QUICK SCOPE

Bulletin No. 2018

Non-Contact Vision Measuring Machine Offers High Accuracy, Real Affordability and Powerful Functionality!

Mitutoyo

Compatibility between Ease of Operation and Enhanced Image Processing Functions

In industry, where the need for high-accuracy non-contact measurement currently increases, high-speed and high-accuracy vision systems are becoming the mainstream in non-contact precision measurement.

Mitutoyo Quick Scope Series are vision measuring microscopes that anyone can easily use to perform not only image observation and single part measurement, but also automatic multiple part measurement.

Quick Scope powerfully supports your vision measurement applications in most diverse environments.

Software

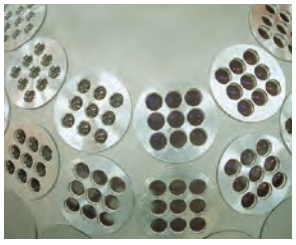
Basic software to control Quick Scope

The vision measuring software, QSPAK, continues to evolve. QSPAK and various application software provide multifunctional analysis, high speed image processing, and ease of operation.

Research & Development Division

Optical system

The optical system used in Quick Scope machine is manufactured based on leading-edge optical technologies that Mitutoyo has developed over the years. This is an ideal optical system that provides an even and flare-free image over the entire visual field.



Lens design and manufacture

Traceability

Mitutoyo offers calibration services of various kinds from a unique company that is home to nationally accredited calibration laboratories in three fields - laser sources for length measurement, end standards, and line standards. Also, as a comprehensive manufacturer of precision instruments, Mitutoyo provides a number of measuring instruments traceable to national standards, such as coordinate measuring machines, optical measuring instruments, and form measuring instruments as well as vision measuring systems.

Linear Scale manufacture

Iodine absorption stabilized He-Ne laser (633nm, for length standards)

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The Quick Scope Series can be used for measurement in various industries for such products as molded-plastic parts, machined parts, cutting tools, medical devices and electronic components.

The vision measuring software QSPAK, which combines excellent operability with high functionality, aids customers in meeting measurement challenges. The additional use of the application software FORMPAK-QV can extend QSPAK capabilities to enable form assessment and analysis.

QS Series Lineup

QS-200Z

Drive method	Focus	Optical system	Image detecting unit
CNC all axes	AF	Fixed/zoom lens selectable	Color CCD camera

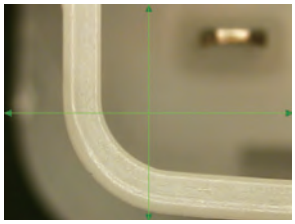
QS-LZB

Drive method	Focus	Optical system	Image detecting unit
Manual all axes	Contrast-level function	Zoom	CMOS color camera

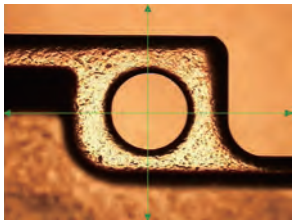
QS-EB

Drive method	Focus	Optical system	Image detecting unit
Manual all axes	Contrast-level function	Fixed-magnification	CMOS color camera

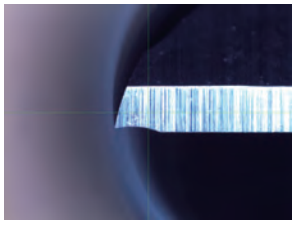
Workpiece examples



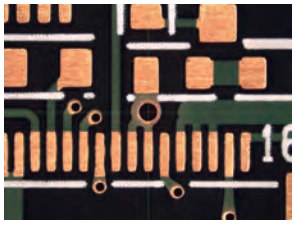
Molded-plastic part



Pressed part



Cutting tool

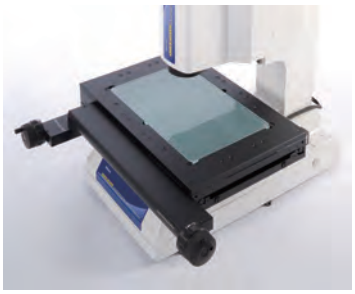


Printed circuit board

Drastic Improvement in Working Efficiency Thanks to Functions Focused on Operability

Stage variations

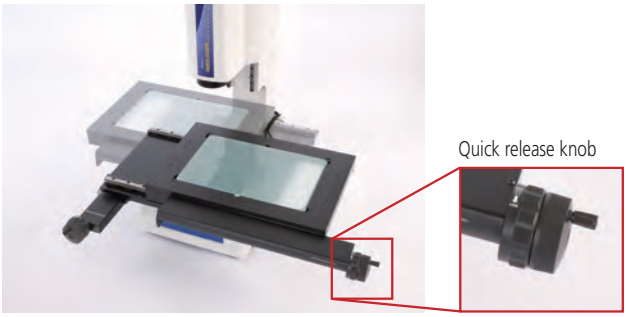
The QS-200Z Series stage lineup offers two sizes with an XY measuring range of 200×200mm and 200×250mm.
The QS-LZB and QS-EB stage lineup comprises three sizes with an XY measuring range of 200×100mm, 300×170mm and 400×200mm, respectively.



Quick release mechanism

Applicable models: QS-LZB, QS-EB

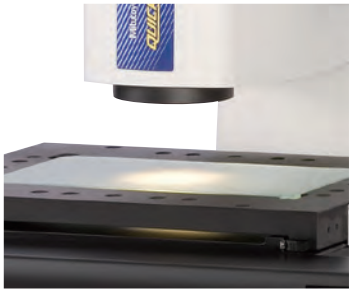
A quick release mechanism is installed on the XY stage of these models. Stage feed can be switched between Coarse and Fine (FREE and LOCK). Since this mechanism puts the stage in a completely free state, it greatly eases moving the stage if it is a long way to the next measuring point.

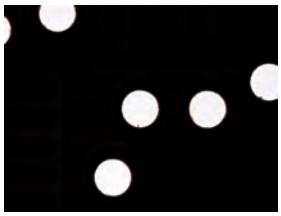


Illumination functions provide excellent support for measurement and observation

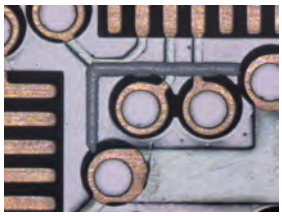
In addition to contour and surface illumination, Quick Scopes are equipped with a fiber-optic ring light to aid in reproducing color images more clearly. This illumination enables measurement and observation of images under optimal conditions.

* The fiber-optic ring light for the QS-EB is optional.

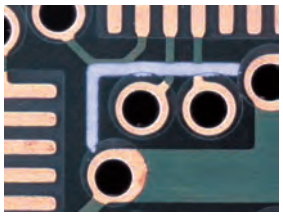




Contour (stage) illumination



Surface (coaxial) illumination



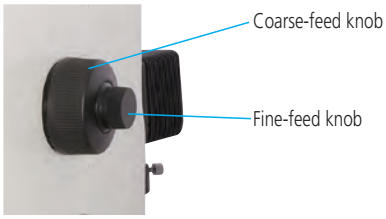
Fiber-optic ring illumination

During auto-measurement the measurement procedure program executes automatic control over the illumination system, providing compatibility between user-friendliness and high efficiency.

Left and right knobs on the Z-axis feed mechanism

Applicable models: QS-LZB, QS-EB

Z-axis feed knobs are fitted to both sides to allow the choice of focusing hand.
The outside coarse-feed knob adjusts the Z axis 30mm per revolution and the inside fine-feed knob feeds at 0.2mm per revolution.
This type of dual-concentric coarse- and fine-feed control dramatically improves operability.



AF tool

Applicable models: QS-200Z

The AF (Auto-focus) tool allows focusing without personal error, therefore achieving high-accuracy height measurement.

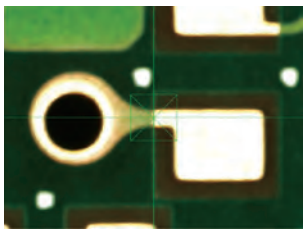


Image before AF

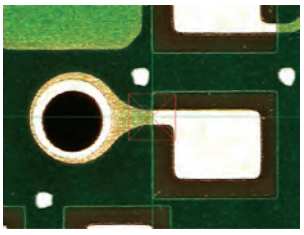


Image after AF

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Programmable power zoom

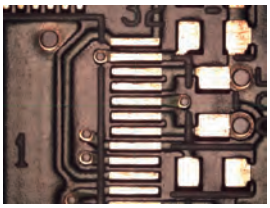
Applicable models: Zoom lens models of QS-200Z and QS-LZB

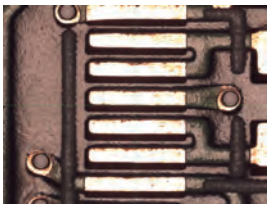
Zooming from low to high magnifications can support either observation to high-magnification measurement without changing lenses.
Additionally, the automatic light control function associated with a zooming operation and automatic correction functions, such as image displacement and pixel calibration, is installed in these models.

QS-200Z: 0.5X – 3.5X (28X – 193X) at 8 steps, 7X zoom
QS-LZB: 0.75X – 5.25X (30X – 208X) at 8 steps, 7X zoom

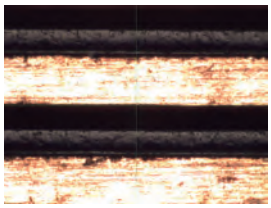
* Each numeral in parentheses indicates the image magnification using a 19-inch LCD monitor.

Image examples in QS-LZB


0.75X


1.5X


3X


5.25X

Control box

Applicable models: QS-200Z, QS-LZB

Frequently-used operations such as illuminating, data entry, zooming, and auto-focusing* can be performed with a single touch of individual buttons conveniently positioned on the control box.
The CNC QS system allows remote operation with a jog shuttle. The manual QS system can be operated with a single touch of a button when repeating measurement.

* Function available only in QS and QS-L/AFB

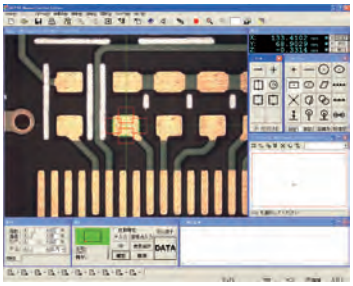

For QS and QS-200Z

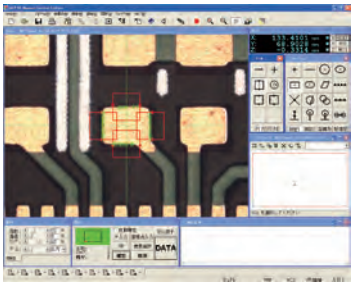
For QS-LZB

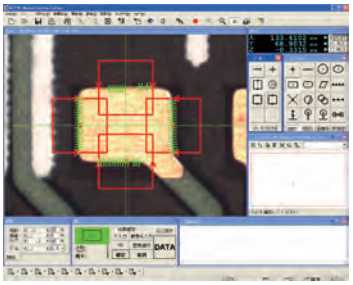
Digital zoom function

Applicable models: QS-LZB, QS-EB

Every click on the menu icon magnifies an image display from normal 1X to 2X and then 4X.
An image can be measured by digital-zooming at every magnification level.


1X


2X


4X

CNC Vision Measuring System
QS-200Z

QS-200Z

Specifications

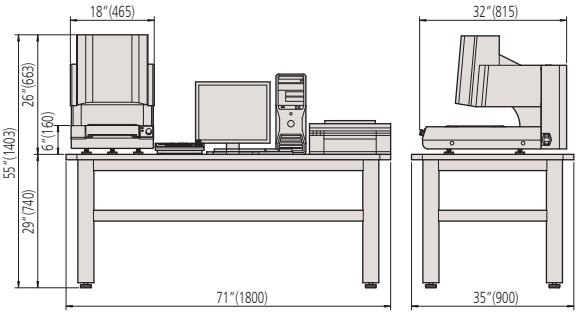
Zoom lens system	Model	QS200Z	QS250Z
	Order No.	359-504-9A	359-508-9A
Drive method		CNC	
Range (X×Y×Z) Inch/mm		8″× 8″×4″ (200×200×100)	8″×10″×4″ (200×250×100)
Resolution/Length standard		0.5μm/Linear encoder	
Image detecting unit		1/3" Color CCD camera	
Measuring accuracy*1	XY	(2.5+6L/1000)μm	
	Z	(5+6L/1000)μm	
Drive speed		Max 80mm/s	
Acceleration and deceleration		Max.250mm/s²	
Stage glass size		11″×10″ (269×261)	11″×12″ (269×311)
Maximum stage loading		22lbs (10kg)	
Illumination		Contour Illumination: 12V/30W Halogen Reflected Illumination: 12V/50W Halogen Fiber-optic ring light: 12V/100W Halogen	
Dimensions (W×D×H) Inch/mm		18″×32″×26″ (465×815×663)	
Mass		169lbs (76kg)	
Power consumption*2		970W at max	

*1 Company standard (fixed lens system: 2.5X, zoom lens system: 2.5X at the time of zooming in) under an installation environment of 20°C and during use of the standard lens

*2 Value in the case of selecting the color ink-jet printer (12AAC761)

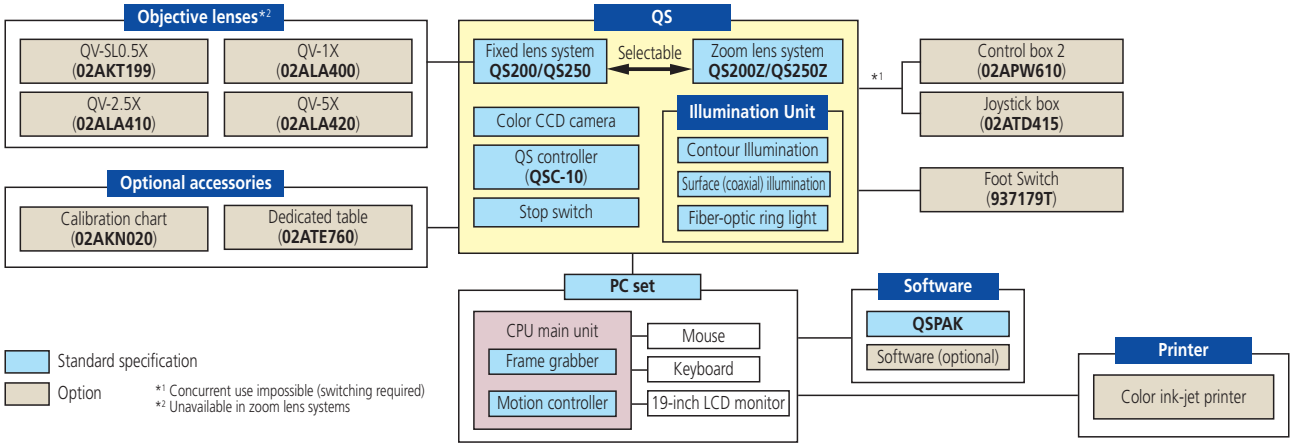
Dimensions

Unit: Inch (mm)



*Shown on optional table

System diagram



Optical system magnification ratios available for Quickscope Systems

Monitor magnification	28X	36X	47X	55X	83X	111X	138X	193X	276X
Visual field (mm)	9.5×7.1	7.3×5.4	5.6×4.2	4.7×3.5	3.1×2.3	2.3×1.7	1.9×1.4	1.3×1.0	0.9×0.7
Fixed lens system	●			●			●		●
	0.5X			1X			2.5X		5X
Optical Magnification (mm)	30.5			39X			98X		196X
Zoom lens system	●	●	●	●	●	●	●	●	
	0.5X	0.65X	0.85X	1X	1.5X	2X	2.5X	3.5X	
Optical Magnification (mm)	20X	25X	34X	39X	59X	78X	98X	137X	

*The values of monitor magnification indicate those for a 19-inch LCD monitor. Each lens of a fixed lens system is optional.

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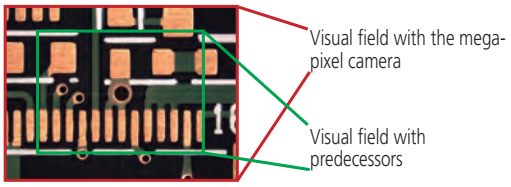
Manual Vision Measuring Systems
QS-LZB, QS-EB

QS-L2010ZB

Wider view with mega-pixel camera

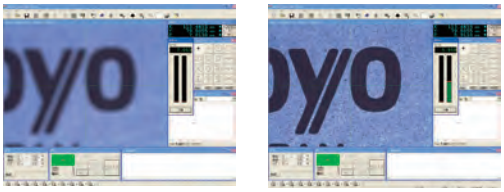
Applicable models: QS-LZB, QS-EB

A mega-pixel camera has widely expanded the visual field available. The field is approximately 40% wider than those of predecessors. This camera achieves efficient measurement in batch measuring of multiple items in the display screen.



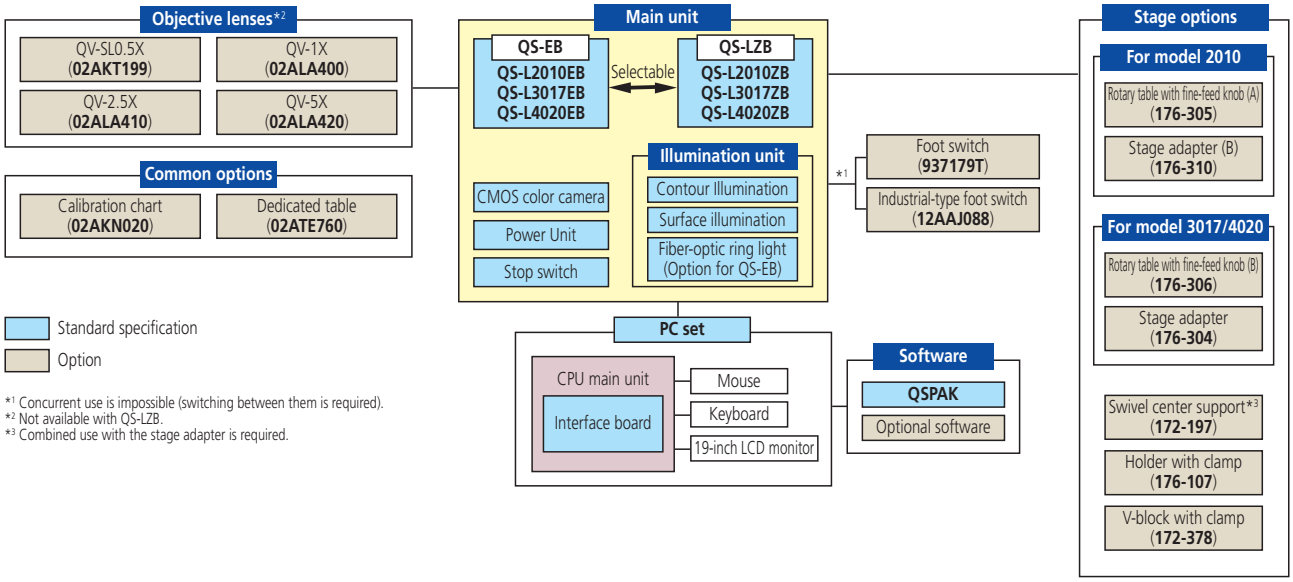
Improved manual focusing repeatability

An indication of image contrast near the center of the video window is displayed on a level meter. A peak level indicates a focal position. This improves the repeatability of focal positions in manual focusing.



Before focusing | After focusing

System diagram



*1 Concurrent use is impossible (switching between them is required).
*2 Not available with QS-LZB.
*3 Combined use with the stage adapter is required.

Optical system magnification ratios available

Monitor magnification	20X (80X)	30X (120X)	39X (156X)	40X (160X)	51X (204X)	60X (240X)	89X (356X)	99X (396X)	119X (476X)	149X (596X)	198X (792X)	208X (832X)
Visual field (mm)	13.2×9.8	8.8×6.6	6.8×5.1	6.6×4.9	5.2×3.9	4.4×3.3	2.9×2.2	2.6×2.0	2.2×1.6	1.7×1.3	1.3×0.9	1.2×0.9
QS-LZB		●	●		●	●	●		●	●		●
		0.75X	0.98X		1.28X	1.5X	2.25X		3X	3.75X		5.25X
Working distance (mm)							55					
QS-EB	●			●				●			●	
	0.5X			1X				2.5X			5X	
Working distance (mm)	30.5			34				34			33.5	

The values of monitor magnification indicate those for a 19-inch LCD monitor. The values in parentheses indicate those in the case of using digital zoom 4X. Each lens of a fixed lens system is optional.
During the use of digital zoom the image in each visual field in the above table is expanded. The use of digital zoom 4X narrows each visual field in the table to 1/4.

Manual Vision Measuring Systems

QS-E2010B

Specifications

Model		QS-L2010ZB	QS-L3017ZB	QS-L4020ZB	QS-E2010B	QS-E3017B	QS-E4020B
Order No.		359-710-1A	359-711-1A	359-712-1A	359-720-1A	359-721-1A	359-722-1A
Feed mechanism		Manual					
Observation unit		Zoom: 0.75X – 5.25X (8X in 7 steps)			Interchangeable lens:, 0.5X, 1X, 2.5X, 5X		
Range (X×Y×Z) Inch/mm		8"×4"×6" (200×100×150)	12"×7"×6" (300×170×150)	16"×8"×6" (400×200×150)	8"×4"×6" (200×100×150)	12"×7"×6" (300×170×150)	16"×8"×6" (400×200×150)
Resolution/Length standard		0.1µm / Linear encoder					
Image detecting unit		1/2-inch color CMOS camera 3 mega-pixels					
Digital zoom		1X - 2X - 4X					
Measuring accuracy*1	XY	(2.5+20L/1000)µm			(3+20L/1000)µm		
	Z	(5+40L/1000)µm					
Stage glass size Inch/mm		10"×6" (250×150)	15"×9" (370×240)	17"×9" (440×240)	10"×6" (250×150)	15"×9" (370×240)	17"×9" (440×240)
Maximum stage loading		22lbs (10kg)	44lbs (20kg)	33lbs (15kg)	22lbs (10kg)	44lbs (20kg)	33lbs (15kg)
Illumination		Contour illumination: 12V/50W halogen, Surface illumination: 12V/50W halogen Fiber-optic ring light (optional for QS-EB): 12V/100W halogen					
Dimensions*2 (W×D×H)mm	Main unit	25"×30"×28" (624×769×722)	27"×36"×33" (682×916×837)	30"×37"×33" (757×930×837)	25"×30"×28" (624×769×722)	27"×36"×33" (682×916×837)	30"×37"×33" (757×930×837)
	Control unit	12"×13"×4" (310×330×103)					
Mass	Main unit	160lbs (72kg)	311lbs (140kg)	321lbs (146kg)	147lbs (66kg)	298lbs (134kg)	311lbs (140kg)
	Power unit	11lbs (5kg)			10lbs (4.5kg)		
Power consumption		160W at max					

*1 Company standard (zoom magnification: 3X for QS-LZB, 2.5X for QS-EB) under an installation environment of 20°C and during use of the standard lens

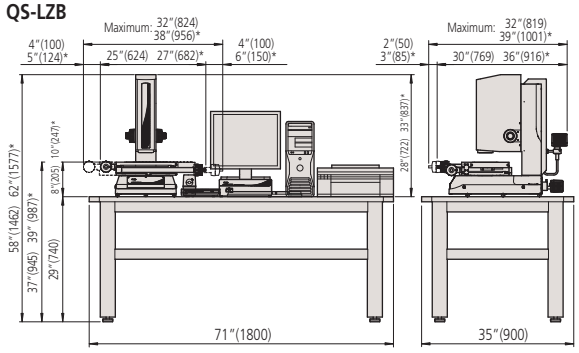
*2 The width and height increase by a maximum of X-axis stroke and Z-axis stroke, respectively. The depth increases by one half of the Y-axis stroke at most.

Dimensions

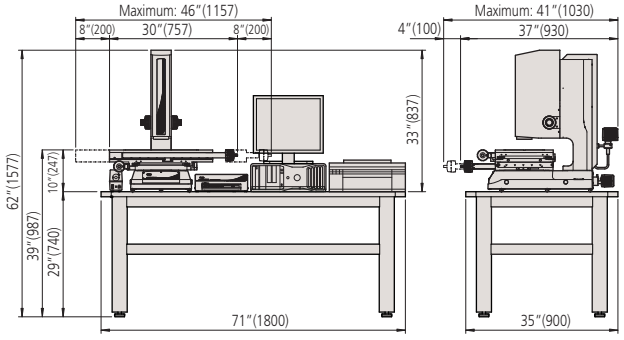
* Shown on optional table

Unit: Inch (mm)

● QS-LZB

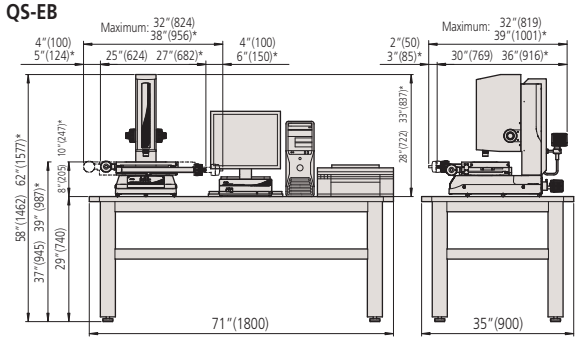


*Dimensions for model 3017

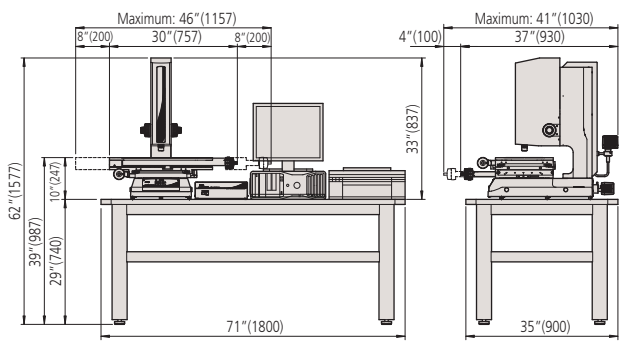


Model 4020

● QS-EB



*Dimensions for model 3017



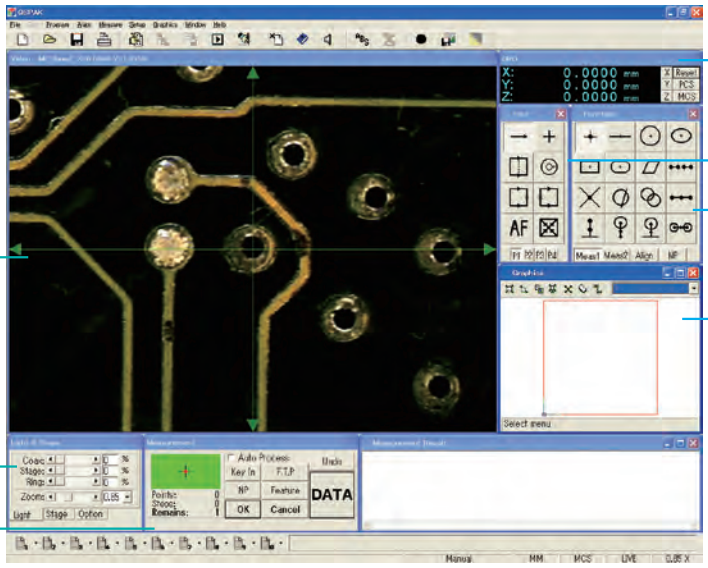
Model 4020

Mitutoyo

QSPAK® –A Powerful Vision Measuring Software System that supports a wide variety of measurement

In order to support various measuring methods from measurement of a wide variety of single parts to CNC measurement of mass production parts, **QSPAK®** has achieved both high-reliability vision detecting capability and user-friendly operability.

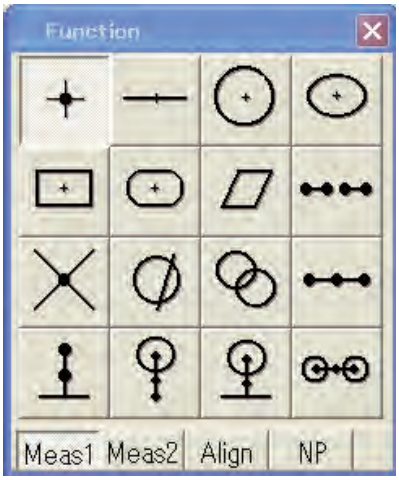
MiCAT
Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
VISION



Measurement Commands Covering Basic Methods of Measurement

Coordinate system creation commands

Measurement item commands



* Item names are not actually displayed, but displayed as on-line help.

Tools that Reduce Operation Error and Improve Repeatability

One-click tools ● Patent pending (Japan)

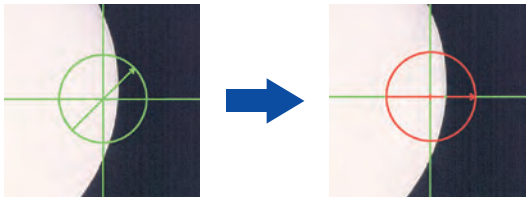
A single click in the vicinity of a workpiece edge allows automatic processing from tool setting to edge detection/calculation. Additionally, this function does not need stage movement for any workpiece measurement within a screen, drastically reducing measurement time.

One-click circle tool

One-click box tool

Smart tool ● Patent pending (Japan)

The Smart tool automatically detects the clearest edge within the range enclosed with a circle, thus allowing speedy edge detection compared with edge alignment using the cross hairs of a microscope or profile projector.



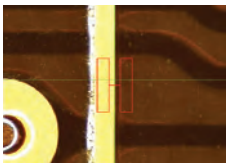
Auto-trace tool

This is a tool for form measurement in which the edge of an arbitrary form is detected with multiple points at a time.

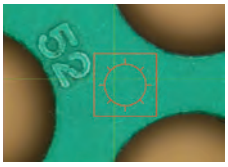
* The Auto-trace tool of QS-LZB, or QS-EB only functions within a screen.

Automated Lighting Tools • Patented Function

The Dual area contrast tool is a tool for automatically setting the light intensity so as to maximize the contrast of edge areas. The Brightness tool is for setting illumination so as to match the screen brightness between the times during part program creation and part program execution.



Dual area contrast tool



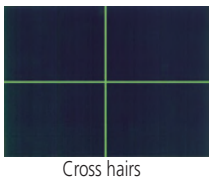
Brightness tool

Convenient Tools Effective for Visual Measurement

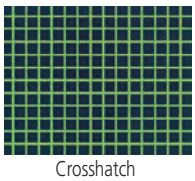
Template tools

■ Basic templates (overlays)

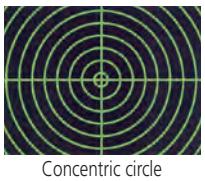
The following are three basic templates corresponding to the reticle of a microscope.



Cross hairs



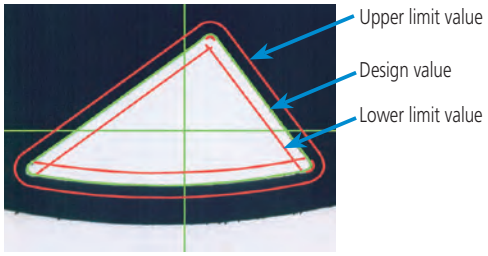
Crosshatch



Concentric circle

■ User pattern matching

The user can freely create a template (master) in accordance with a workpiece, different from the basic templates and extension templates to perform tolerancing with a master. Also, the user can easily perform tolerancing by displaying key-entered upper limit and lower limit lines on the screen.



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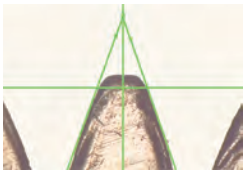
Convenient Tools Effective for Visual Measurement

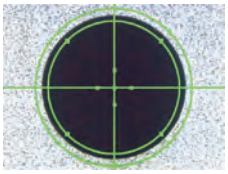
Template tools

Extension templates

Extension templates are provided based on four types of pattern: cross-hair; circle; rectangle; and angle. A diameter, distance, angle, and other value can freely be set by key entry in the same manner as used in comparison measurement with a profile projector.



Angle template

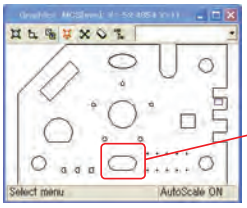


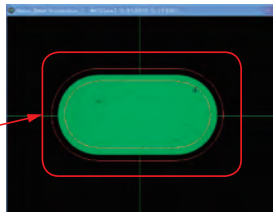
Circle template

CAD user template function

This function allows a template to be created using a form (CAD data) in the Graphics window.

* To create a template, CAD data needs to be imported and exported.

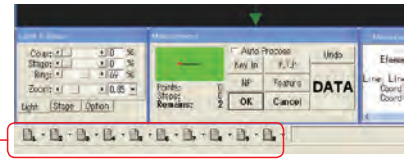




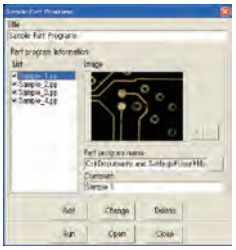
Convenient Functions to Simply Execute and Edit an Auto-measurement Procedure Program

One-click simple execution function – Program Launcher

An auto-measurement procedure program can be associated with a dedicated icon along with a photo and comments to enable a program to be started by a single click.
A total of 10 icons are provided and programs can be managed for each operator or workpiece using these icons.



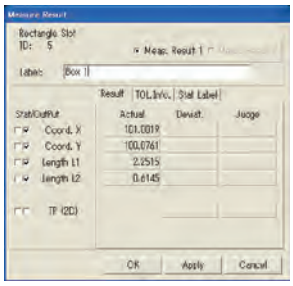
Program launcher icons (new feature)



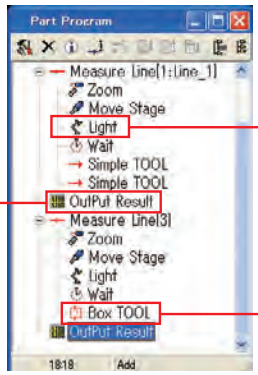
Auto-measurement procedure program association window

Smart editor

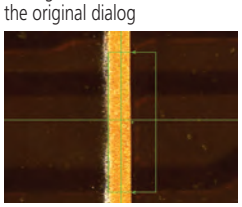
This function allows an XY-stage travel position, lens magnification, illumination condition, etc., to be separately displayed as icons or labels in the list of part programs (auto-measurement procedure programs), thereby simplifying program editing.



Editing design values and tolerances using the original dialog



Editing an illumination condition using the original dialog



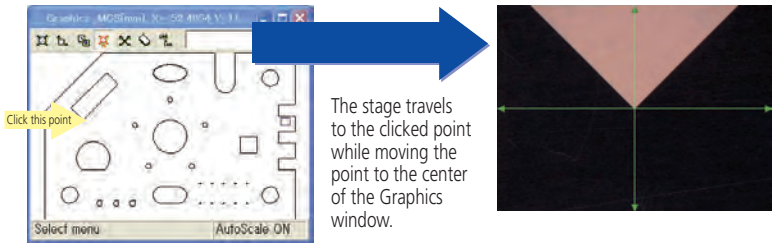
Editing a direct tool on the Video window (positioned as created)

Navigation Function Contributes to Reduction in Measurement Time

Stage navigation (QS) ● Patent pending (Japan)

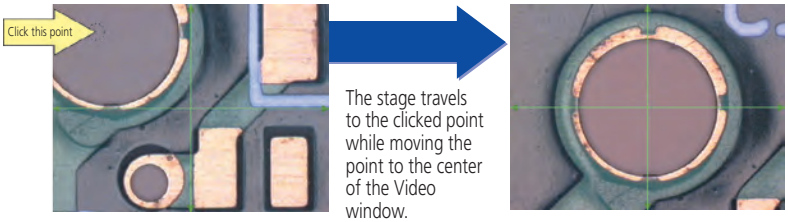
This stage navigation function enables pinpoint positioning when the stage needs to be moved significantly. To move the stage, click the point in the Graphics window to which the stage is to be repositioned. Then, the stage directly moves to the point. This can suppress wasted stage motion such as overrun or deficient run to the minimum. To accurately move the stage, click a point to move to the center of the Video window with the mouse. Then, the stage accurately moves to the center of the Video window. The use of this function will significantly reduce the setup time needed for a part program.

Stage movement with the Graphics window



The stage travels to the clicked point while moving the point to the center of the Graphics window.

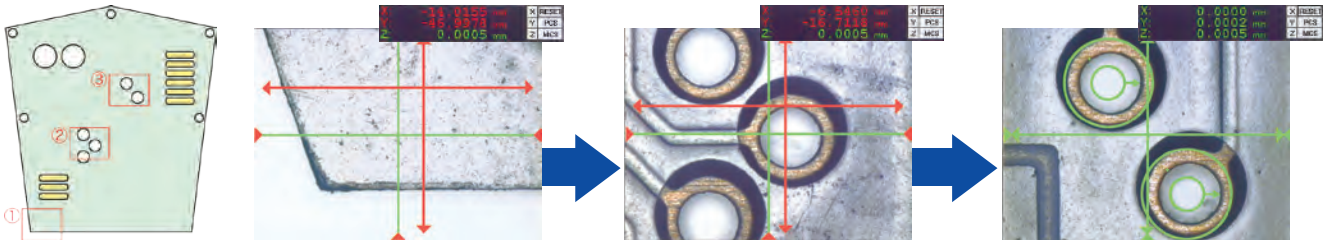
Stage movement with the Video window



The stage travels to the clicked point while moving the point to the center of the Video window.

Quick navigation (QS-LB, QS-EB) ● Patent pending (Japan)

This is a navigation function that concurrently uses the Learn/Repeat function for storing and reproducing a series of measuring procedures. This function navigates the operator to the next measuring point in accordance with the measuring procedure stored. Move the stage until the red cross-hairs indicating the next measuring point to coincide with the green cross-hairs at the center of the monitor screen. Then, the view at the next measuring point will appear on the screen. This function also allows zero approach using the digital counter. The operator does not need to check a measuring point while looking at a workpiece and can perform measurement while concentrating on the screen.



(1) The next measuring point is indicated with the red cross-hairs.

(2) As the stage approaches the next measuring point, the red cross-hairs and green cross-hairs get closer to one another.

(3) When the two cross-hairs coincide and the target view appears, press the Enter button to complete the measurement.

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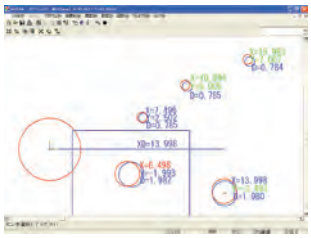
Enhanced Capabilities Supporting Tasks from Operator Management to Inspection Report Creation

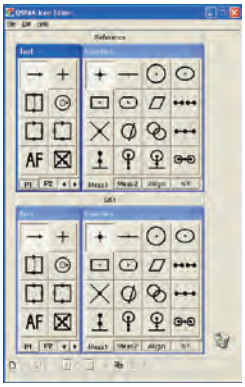
Graphics window

Measuring features and measurement results are displayed in real time on the Graphics window. This allows the operator to verify measurement points with visual images. Measuring features can also be selected from graphics, thus allowing speedier measurement. Calculation between features is possible using the Graphics window.



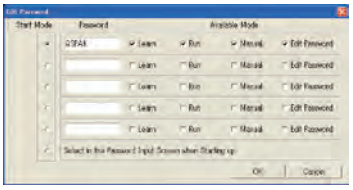
Icon editor

The layouts of measurement item icons, tool icons, etc., can freely be rearranged. The operator can apply custom icon configuration in which, for example, frequently-used icons are grouped on the first page.



Security function

This function restores the range of use depending on the task level by requesting password entry when QSPAK® starts up. Built in system level security for operators



Video image scale display

Scales in accordance with the actual field of view can be displayed on the Video window to quickly estimate size of a workpiece. If workpiece images are stored along with scale indication, it gives a rough indication of the size of each workpiece.

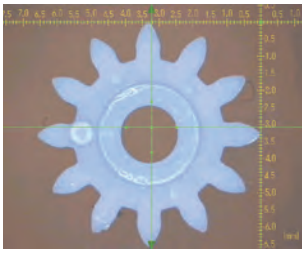
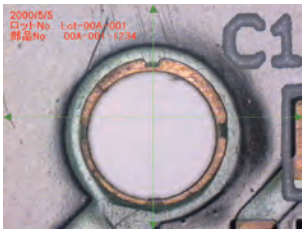


Image storage

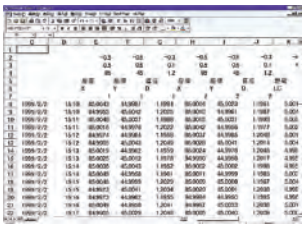
Color images on the Video window can be output as a file in BMP or JPG format. Also, the images can easily be attached to record workpiece graphics, inspection report, etc.

* They can be recalled from memory and remeasured



Measurement reporting ● Patent pending (Japan)

Measurement results obtained by a part program can be output as they are in CSV format. This file can then be imported into a commercial spreadsheet software, such as MS Excel. This allows for a company-specific inspection report.



Optional Accessories

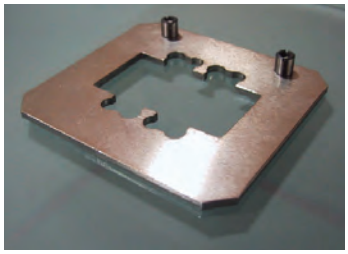
Application Software Lineup that Meets the Needs for Advanced Measurements

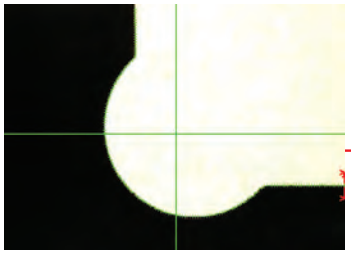
Form assessment and analysis software

●FORMPAK-QV (Optional Software)

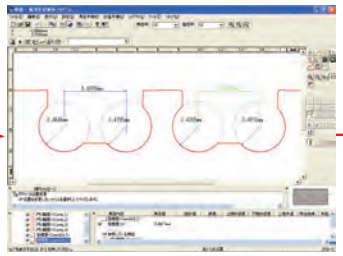
This software can perform contour analysis and tolerancing with design values from multi-point data acquired with the Auto-trace tool, etc.

* The Auto-trace tool for the QS-L/AFB, QS-LZB, or QS-EB only functions within a screen.

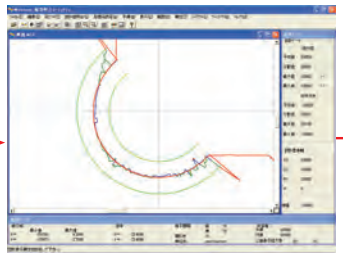




• Measurement with the Auto-trace tool



• Contour analysis screen



• Contour tolerancing screen

• Contour tolerancing screen

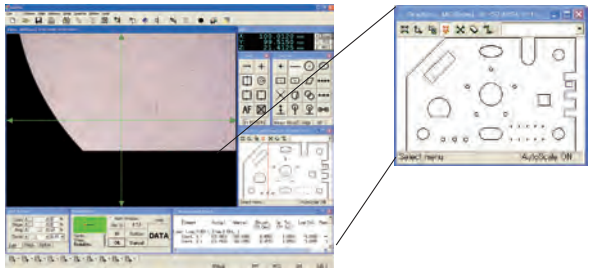
Measurement Support Software

●QS-CAD I/F (Optional Software)

Importing CAD data (DXF- or IGES-formatted) created at the time of design to QSPAK® can drastically improve operability and reduce the creation time of a part program. This software can also convert measurement results of QSPAK® to CAD data.

Feature

- The design value of each measurement item is automatically entered.
- The stage can quickly be moved to a given point in the CAD data.
- Graphics data can be output in a specified CAD format.



MeasurLink®

A real-time display of measurement results and statistical analysis on the shop floor, with data saved in a database. Includes SPC and statistical analysis, data filtering and reporting systems for complete control of your manufacturing processes. MeasurLink includes modules for shop floor data collection, QC room data analysis and reporting, gage R&R studies, and gage tracking.

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Objective Lenses (QS-E model only)

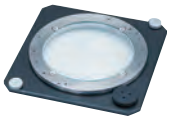
Options for fixed-lens systems

NEW

Objective lens	Order No.	Magnification on Monitor*1	View field (mm)	Working distance (mm)
QV-SL0.5X	**02AKT199**	28X (20X)	9.5×7.1 (13.2×9.8)	30.5
QV-1X	**02ALA400**	55X (40X)	4.7×3.5 (6.6×4.9)	34
QV-2.5X	**02ALA410**	138X (99X)	1.9×1.4 (2.6×2.0)	34
QV-5X	**02ALA420**	276X (198X)	0.9×0.7 (1.3×0.9)	33.5

Applicable model: **QS200, QS250, QS-EB**

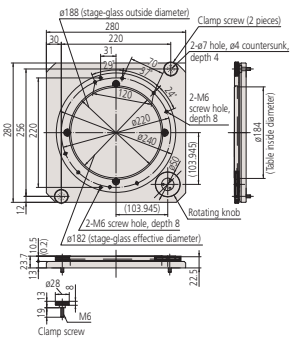
*1 Magnification in the case of using a 19-inch LCD monitor.
Each numeric value in parentheses indicates that for QB-EB.



Rotary table with fine-feed knob (A)

Order No.	**176-305**
Dimensions	11" x 11" x 0.945" (280 (W) ×280 (D) × 24 (H)mm) Table-top surface No reading scale of 360° rotation angle
Mass	12lb (5.5kg)
Stage-glass effective diameter	7"(178mm)
Applicable model	**QS-LZB, QS-EB**

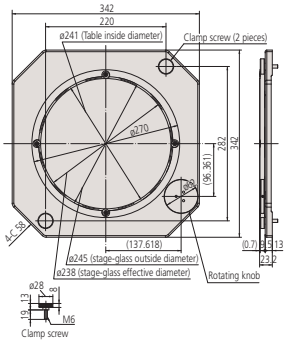
NOTE: V-block with clamp, swivel center support, and holder with clamp can be secured on the table.



Rotary table with fine-feed knob (B)

Order No.	**176-306**
Dimensions	13" x 13" x 0.905" (342 (W) x 342 (D) x 23 (H)mm) Table-top surface No reading scale of 360° rotation angle
Mass	14lb (6.5kg)
Stage-glass effective diameter	9" (235mm)
Applicable model	**QS-LZB, QS-EB**

NOTE: V-block with clamp, swivel center support, and holder with clamp can be secured on the table.



QS-E model option

Rotary table with fine-feed knob (A)

Order No.	**176-304 / B: 176-310**
Dimensions 1 piece	2" x 13" x1" (50 (W) x 340 (D) x 15 (H)mm) NOTE: 280 (D) mm for adapter B
Mass	3lb (1.5kg) / B: 3lb (1.2kg)
Applicable model	**QS-LZB, QS-EB**

NOTE: 2 pieces per set

Fiber-optic ring light unit

Order No.	**359-643***
Dimensions	3" x 9" x 5" (76 (W) x 235 (D) x 120 (H)mm)
Overall length	59" (1500mm)
Applicable model	**QS-EB**

* Combined use of external light source control cable (**12AAD128**) is required.
* Suffix code according to AC line voltage: **C** for 110V AC, **A** for 120V AC, **D** for 120V AC, **E** for 240V AC, no suffix for 100V AC

Calibration chart

• Calibration chart

This chart is used for correcting the pixel size of image detection.
In zoom lens systems, it is also used for zoom offset calibration that corrects an optical axis offset.

02AKN020

Joystick box

Order No.	**02ATD415**
Applicable model	**QS-200Z**

Dedicated table

Order No.	**02ATE760**
Dimensions	71" x 35" x 29" (1800 (W) x 900 (D) x 740 (H)mm)
Mass	132lb (60kg)
Applicable model	**QS, QS-200Z, QS-LZB, QS-EB**

Foot switch

Order No.	**937179T**
Applicable model	**QS, QS-L/AFB, QS-LZB**

* Standard accessory for QS-EB

Industrial-type foot switch

Order No.	**12AAJ088**
Applicable model	**QS-L/AFB, QS-LZB, QS-EB**

V-block with clamp

Order No.	**172-378**
	Maximum holding diameter: 0.984" (25 mm) Center height from mounting face: 38 to 48mm
Dimensions	5" x 4" x 2" (117 (H) x 90 (W) x 45 (D)mm)
Mass	2lb (0.8kg)
Applicable model	**QS-LZB, QS-EB**

* Used in combination with stage adapter B (**176-310**) or rotary table A (**176-305**).

Swivel center support

Order No.	**172-197**
	Variable inclined posture within ±10°, minimum reading of angle: 1° Optimal for measurement of screws, etc. Maximum possible holding dimensions: ø80×140mm in horizontal posture Maximum possible holding dimensions: ø65×140mm in 10° inclined posture
Mass	6lb (2.5kg)
Applicable model	**QS-LZB, QS-EB**

* Used in combination with stage adapter B (**176-310**) or rotary table A (**176-305**).

Holder with clamp

Order No.	**176-107**
Maximum length of clamp	1.378" (35mm)
Dimensions	2" x 6" x 1.496" (62 (H) x 152 (W) x 38 (D)mm)
Mass	1lb (0.4kg)
Applicable model	**QS-LZB, QS-EB**

* Used in combination with stage adapter B (**176-310**) or rotary table A (**176-305**).

- 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

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