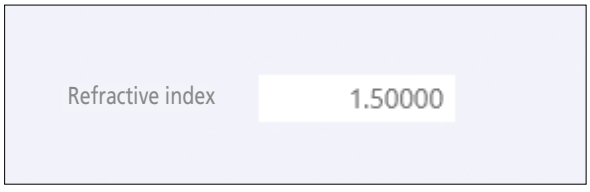


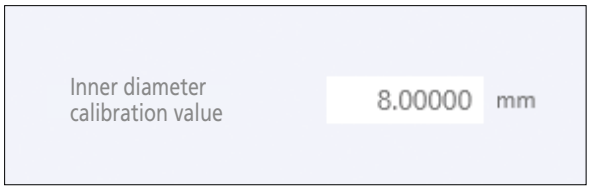


Point 2

Refractive index, calibration, and upper and lower limit settings

The refractive index can be set in accordance with the physical properties of the object being measured.
In addition, inner diameter calibration is also supported, which enables highly accurate measurements by comparison with the customer's master workpiece. Setting upper and lower limits enables pass/fail judgments to be made.







■ Sensor section

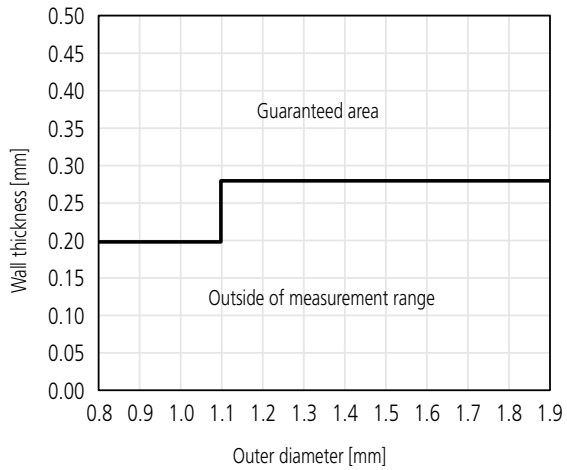
Specifications

Designation		LSIU-02	LSIU-30
Measurement range	Outer diameter	0.8 to 1.9 mm	6.0 to 25.0 mm
	Inner diameter	0.4 to 1.4 mm	4.0 to 21.0 mm
	Wall thickness	0.2 to 0.4 mm	1.0 to 3.0 mm
Minimum display amount		0.01 µm	
Repeatability (2σ) *1, *2, *3		[Within the guaranteed area] Outer diameter, inner diameter, wall thickness: ±0.4 µm	[Area (1)] Outer diameter, inner diameter, wall thickness: ±0.3 µm [Area (2)] Outer diameter, inner diameter, wall thickness: ±0.5 µm [Area (3)] Outer diameter, inner diameter, wall thickness: ±0.7 µm
Measurement area (optical axis direction x scanning direction) *4		1×2 mm	10×30 mm
Number of times averaged		256 to 2048 times	
Sampling rate *5		Approximately 1 sample/sec	
Laser class		Semiconductor laser: Class 1 (Maximum power: 1.0 mW, wavelength: 650 nm)	
Protection class *6		IP67	
Usage environment		Temperature: 0 °C to 40 °C, Humidity: 35% RH to 85% RH (no condensation allowed) Altitude: 2000 m or less	
Storage environment		Temperature: -10 °C to 50 °C, Humidity: 35% RH to 85% RH (no condensation allowed)	
Standard accessories		Signal cable USB memory (User's Manual), Quick Start Manual	

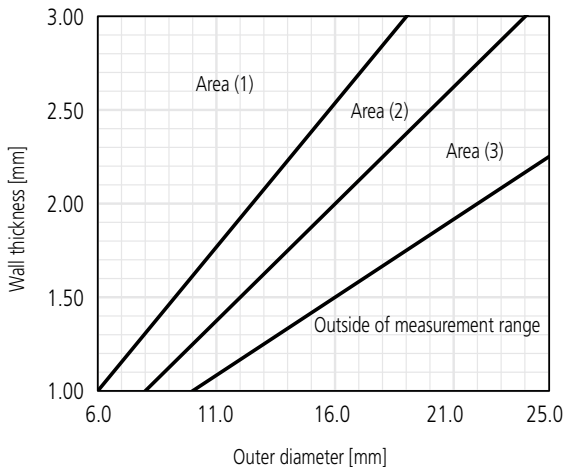
*1: Accuracy inspection is performed using our standard workpieces [glass pipe with refractive index: 1.5 (LSIU-02), acrylic pipe with refractive index: 1.5 (LSIU-30)] as the measurement object.
Environment: Temperature: 20 °C ± 1 °C, Humidity: 50% ± 10% RH
A measurement error may occur with this product due to the effect of the refractive index of the object being measured.
If the refractive index of the object being measured changes, please set the refractive index again and recalibrate.
For examples of how changes in refractive index affect inner diameter measurement results, please contact our sales department.
*2: Value of ±2σ (σ: standard deviation) when the outer diameter, inner diameter, and wall thickness of a stationary reference workpiece are measured continuously for 2 minutes with averaging over 1024 measurements
*3: Value when measured within the measurement area
*4: If you change the work position, please calibrate.
*5: Value when measured with averaging over 1024 measurements
*6: IP67 does not guarantee protection for use immersed in water.
Protection rating: IP67 (For details, see IEC 60529 and JIS C0920)
IP6X = Protection against foreign objects: Foreign objects cannot get inside
IPX7 = Protection against water: When temporarily submerged in water for the specified pressure and time, water will not penetrate to a harmful degree

Repeatability accuracy guaranteed range

LSIU-02



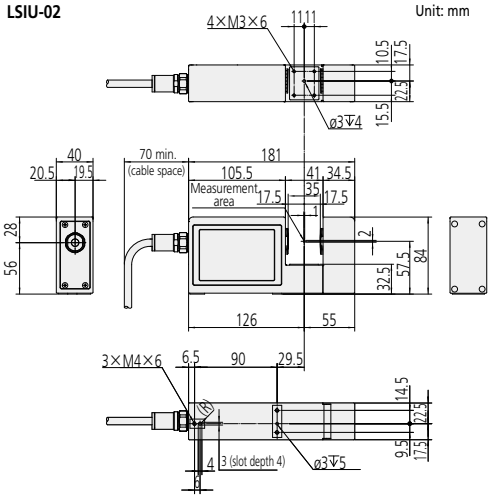
LSIU-30



External dimensional diagrams

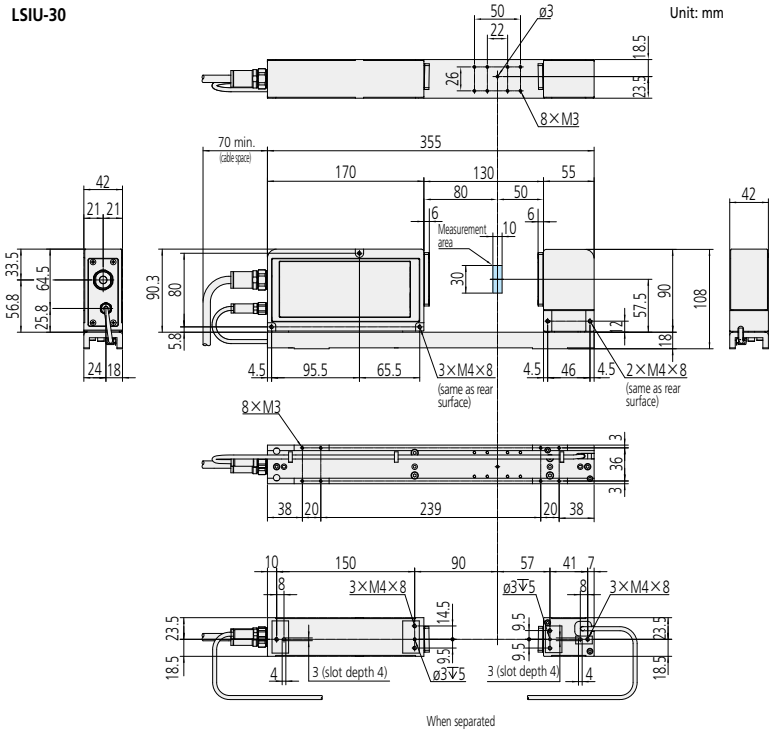
LSIU-02

Unit: mm



LSIU-30

Unit: mm



Controller

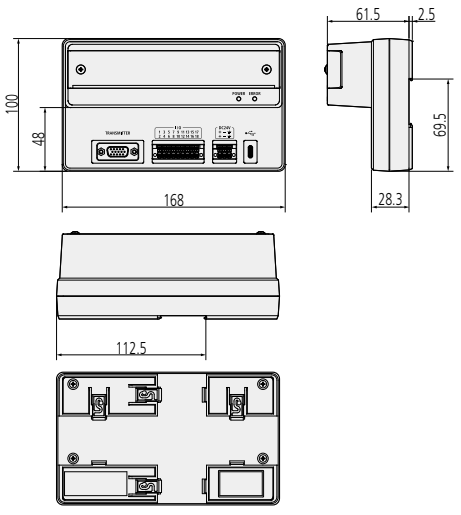
Specifications

Designation		LSIU-CU
Measurement functions	Edge specification	1 to 255
	Number of times averaged	32 to 2048 times (simple average)
	Functions	Number of parameter sets (measurement conditions): 20, workpiece position, calibration (outer diameter), analogue output (scan waveform output), display unit switching, protective glass soiling detection [Software (LSIUPAK) functions] Refractive index input, pass/fail judgment (upper and lower limits), calibration (inner diameter), preset, offset, statistical calculations
Standard interface	Indicators	[POWER] LED (green), [ERROR] LED (red)
	Signal cable connector	Mini D-Sub (15-pin)
	USB connector	Type C
	I/O connector	Separate terminal block (18-pin)
	Power connector	Separate terminal block (6-pin)
Rated power supply		DC + 24 V±10%, 3.0 A min.
Usage environment		Temperature: 0 °C to 50 °C, Humidity: 20% RH to 85% RH (No condensation allowed), Altitude:2000 m max.
Storage environment		Temperature: -10 °C to 60 °C, Humidity: 20% RH to 85% RH (no condensation allowed)
Mass		About550 g
Standard accessories		I/O terminal socket, power terminal socket, earth lead (4 m), USB memory (LSMPAK, LSIUPAK, User Manual), Quick Start Manual

External dimensional diagrams

LSIU-CU

Unit: mm



Precautions for use

Compatibility

The LSIU-02/30 LSIU sensor and LSIU-CU LSIU controller are not compatible with previous models (LSM-3000, 3100, 4000, 4100, 400 series, 5000, 5100, 5200, 6000, 6100, 6200, 500 series, 500H series, and 500S series).

Object being measured and measurement conditions

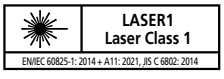
The shape and surface roughness of the object being measured may cause measurement error. In this case, be sure to calibrate using a standard gauge or master gauge with a known shape and surface roughness of the same value. If the measurement values vary greatly with the measurement conditions, high accuracy measurement can be achieved by taking as many measurements as possible.

Noise countermeasures

To prevent malfunction, do not route the signal cable and relay cable for this device together with high-voltage lines or cables that generate surge noise. Also, be sure to electrically ground the device.

Safety precautions for laser light

For measurement, this device uses a low-power visible laser beam in accordance with Class 1 (visible light) of JIS C 6802 "Safety Of Laser Products." The LSIU-02/30 LSIU sensor has the Class 1 explanatory label that is shown in the figure below.



OPTIONS

Guide pulley

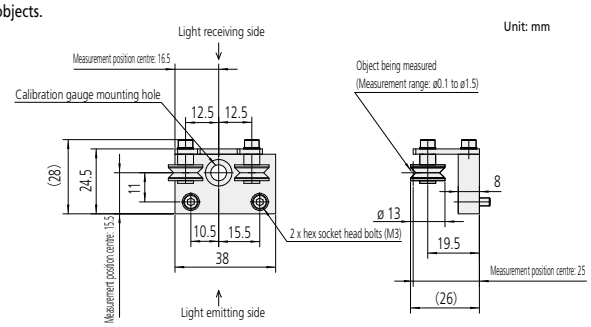
This pulley jig acts as a guide to enable stable measurement of the inner and outer diameters of transparent objects.

Applicable models	LSIU-02
Code No.	02AGD200

The measurement ranges are as follows.
LSIU-02: ø0.1 mm to ø1.5 mm
If you want to measure an object larger than ø1.5 mm, please contact our sales and service department.



Unit: mm

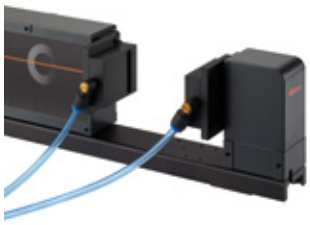


Air cleaning port cover

If there is smoke or dust on the light receiving/emitting window, clean air can be blown through the air cleaning port of the light receiving/emitting unit to keep the light receiving/emitting window clean.

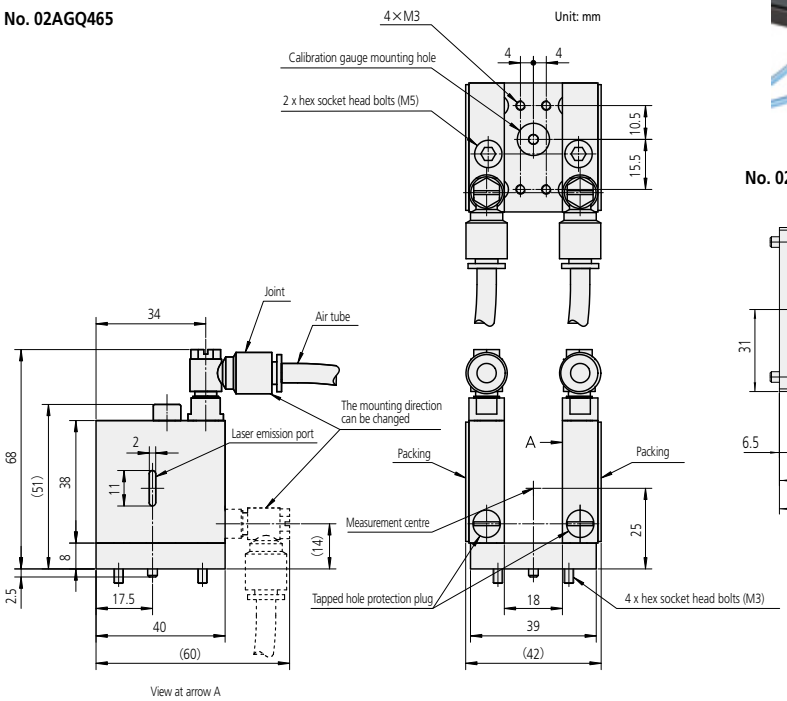
Applicable models	LSIU-02	LSIU-30
Code No.	02AGQ465	02AGQ450

*The air cleaning port cover has a 5 m long air tube (outer diameter 6 mm).



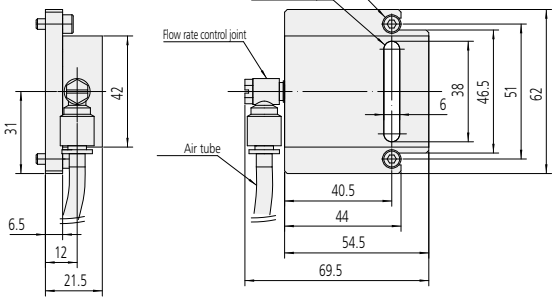
No. 02AGQ465

Unit: mm



No. 02AGQ450

Unit: mm



Controller stand

Used when installing on a workbench in a measurement room or elsewhere.

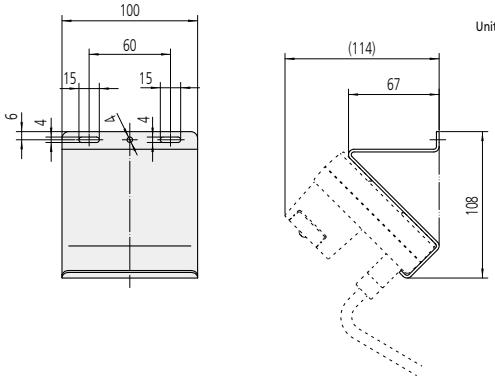
Applicable models	LSIU-CU
Code No.	02AGQ489





Usage example

Unit: mm



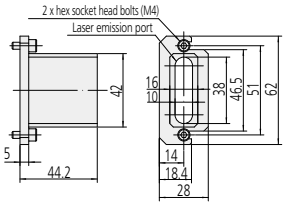
Laser beam path stabilizing cover

This suppresses variation in measurement values caused by air movement in the measurement space.

Applicable models	**LSIU-30**
Code No.	**02AGQ452**



Unit: mm

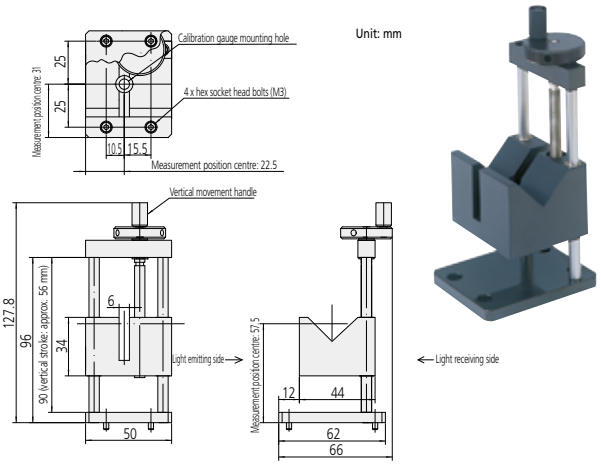


Work stage

The shaft and other parts can be set up easily and the height can be adjusted, all of which enables highly accurate measurements.

Applicable models	**LSIU-30**
Code No.	**02AGD270**

Unit: mm

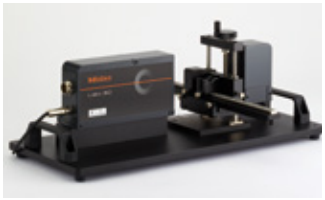


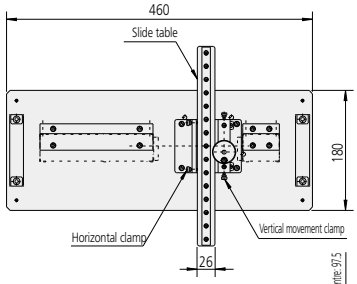
Adjustable work stage (for LSIU-30)

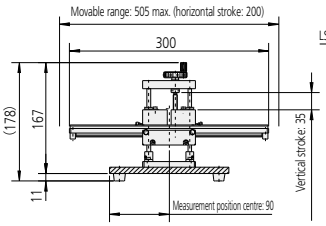
The up/down/left/right sliding mechanism makes it simple to measure the diameter of diverse objects.

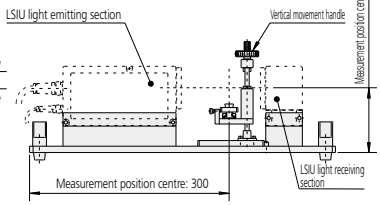
Unit: mm

Code No.	**02AGD490**
Measurement range	0.3 to 30 mm
Horizontal stroke	200 mm
Vertical stroke	35 mm
Maximum load mass	2.0 kg
Mass	4.9 kg
Standard accessories	V Block (No. **02AGD420**) x 2 Stopper (No. **02AGD430**) x 1
Accessories (options)	Double centre (No. **02AGD440**) Vertical movement V-block (No. **02AGD450**)



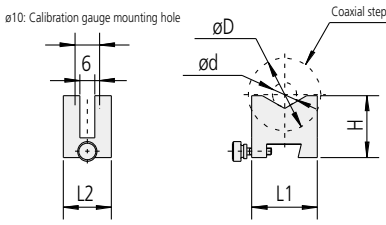






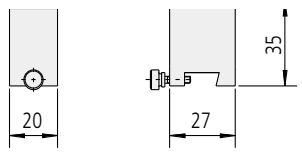
Adjustable work stage standard accessories (for LSIU-30)

V block



Code No.	**02AGD420**
Workpiece diameter øDmax	30 mm
Shaft diameter ødmax	30 mm
(øD-ød) max.	25 mm
Mass	0.03 kg (mass of one piece)
Remarks	Usable calibration gauges ø1 (No. **02AGD920**) ø30 (No. **02AGD961**)

Stopper



Code No.	**02AGD430**
Mass	0.05 kg
Application	Used to position the object to be measured

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Coordinate Measuring Machines



Vision Measuring Systems



Form Measurement



Optical Measuring



Sensor Systems



Test Equipment



Digital Scale and DRO Systems



Small Tool Instruments and Data Management



Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

Find additional product literature and our product catalogue

www.mitutoyo.eu

Mitutoyo

Mitutoyo Europe GmbH

Borsigstraße 8-10
41469 Neuss

Tel. +49 (0) 2137-102-0

info@mitutoyo.eu
www.mitutoyo.eu

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