# Mitutoyo

# Vision Measuring Systems
# QUICK SCOPE QS-L

# Height measurement now available from one machine

High-speed image auto focus achieving height measurement now standard equipment. Measurements thus far performed separately using an optical measuring instrument and an indicator are now integrated into one machine.

## Reliable small-parts measurement

High-speed 7X optical zoom with an interchangeable objective lens unit provides sharp and bright images. Measures details that cannot even be recognized when using digital zoom.
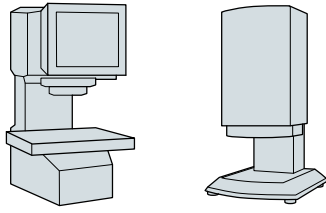
## Highlights hard-to-see edges

High-intensity 4-quadrant LED ring light generates shadows to highlight edges that otherwise would be practically invisible.

Vision Measuring Systems
# QUICK SCOPE QS-L

# Problems with simple dimensional measuring devices

**Mitutoyo**

## Problems

### ✔ Hard to measure reliably using regular microscope lighting

Some edges cannot be accurately detected and captured when using only the ring light as edge height and shape are so variable.

Indistinct image using ring light

### ✔ Cannot measure micro dimensions due to low magnification

Some micro forms cannot be measured with only a digital zoom.

Measurement of the width of micro-recessed-forms cannot be accurately performed due to low magnification
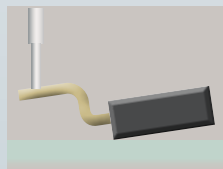
### ✔ Edge measurement of a stepped feature cannot be performed correctly

Some desired edge contrast cannot be obtained with a simple dimension measuring device that has generally low magnification due to deep focus depth
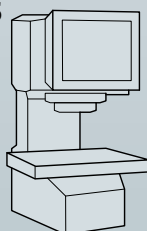
### ✔ Height measurement results are not stable

Height measurement with a contact probe

### ✔ Unsure about the integrity of measurement results to be submitted to customers

## QS-L solutions

### Edge measurement using a combination of co-axial light, ring light and transmitted light

Positive edge detection with co-axial light

### 7X optical zoom unit with interchangeable objective lenses enables measuring small parts

Edge capture with the ideal magnification is always available

Measurement of micro radii is easy with the correct magnification

### Edges can easily be captured with the interchangeable objective lens zoom unit

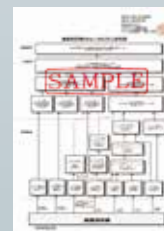Measurement with optimized optical zoom is available

### Image auto focus function is equipped as standard

Image auto focus offers sure and highly accurate measurement of target height with the minimum clamping of a workpiece

| | Image auto focus |
|---|---|
| Measurement accuracy in the Z-axis | $(4.5+0.006L)$ μm |

### Mitutoyo provides inspection/calibration services using reference instruments that are traceable to the national standard

SAMPLE

# Generic technology realizes accurate measurement

**7X optical zoom unit with interchangeable objective lenses** offers reliable small-parts measurement

Newly designed 7X optical zoom unit with interchangeable objective lenses securely captures measurement targets from wide-field to micro form. In addition, 4X digital zoom is available using software.

**Cutting tool**

0.75X
0.98X
1.28X
1.5X
2.25X
3X
3.75X
5.25X    1.5X objective

**Plastic molded article**

0.5X
0.65X
0.85X
1X
1.5X
2X
2.5X
3.5X    1X objective (optional)

**LED device**

1X
1.3X
1.7X
2X
3X
4X
5X
7X    2X objective (optional)

1X objective (optional)
1.5X objective (standard accessory)
2X objective (optional)

| Optical magnification | 0.5X | 0.65X | 0.75X | 0.85X | 0.98X | 1X | 1.28X | 1.3X | 1.5X | 1.7X | 2X | 2.25X | 2.5X | 3X | 3.5X | 3.75X | 4X | 5X | 5.25X | 7X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| View field  Horizontal (H) (mm) | 13.2 | 10.2 | 8.8 | 7.8 | 6.8 | 6.6 | 5.2 | 5.1 | 4.4 | 3.9 | 3.3 | 2.9 | 2.6 | 2.2 | 1.8 | 1.7 | 1.7 | 1.3 | 1.2 | 0.9 |
| Vertical (V) | 9.9 | 7.7 | 6.6 | 5.9 | 5.1 | 5.0 | 3.9 | 3.8 | 3.3 | 2.9 | 2.4 | 2.2 | 2.0 | 1.6 | 1.4 | 1.3 | 1.2 | 1.0 | 1.0 | 0.7 |
| Total magnification (on the monitor) | 20 | 26 | 30 | 34 | 39 | 40 | 51 | 52 | 60 | 68 | 79.3 | 89 | 99.3 | 119 | 138.7 | 149 | 158.7 | 198.7 | 208 | 277.3 |

| Objective lens | | |
|---|---|---|
| 1X objective (optional) Working distance | 74 mm | |
| 1.5X objective (standard accessory) Working distance | 42 mm | |
| 2X objective (optional) Working distance | 42 mm | |

Note: The total magnification indicates the magnification on the monitor when the **QSPAK** video window size is the default 252.7 x 214.9 mm.

# High-speed image auto focus enables highly accurate height measurement

Since non-contact measurement requires only the minimum clamping of the workpiece, height measurement can be performed efficiently. Also, in contrast with laser-equipped measuring devices, height measurement is less influenced by the surface roughness of the workpiece.

| | Image auto focus |
|---|---|
| Measurement accuracy in Z-axis | (4.5+0.006L) µm |
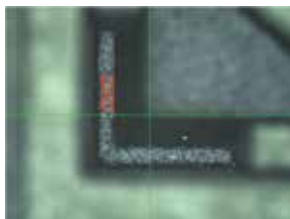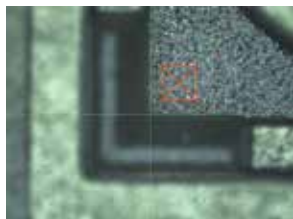


Sectional view
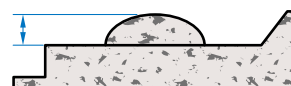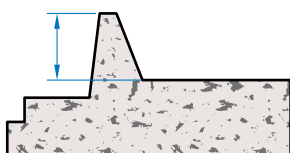
# LED light unit offers a high degree of freedom for reliable edge measurement

The view may vary depending on the type of method used for lighting the workpiece.
The **QS-L** can capture edges accurately by switching between transmitted lighting, co-axial lighting and ring lighting.



Transmitted light

Co-axial light
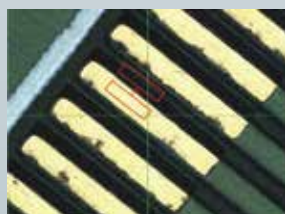
Ring light
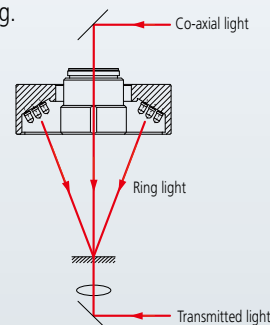
**4-quadrant LED ring light**



Back

Front

Right

Left

**Lighting tool (Contrast and brightness)**

The lighting tool offers automatic setting of the ideal light intensity so that constant brightness can be maintained. It also eliminates data dispersion caused by lighting conditions.



Dual-area contrast tool

Brightness tool

# Software enables easy operation and reliable measurement QSPAK

## Large screen makes detailed operations easy

All the functions needed for measurement are displayed on one screen; measurement can be performed by simply moving the mouse. Large images enable users to measure details with ease.
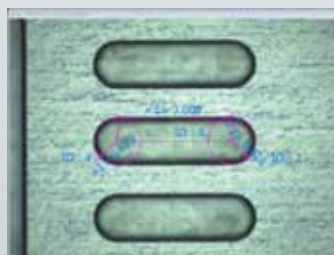


## Many commands enable fast measurement

A wide choice of commands including various distance and intersection point measurements enables easy and reliable measurement.
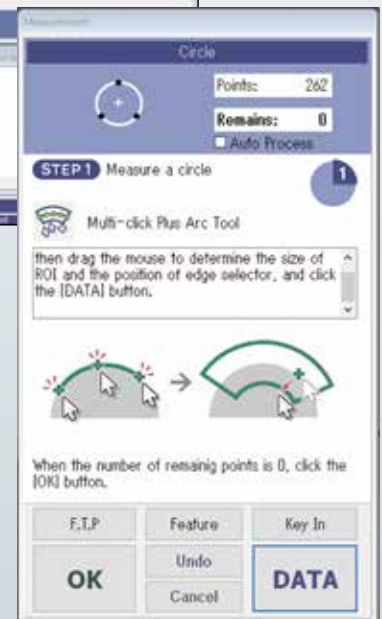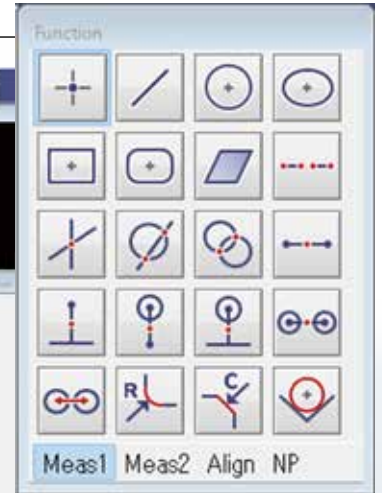


## Eliminates confusion between results and points

Since measurement result images are displayed, confusing results that can occur with just showing measuring points can be eliminated.



## Detection tools matched to targets
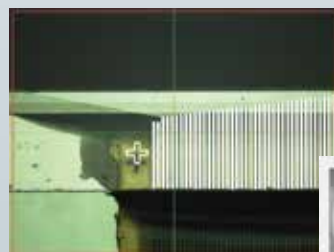
Detection tools can be selected according to the measuring point in order to capture edges with high accuracy.



Pattern tool

## One-click edge detection

Circles, lines and dots around the measurement point can be read out instantly with one-click of the mouse.
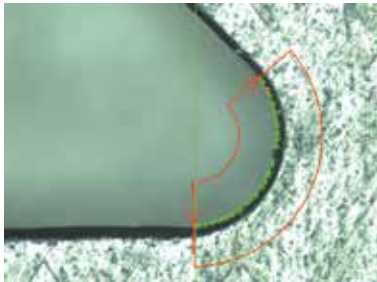


One-click line tool

## User-friendly operation guidance

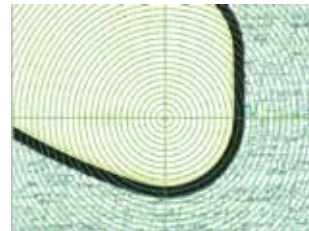When a command is selected, an explanation of the corresponding operation method is provided.

## Remove influence from breakage and burrs by excluding abnormal points

Erroneous measurement points caused by dust adhering to a workpiece including breakage and burrs are automatically removed. The removal threshold can also be set easily.
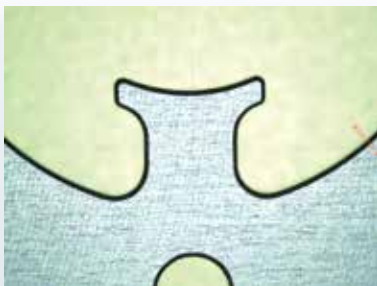


## Form tolerance is also supported

The auto trace tool enables tracking and acquiring contours on the screen by copying automatically.
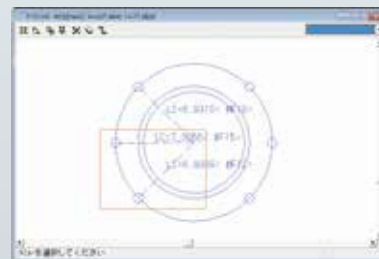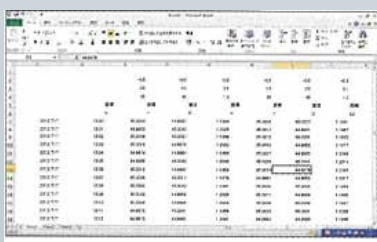


**In addition**

## Identifies desired measuring points quickly

Measuring points can be quickly found in the graphical window. Operations on measured elements using graphics can also be performed easily.



## Totalization of daily measurements can be easily performed

CSV output of measurement results is available so that they can be used for statistical data processing with Excel.



**In addition**

## Template function

The template function making forms visible is featured for the first time.



Concentric circle template

User template

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**Option**



The **FORMTRACEPAK-AP** optional analysis software can provide advanced dimensional analysis.

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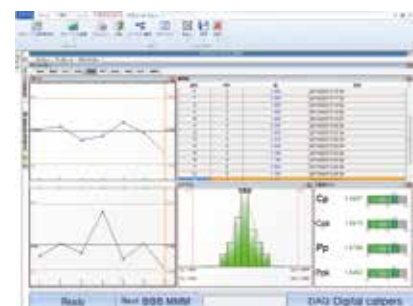
**Option**



The optional **MeasurLink** software provides the statistical process control (SPC) control charts, histograms and process capability indexes.

# Mitutoyo

# Manual Vision Measuring Machine with Motor-operated Z-axis QS-L/AFC



## Specifications

| Model | | QS-L2010Z/AFC | QS-L3017Z/AFC | QS-L4020Z/AFC |
|---|---|---|---|---|
| Order No. | | **359-713 -10** | **359-714 -10** | **359-715-10** |
| Drive method | | X/Y axes: Manual    Z axis: CNC with Auto focus | | |
| Measuring volume | | 200×100×150 mm | 300×170×150 mm | 400×200×150 mm |
| Resolution / Scale type | | 0.1 µm / Linear encoder | | |
| Accuracy [1][2] | X axis, Y axis | (2.2+0.02L) µm | | |
| | Z axis | (4.5+0.006L) µm | | |
| Accuracy guaranteed temperature range | | 20±1 °C | | |
| Observation unit [3] | | 7X zoom (8 steps) interchangeable objective lenses (1X objective 0.5X - 3.5X; 1.5X objective 0.75X - 5.25X; 2X objective 1X - 7X) | | |
| Image sensor | | 3 Megapixel, CMOS color camera | | |
| Illumination | Transmitted light | white LED | | |
| | Co-axial light | white LED | | |
| | Ring light | 4-quadrant ring light (LED) | | |
| Dimensions (main unit, WxDxH) | | 624×711×729 mm | 692×857×837 mm | 757×867×837 mm |
| Stage glass size | | 250×150 mm | 370×240 mm | 450×240 mm |
| Maximum stage loading | | 10 kg | 20 kg | 15 kg |
| Mass (main unit) | | 70 kg | 160 kg | 167 kg |

*1: Inspected to Mitutoyo standard. L =  measuring length (mm)
*2: 3X lens magnification or greater
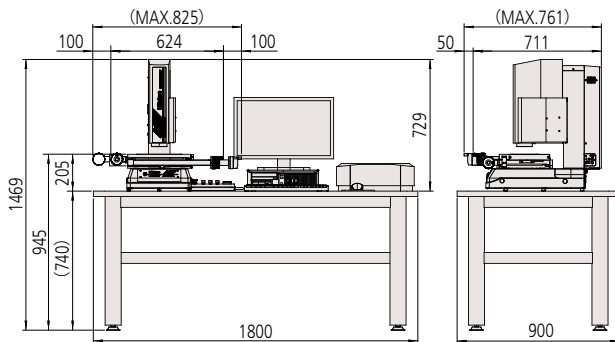*3: 1X and 2X objective lenses are optional

## Remote box



Adjustment knob for co-axial light, transmitted light and ring light intensity

Emergency stop switch

Speed adjustment knob

X-/Y-/Z-axis reset button

Outer: Jog-shuttle (Z-axis fast feed)

Inner:
Jog dial (Z-axis fine acceleration)

Data input button

Zoom switch button

Auto focus button

## External dimensions

### QS-L2010Z/AFC



(MAX.825)
100  624  100
(MAX.761)
50  711
729
1469
945
205
(740)
1800
900

### QS-L3017Z/AFC



(MAX.956)
150  656  150
(MAX.942)
85  857
837
1577
247
987
(740)
1800
900

### QS-L4020Z/AFC



(MAX.1157)
200  757  200
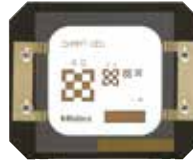(MAX.957)
100  857
837
1577
247
987
(740)
1800
900

## Option

### ■ Calibration chart



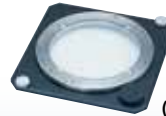| Order No. | 02ATN695 |
|---|---|
| Application | This corrects the pixel size of the camera, the accuracy of automatic focusing at each magnification and optical axis offset. |

### ■ Foot switch (Solid type)



| Order No. | 12AAJ088 |
|---|---|

### ■ Turntable with fine adjustment (A), (B)



| | (A) | (B) |
|---|---|---|
| Order No. | 176-305 | 176-306 |
| External dimensions | 280(W)×280(D)×24(H) mm | 342(W)×342(D)×23(H) mm |
| Effective glass size (mm) | ø182 | ø238 |

Note) V-block stage, swivel center support and holder with clamp can be fixed on the table.
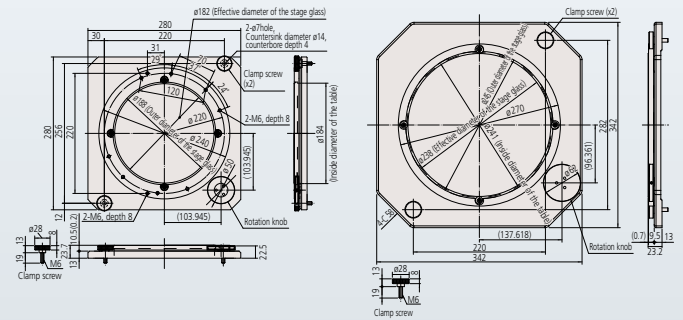


### ■ Holder with clamp

| Order No. | 176-107 |
|---|---|
| Maximum length of the clamp | 35 mm |

### ■ V-block with clamp

| Order No. | 172-378 |
|---|---|
| | Maximum supportable diameter: 25 mm Center height from the mounting surface: 38 - 48 mm |

### ■ Swivel center support



| Order No. | 172-197 |
|---|---|
| | ±10° swivel is available, minimum readable angle 1° Suitable for measurement of screw |

* Adapter B (176-310) is separately required for size 2010.
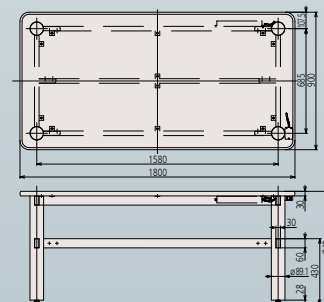* Adapter B (176-304) is separately required for size 3017 and 4020.

### ■ Stage adapter Stage adapter B

| Order No. | Stage adapter: 176-304 Stage adapter B: 176-310 |
|---|---|
| Application | Some optional products require this be mounted on the measuring machine. |

Note) A set consists of 2 sheets.

### ■ Exclusive table



| Order No. | 02ATE760 |
|---|---|
| External dimensions | 1800(W)×900(D)×740(H) mm |
| Mass | 60 kg |

# Optional software

## FORMTRACEPAK-AP

Geometrical tolerance, contour degree evaluation and micro dimension analysis can be performed on the basis of the contour data obtained using a quick scope.
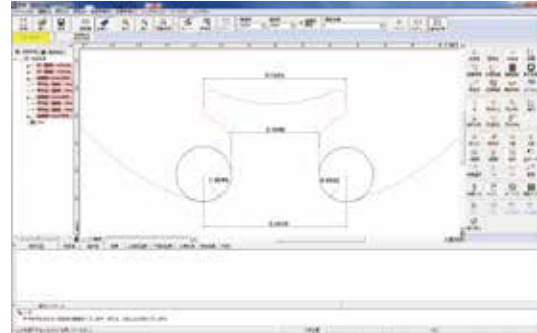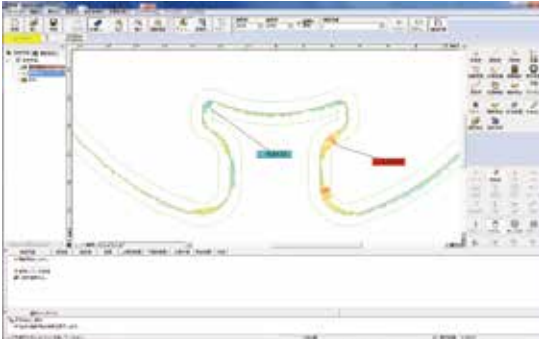




## MeasurLink Real-Time Professional

**MeasurLink Real-Time** is the Statistical Process Control (SPC) software that displays statistical processing results including control charts, histograms and process capability indexes in real-time based on data collected through the quick scope and measuring devices and systems.
The software helps prevent generating scrap by tracking dimension variation trends so that early preventive action can be taken when a process is seen to be about to produce product outside the tolerance limits.
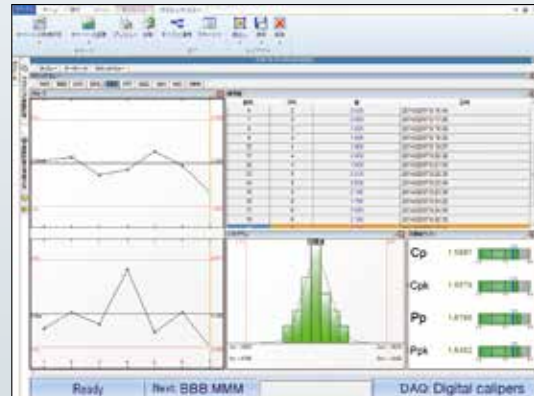




## QS-CAD I/F

- Specifies the current observation point corresponding to stage position information.
- Can extract design information from graphic elements and omit key input during verification.
- Output of measurement results as CAD data is available.
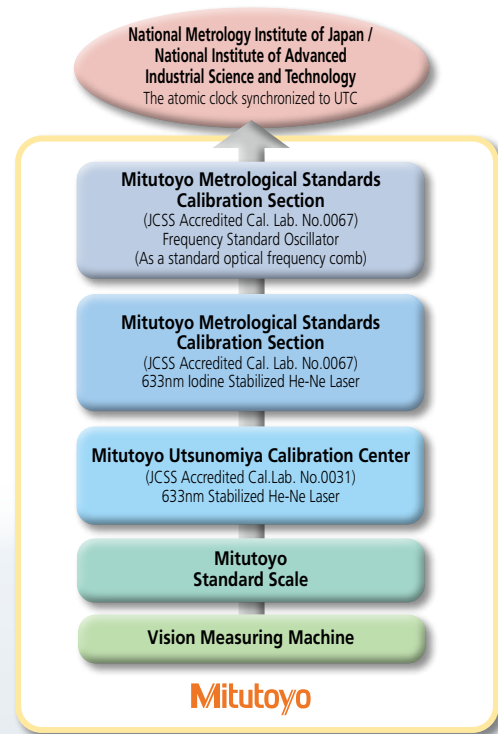


## Measure Report

This software creates inspection sheets from data collected by measuring devices and systems including the quick scope, using a layout offering a high degree of freedom.
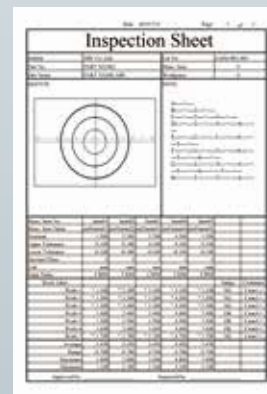
# Traceability

## Traceability to the national standard of length

- Mitutoyo owns standard scales that are traceable to the national standard of length and these are used to calibrate the reference gages used for calibration of measuring instruments, thus establishing and maintaining traceability for each instrument.
- Our calibration organizations are accredited by IAJapan, a signatory to the Mutual Recognition Arrangement (MRA) of the International Laboratory Accreditation Cooperation (ILAC), and approved of as having measurement skills equivalent to those of overseas organizations.
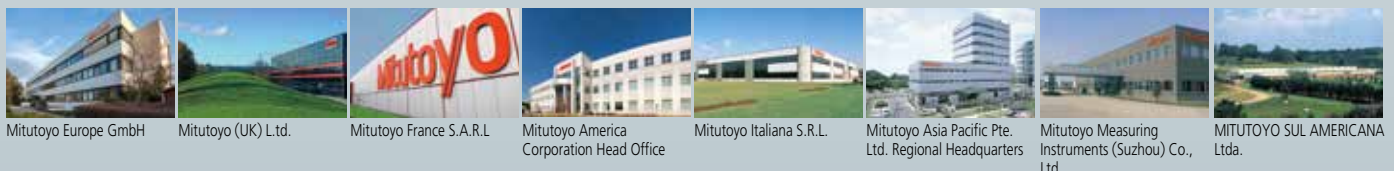
**National Metrology Institute of Japan /
National Institute of Advanced
Industrial Science and Technology**
The atomic clock synchronized to UTC

**Mitutoyo Metrological Standards
Calibration Section**
(JCSS Accredited Cal. Lab. No.0067)
Frequency Standard Oscillator
(As a standard optical frequency comb)

**Mitutoyo Metrological Standards
Calibration Section**
(JCSS Accredited Cal. Lab. No.0067)
633nm Iodine Stabilized He-Ne Laser

**Mitutoyo Utsunomiya Calibration Center**
(JCSS Accredited Cal.Lab. No.0031)
633nm Stabilized He-Ne Laser

**Mitutoyo
Standard Scale**

**Vision Measuring Machine**

Mitutoyo

## Reliable support system

## The world's top-level global network

Following the establishment of MTI Corporation (U.S.) in 1963, Mitutoyo has been expanding its market presence throughout the world. Currently, the company has R&D, manufacturing, sales, and engineering service bases in 29 countries, as well as a network of distributors in some 80 countries. Mitutoyo maintains its rock-solid status as a leading global manufacturer providing services tailored to each regional society.

**Headquarters**

- ■ Sales
- ■ Research and development facility
- ■ Manufacturing facility

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Instruments (Suzhou) Co.,
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MITUTOYO SUL AMERICANA
Ltda.

| Coordinate Measuring Machines | Vision Measuring Systems | Form Measurement | Optical Measuring |
|---|---|---|---|
| **Sensor Systems** | **Test Equipment and Seismometers** | **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 bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

Note: Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon.
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