Mitutoyo

Mitutoyo Quality

2-D Color Vision Measuring System
QUICK IMAGE Series

The 2-D Measuring System Designed and Manufactured by Mitutoyo

Superior addition to your quality control system

Simple to operate with easy-to-use measurement functionality

Reliability

Usability

Efficiency

Outstanding improvement in operational efficiency and productivity

2-D Color Vision Measuring System
QUICK IMAGE Series

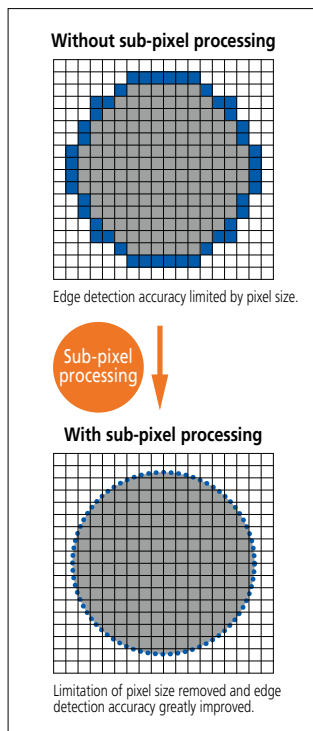# Reliability   Superior Addition to Your Quality Control System

Perform Stable, Highly Accurate Measurements Anywhere Within the Screen

The highest level of measuring accuracy within the screen in its class   Patent registered (Japan)

- Accuracy of ±1.5µm within the screen, repeatability of ±0.7µm in high-resolution mode (QI-B Series) and the ability to focus through a wide range of applications.

Both a wide view field and high accuracy

- Sub-pixel processing enables high-accuracy edge detection.

Without sub-pixel processing

Edge detection accuracy limited by pixel size.

Sub-pixel processing

With sub-pixel processing

Limitation of pixel size removed and edge detection accuracy greatly improved.

Sub-pixel processing image

Stable and Highly Accurate Measurement of Large Workpieces

Highly accurate stages

- Stages come in various sizes with an accuracy of ± (3.5 +0.02L) µm, letting you perform highly accurate and stable measurements and obtain reliable data for any kind of workpiece.

Rigid construction

- Robust construction with a maximum load capacity of 20kg (approx. 44 lbs.) and a vertical stroke of 100mm allows large workpieces to be measured.

240mm
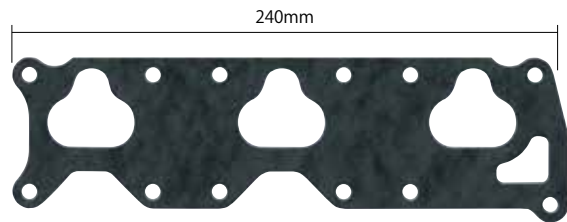
Gasket

Light alloy die-cast part

Ultra-long Working Distance of 90 mm

- The 90mm working distance ensures you can focus, even with stepped workpieces, without worrying about collisions.
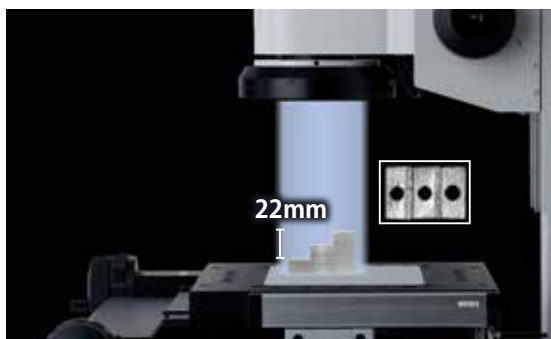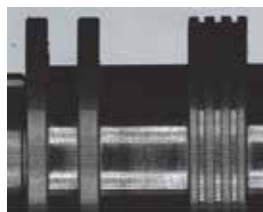
Human Errors Due to Focusing are Eliminated

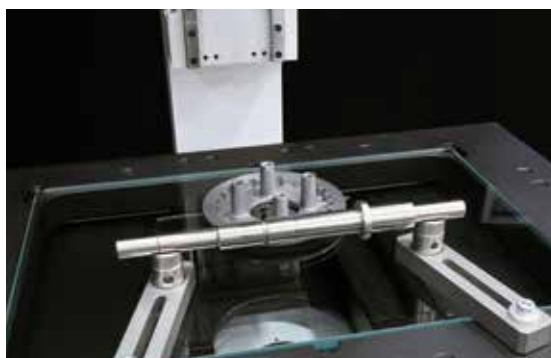## Utilizes our in-house-developed Telecentric Optical System   Patent registered (Japan, the U.S.A. and Europe)

• Errors due to height are greatly minimized within a depth of focus with steps of up to 22mm. Measurement errors due to human focusing are eliminated.

22mm
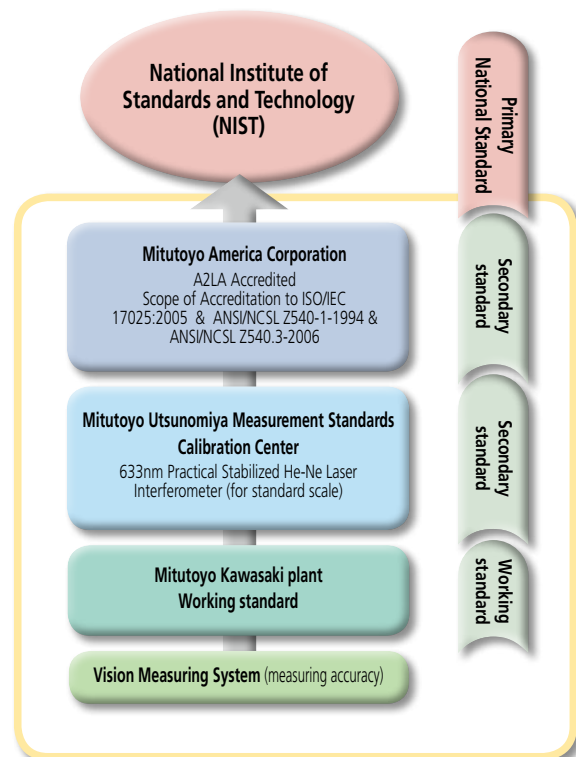
Measuring a stepped workpiece

Measuring of a cylindrical workpiece

Traceability to National Standards

Mitutoyo...

Uses calibration artifacts traceable to national standards

• Mitutoyo has a large collection of standard artifacts whose dimensions are traceable to the national length standards of Japan and the USA. These artifacts are used to calibrate the specialized equipment used in the calibration of Mitutoyo's measuring tools and instruments so traceability to international length standards is established and maintained. Mitutoyo also provides a temperature calibration service that is absolutely essential to high-accuracy length measurement.

National Institute of Standards and Technology (NIST)

Primary National Standard

Mitutoyo America Corporation
A2LA Accredited
Scope of Accreditation to ISO/IEC 17025:2005 & ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

Secondary standard

Mitutoyo Utsunomiya Measurement Standards Calibration Center
633nm Practical Stabilized He-Ne Laser Interferometer (for standard scale)

Secondary standard

Mitutoyo Kawasaki plant Working standard

Working standard

Vision Measuring System (measuring accuracy)

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Usability — Simple to Operate with Easy-to-Use Measurement Functionality

New **Entire View of a Large Workpiece Drastically Improves Ease of Operation and Measurement Efficiency**

Stitching Function

- A newly developed correction algorithm stitches multiple images together (multiple image-to-image coupling) while maintaining high-accuracy measurements.
  After a stitching operation, measurement is easily processed without the need to move the stage.

Full (single image) multiple field of view measurement processing and programming
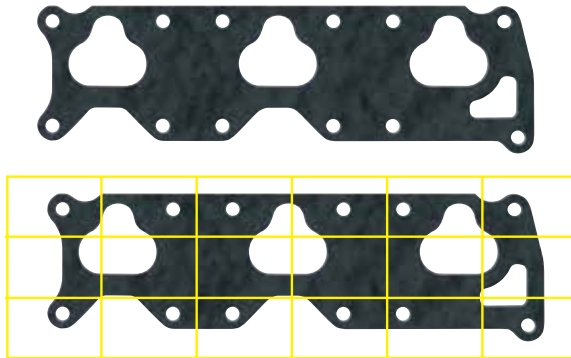

Multiple view-field stitching image
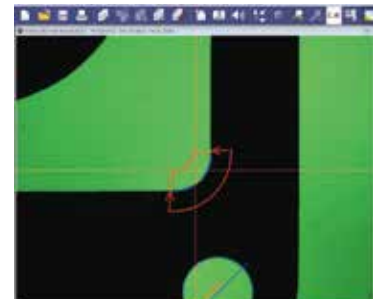
High-accuracy measurement of a small feature is achieved by the image zoom function
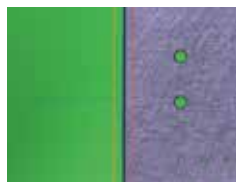
Simple Execution of Multiple Measurements

One-click tool

- With just one click, anyone can easily perform multiple measurements. The outlier removal function automatically eliminates unnecessary measurement points, thus enabling accurate and stable multipoint measurement.
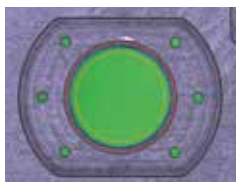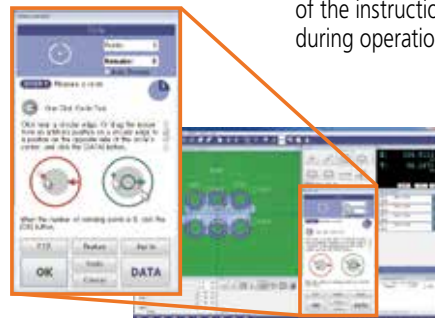

One-click circle tool

One-click box tool

Easy-to-Operate Without Instruction

EZ mode   Design application pending (Japan)

- This mode provides an operation guidance display to guide the operator even if it's their first time performing measurements. This removes the need for continual reference of the instruction manual during operation.

No Troublesome Positioning is Required

One-click execution function   Patent pending (Japan)

- After placing the workpiece within the field of view, the machine automatically recognizes the position and angle using a pattern search function and then finishes the measurements. There is no need for positioning and axially-aligning the workpiece.
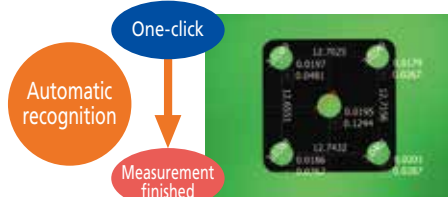
The position and inclination of a workpiece can be measured even if it has moved

An Intuitive OK/NG Judgment of Measurement is Provided

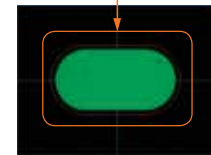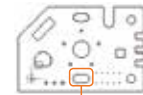## Template comparison test function

- The test function compares workpieces against their templates to enable OK/NG judgments to be made at a glance. The function lets you utilize a drawing and CAD model for templates. Standard template shapes can also be created.

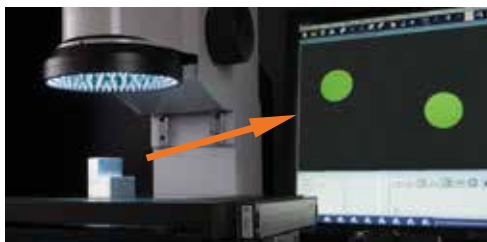Enhanced rectangle template

User template

CAD user template
Note: QS-CAD I/F is required (available as an option).

Simple Focusing

Wide focus range

- Our specifically designed optical system achieves the long focal depth of 22mm. This allows measurement without the time-consuming focusing task, supporting an efficient measurement operation.


Focusing in on a stepped workpiece like the one shown above is unnecessary with the telecentric objective.

Capable of Visually Capturing an Entire Image

Graphics function

- The current position, coordinate system, measuring item and measurement result are automatically displayed in a graphics window. The graphics window prevents omissions and errors with the measurements from occurring. 2-D CAD model data can be imported (optional) in order to better capture the actual full image.
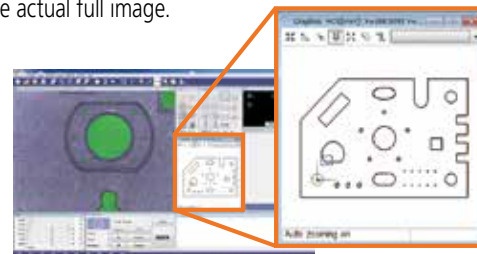
Perform Quick Measurements Even on Large Workpieces

Quick release mechanism on the XY stage   *QI-A series, QI-B series

- Quick-release mechanisms are built into both fine feed controls on the XY stage. This allows the stage to be moved rapidly to bring the next measuring point into view no matter where it is on the workpiece.
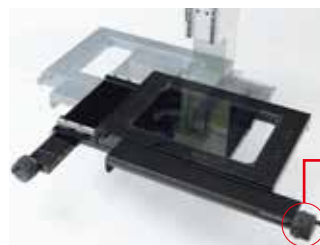
Quick-release ring

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New User-friendly and Convenient XY Stage Movement

New Lineup of Motor-driven Stage Models *QI-C series

- The joystick provides an easy, convenient control for coarse and fine feed of the stage. This effortless moving of the XY stage demonstrates outstanding performance in long-length measurement. The motor-driven stage automatically moves for stitching by specifying its start and end points.

Dedicated remote box

Motor-driven stage

Confirm Measurement Results Quickly and Easily

Video window measurement result display function

- Measurement results can be understood intuitively just by looking at a measurement image. Any out-of-tolerance result data is easily identified by changing its display color. A graphic image with measurement data also leads to creation of a user-friendly report.
- Each OK/NG result is color-coded with its operator selectable display color.
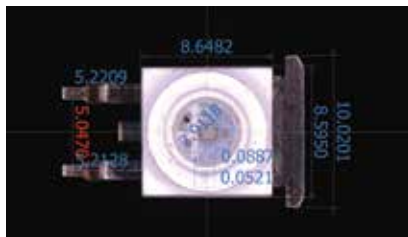
The measurement results display for OK/NG can be color-coded to meet your requirements.

Capable of Supporting a Variety of Workpieces

Large-stage model and extensive line up of stages

- The large stage allows you to arrange multiple workpieces and measure them in a single setup, thereby saving valuable time that would otherwise be spent in loading and unloading the stage.
- XY measurement range: Measure workpieces up to 400x200mm.
- 100mm Z-stroke allows you to measure tall workpieces.
- A maximum load capacity of 44 lbs (20Kg) allows you to measure heavy workpieces.

24.01"(610)
17.71"(450)
9.44"(240)
13.46'(342)
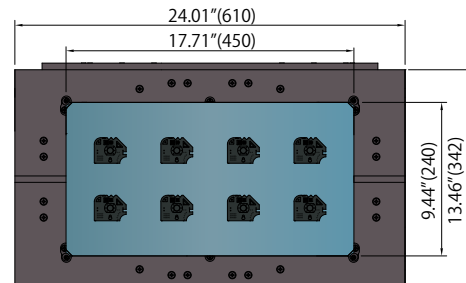
Take advantage of the largest stage by performing multiple measurements at one setup.

Measure Multiple Workpieces Within the Field of View All at Once

Locate and measure multiple workpieces with just one click

• Use pattern search for multiple workpieces within the screen view, and measure them all in one operation with the one-click execution function. This eliminates the need for accurate positioning of workpieces and cumbersome setup of fixtures.
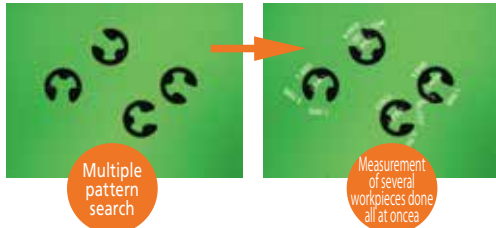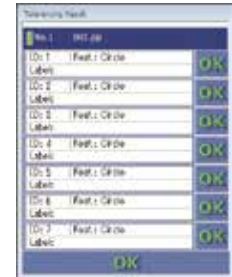

Multiple pattern search

Measurement of several workpieces done all at oncea

Simple "OK/NG Judgment" of Multiple Workpieces

Tolerance judgment result display function

• OK/NG judgment can be seen at a glance for faster operation.
• OK/NG judgment can be done for each measurement item, and judgment can be passed on each workpiece.
• Prevents NG data omissions.

Generate Reports and Observe All On One Machine

High-definition color camera

• This camera provides high-resolution color images for effective use in high-accuracy measurement and workpiece surface observation. Bright color measurement images are easily stored as a file and can be used for creating an easily understood measurement report.
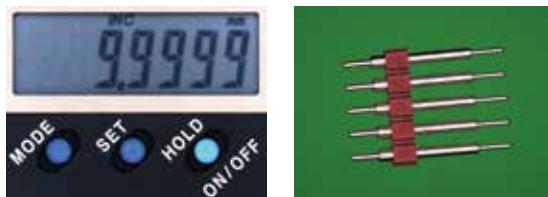
Simple Execution of Stored Measurement Programs

Program launcher

• A measurement procedure program can be stored under a dedicated icon along with a photo and comments to enable the required programs to be started easily.
• 10 icons are available and programs can be managed for each operator or workpiece.

Program launcher icons

Automatic measurement procedure program storage window
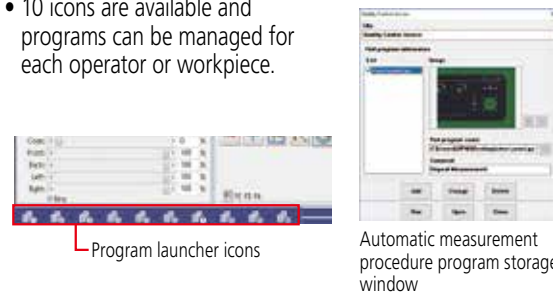
High Accuracy Measurement with Bright and Clear Images

Wide field of view / high-resolution mode

• The high resolution mode produces the same wide field of view as the normal mode that operates with a deep focal depth. This allows you to share a single measurement procedure so that you can execute seamless measurements.
• The shallow depth of focus in high resolution mode shows the edges of stepped workpieces more clearly, making measurements highly accurate.

Enhanced illumination   Patent registered (Japan)

• The enhanced illumination function of the high-resolution mode enables measurements of low reflectivity workpieces like rubber and black resin moldings to be performed with a clear image.

Clear edges
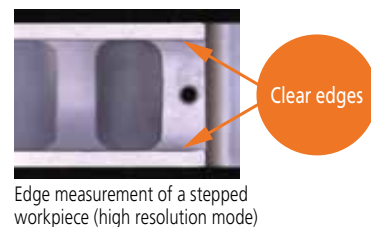
Edge measurement of a stepped workpiece (high resolution mode)

Surface observation of black rubber

Measurement Examples

Progressive Die-pressed Parts
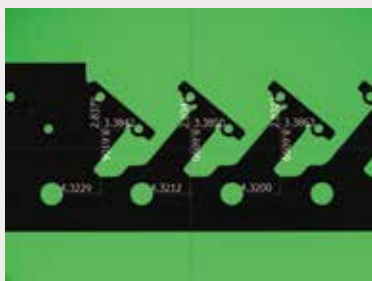
Measure the diameter and difference in coordinates of each hole.

O-ring / Seals

Enhanced illumination is very effective for low reflectivity materials such as rubber and black resin.
(Use ring illumination in high-resolution mode + enhanced illumination

Weatherstrip

Execute a pattern search unrelated to position and finish measuring in one click.

Measuring a Small Stepped Workpiece

You can see and measure edges easily with just one quadrant of the ring light providing illumination.

Measuring a Stepped Workpiece

Measure with simple focusing.

Sheet Switch Measurement

The color camera allows enhanced observation and measurement of workpieces. It is best suited to the inspection of printed materials and creation of a report.

Standard Software QIPAK

QIPAK (Two Modes) Enables Quick and Easy Measurement

EZ Mode
(Simple measurement mode)

PRO Mode
(General purpose measurement mode)
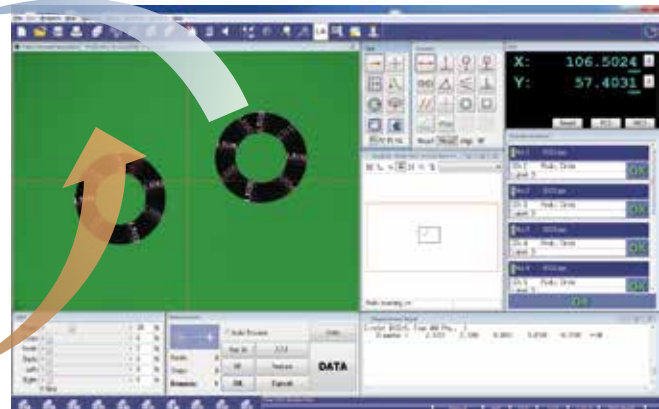
Simple Execution and Editing of Programs

Smart editor

This function allows XY-stage target position, illumination condition, etc., to be separately displayed as icons or labels in the list of part programs (automatic measurement procedure programs), thereby simplifying program editing.
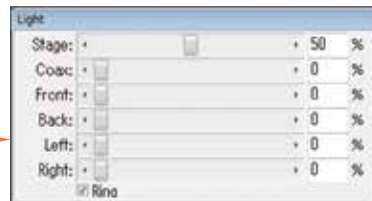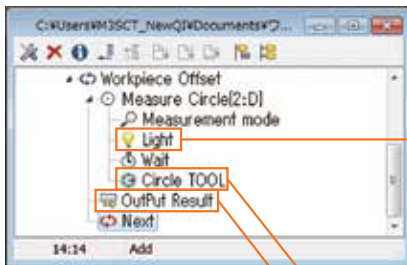
Editing an illumination condition according to the dialog

Editing a circle tool on the video window

Editing design values and tolerances according to the dialog

Powerful Edge Detection Functionality Enables Fast Measurement

Outlier removal
Removes outliers caused by anomalies such as debris, burrs and chips.

Auto trace tool
Automatically detects the edges of unknown contours and obtains point group data.
Point group data lets you perform contour form analysis and design value comparison using FORMTRACEPAK-AP (optional).

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Optional Accessories

Easy Handling of Sophisticated Dimension and Contour Evaluations

Contour evaluation and analysis software: FORMTRACEPAK-AP

FORMTRACEPAK-AP is data processing software for advanced form analysis that carefully reads point group date acquired via tools such as the auto trace tool.

- A contour measurement is easy to make. Perform contour matching against the design value data.
- You can define virtual circles of a given diameter enabling over-pin diameter analysis to be performed.

Example of gear contour matching, and an over-pin diameter analysis

CAD Model Import

Measurement support software: QS-CAD I/F

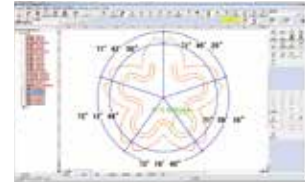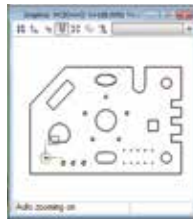2-D CAD model data (DXF-, or IGES-formatted) can be imported into QIPAK. Conversely, QIPAK measurement results can be converted into 2-D CAD model data. The design value for each measurement item is automatically entered. Since the graphics window makes the present location easy to identify, the operator can quickly move the stage to a given point in the 2D CAD model.

Early Detection of Process Irregularities

Centralized process management software: MeasurLink

Statistical data can be displayed in real-time, making early detection of process irregularities possible. Early identification of an out-of-control situation enables rapid remedial action to be taken when necessary.
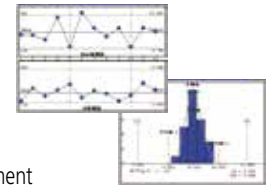
Examples of remedial action
- Mold repair or cycle-timing change
- Cutting tool adjustment or replacement

Holder with Clamp

Clamping of thin workpieces such as PCBs and pressed parts.

Order No.: **176-107**
Maximum clamp length: 35mm
Dimensions: 62(H)×152(W)×38(D)mm
Mass: 0.4kg

Note: An adapter set is required.

V-block with Clamp

Clamping of cylindrical objects

Order No.: **172-378**
                    Max. supportable diameter: ø25mm
                    Center height from mounting face: 38-48mm
Dimensions: 117(H)×90(W)×45(D)mm
Mass: 0.8kg

Note: An adapter set is required.

Foot Switch

Quick data entry while gripping the handle.

Standard type
Order No.: **937179T**

Rigid type
Order No.: **12AAJ088**

Stage Adapter Sets

These are used when connecting some optional peripherals to the measuring device.

Order No.: **Stage adapter :   176-304**
                    Stage adapter B : 176-310
Dimensions (1piece): 50(W)×340(D)×15(H)mm
                    Note: The stage adapter B is 280(D).
Mass: Stage adapter: 1.5Kg
                    Stage adapter B: 1.2Kg

		Stage size	
		1010 2010	2017 3017 4020
176-304	Stage adapter	—	○
176-310	Stage adapter B	○	—

Note: One set consists of two adapters.

Swivel Center Support

Clamping of the workpiece between centers for effective thread diameter and depth measurements.

Order No.: **172-197**
                    Can be set to an inclined angle of ±10°,
                    in minimum increments of 1°
Max. supportable dimensions:
                    When horizontally positioned: ø80×140mm
                    When tilted at 10°angle: ø65×140mm
Mass: 2.5kg

Note: An adapter set is required.

Optional Accessories

Ring Light Diffusion Plate

Order No.: **02ATX180**

Effective on a diffusely reflective workpiece such as a machined surface. This plate makes the surface appear smooth to obtain an image suited to measurement. The working distance is 76mm.

Specifications

0.2X	Model	QI-A1010D	QI-A2010D	QI-A2017D	QI-A3017D	QI-A4020D	QI-C2010D	QI-C2017D	QI-C3017D
		Manual stage model					Motorized stage model		
0.5X	Model	QI-B1010D	QI-B2010D	QI-B2017D	QI-B3017D	QI-B4020D			
Measuring range (X×Y)		3.94" x 3.94" 100×100mm	7.87" x 3.94" 200×100mm	7.87" x 6.69" 200×170mm	11.8" x 6.69" 300×170mm	15.7" x 7.87" 400×200mm	7.87" x 3.94" 200×100mm	7.87" x 6.69" 200×170mm	11.8" x 6.69" 300×170mm
Effective stage glass size		6.69" x 6.69" 170×170mm	9.53" x 5.51" 242×140mm	10.2" x 9.06" 260×230mm	14.2" x 9.06" 360×230mm	17.3" x 9.13" 440×232mm	9.53" x 5.51" 242×140mm	10.2" x 9.06" 260×230mm	14.2" x 9.06" 360×230mm
Maximum stage loading *1		Approx. 22 lbs.(10kg)		Approx. 44 lbs.(20kg)		Approx. 33 lbs. 15kg	Approx. 22 lbs. 10kg	Approx. 44 lbs.(20kg)	
Main unit mass		Approx. 143 lbs. 65kg	Approx. 152 lbs. 69kg	Approx. 330 lbs. 150kg	Approx. 348 lbs. 158kg	Approx. 361 lbs. 164kg	Approx. 158 lbs. 72kg	Approx. 337 lbs. 153kg	Approx. 354 lbs. Approx. 161kg

*1 Does not include extremely offset or concentrated loads

			QI-A / QI-C	QI-B
View field			1.26" x 0.94" (32×24mm)	0.50" x 0.378" (12.8×9.6mm)
Measurement mode			High resolution mode / Normal mode *4	
Travel range (Z axis)			3.94"(100mm)	
Accuracy	Measurement accuracy within the screen *1	High resolution mode	±2μm	±1.5μm
		Normal mode	±4μm	±3μm
	Repeatability within the screen (±2σ) *2	High resolution mode	±1μm	±0.7μm
		Normal mode	±2μm	±1μm
	Measurement accuracy (E1xy) *1		±(3.5+0.02)μm L: arbitrary measuring length (mm)	
Monitor magnification *3			7.6X	18.9X
Optical system	Magnification (Telecentric Optical System)		0.2X	0.5X
	Depth of focus	High resolution mode	±0.6mm	±0.6mm
		Normal mode	±11mm	±1.8mm
	Working distance		3.54"(90mm)	
Camera			3 million pixels, 1/2", full color	
Illumination			Transmitted light: Green LED telecentric illumination Co-axial light: White LED Ring light: 4-quadrant white LED	
Power supply			100-240VAC 50/60Hz	
Accuracy guaranteed temperature range			19-21°C	

*1 Inspected to Mitutoyo standards by focus point position.
*2 The measuring accuracy is guaranteed to be accurate within the depth of focus.
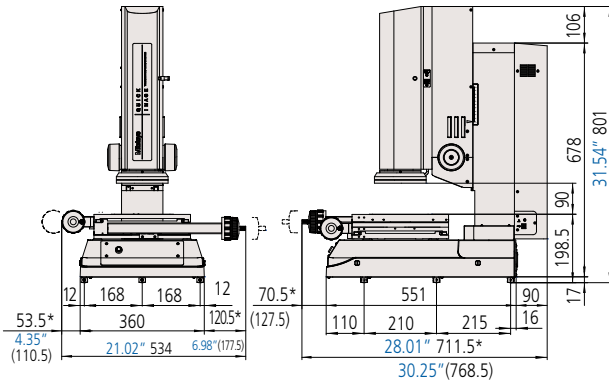*3 For 1X digital zoom (when using the 22-inch-wide monitor)
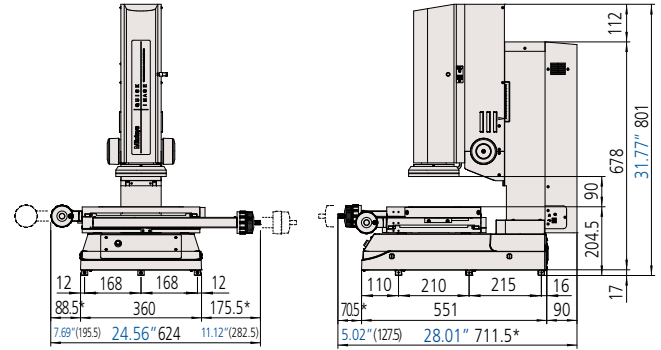*4 Patent registered (Japan)
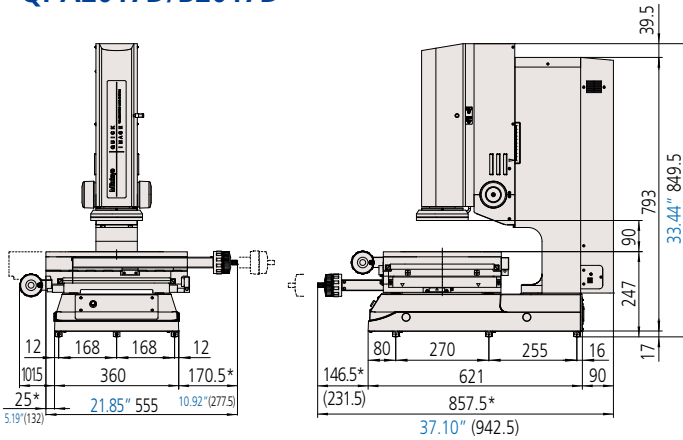
Dimensions Chart

Manual Stage Model

Unit: Inch mm

QI-A1010D/B1010D

106
678
31.54" 801
90
198.5
17
12 168 168 12 70.5* (127.5) 551 90 16
53.5* 360 120.5*
4.35" (110.5) 21.02" 534 6.98" (177.5) 110 210 215
28.01" 711.5*
30.25" (768.5)

QI-A2010D/B2010D

112
678
31.77" 801
90
204.5
17
12 168 168 12 110 210 215 16
88.5 360 175.5* 90
70.5*
7.69" (195.5) 24.56" 624 11.12" (282.5) 5.02" (127.5) 551
28.01" 711.5*

QI-A2017D/B2017D

39.5
793
33.44" 849.5
90
247
17
12 168 168 12 80 270 255 16
1015 360 170.5* 146.5* 621 90
25* (231.5) 857.5*
5.19" (132) 21.85" 555 10.92" (277.5) 37.10" (942.5)

QI-A3017D/B3017D

39.5
793
33.44" 849.5
90
247
17
12 168 168 12 80 270 255 16
101.5 360 220.5* 146.5* 621 90
75* 14.86" (377.5) 9.11" (231.5) 23.75" 857.5*
9.13" (232) 25.78" 655 37.10" (942.5)

QI-A4020D/B4020D

39.5
793
33.45" 849.5
90
247
17
12 168 168 12 80 270 255 16
125* 360 271.5* 161.5* 621 90
13.07" (332) 29.78" 756.5 18.83" (478.5) 10.57" (268.5) 34.35" 872.5*
38.56" (979.5)

QI-A series
QI-B series
QI-A4020D
Manual stage model
The mounting stand (02ATX190) is optional.

* Varies depending on position of XY stage.
Values in parentheses indicate maximum size.

Motorized Stage Model

Unit: mm

QI-C2010D

12 | 168 | 168 | 12
86* | 360 | | 101*
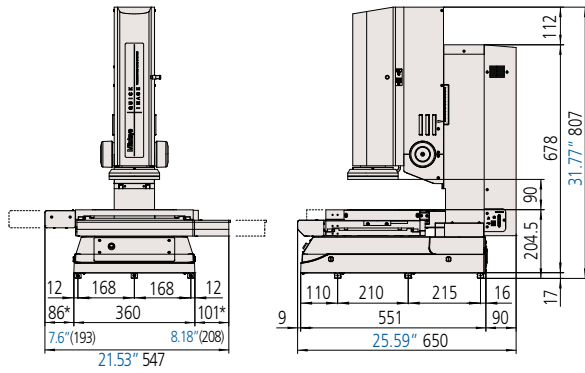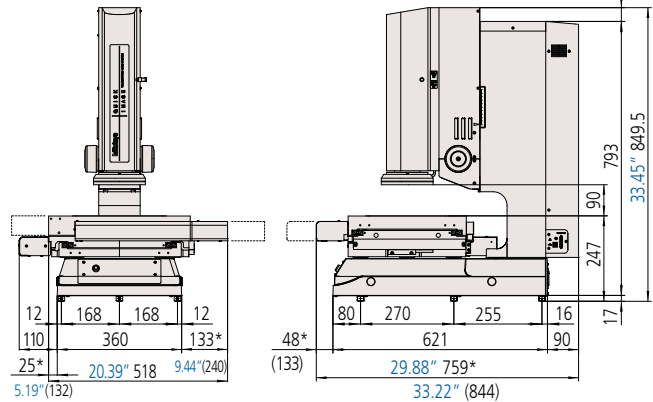7.6"(193) | | | 8.18"(208)
21.53" 547

110 | 210 | 215 | 16
9 | 551 | | 90
25.59" 650

112
678
31.77" 807
90
204.5
17

QI-C2017D

39.5
793
33.45" 849.5
90
247
17

12 | 168 | 168 | 12
110 | 360 | | 133*
25* | 20.39" 518 | | 9.44"(240)
5.19"(132)

80 | 270 | 255 | 16
48* | 621 | | 90
(133) | | |
29.88" 759*
33.22" (844)

QI-C3017D

39.5
793
33.45" 849.5
90
247
17

12 | 168 | 168 | 12
110 | 360 | | 183*
75* | | | 13.38"(340)
9.13"(232) | 25.70" 653

80 | 270 | 255 | 16
48* | 621 | | 90
5.23"(133)
29.88" 759*
33.22" (844)
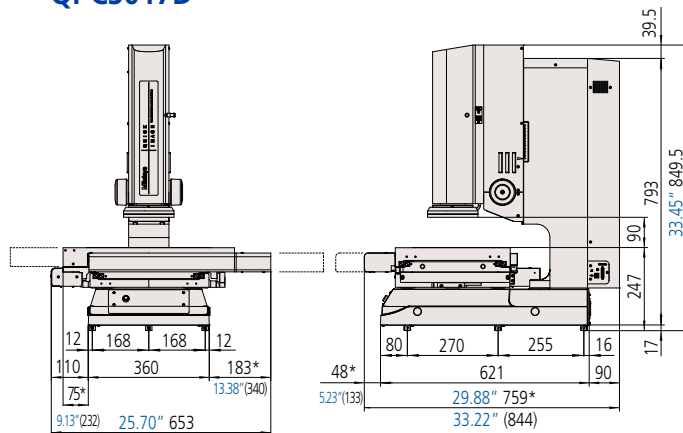
*Varies depending on position of XY stage.
 Values in parentheses indicate maximum size.

QI-C series
QI-C2017D
Motorized stage model

The mounting stand
(02ATX190) is optional.

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Form Measurement

Optical Measuring

Sensor Systems

Test Equipment and Seismometers

Digital Scale and DRO Systems

Small Tool Instruments and Data Management

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