Featured Products

CNC Vision Measuring Machine

Quick Vision Active

Refer to page M-3 for details.

Smart Vision System

QM-Fit

Refer to page M-12 for details.

Manual Vision Measuring System

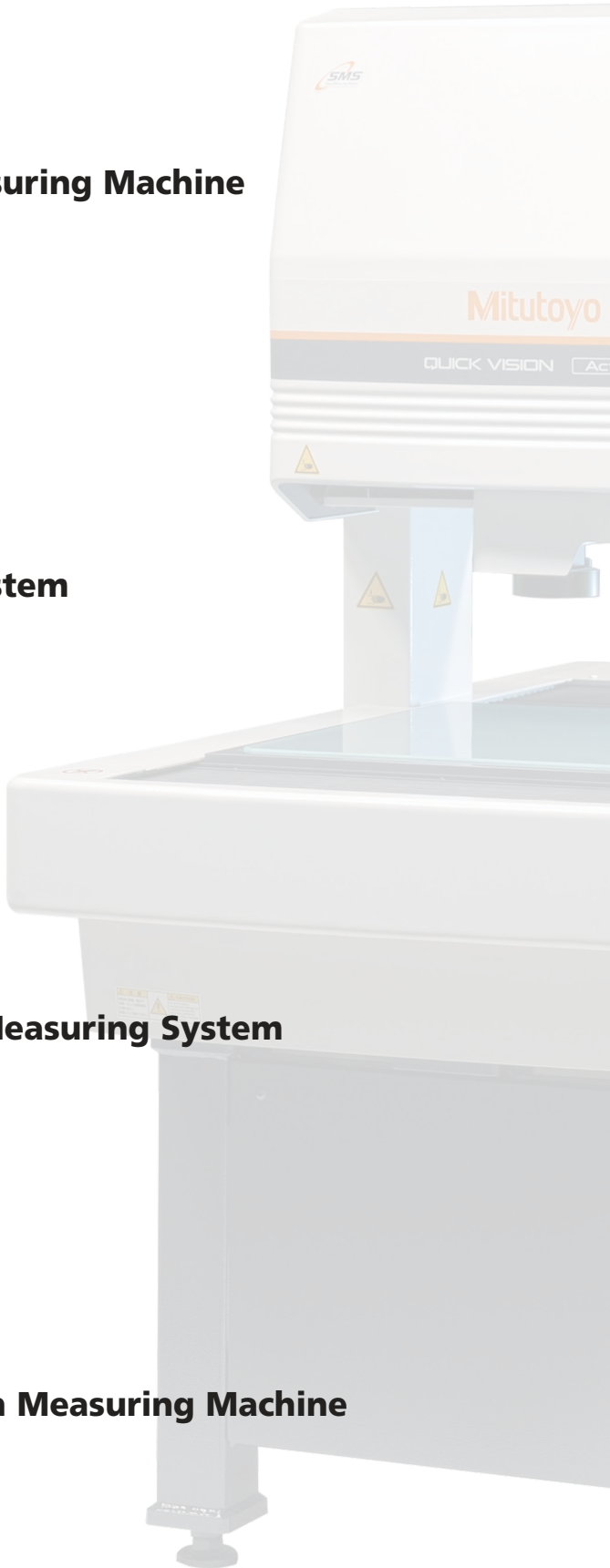
QUICK SCOPE

Refer to page M-13 for details.

Large FOV Vision Measuring Machine

Quick Image with M3

Refer to page M-14 for details.



M

Vision Measuring Systems

INDEX

QUICK VISION Series

QV Active	M-3
QV APEX Pro/QV HYPER Pro	M-4
QV ACCEL	M-5
ULTRA QV	M-6
Hyper QVWLI	M-6
QV TP Active/QV TP Pro	M-7
QVH4 Pro	M-8
QV HYBRID TYPE1	M-8

Micro Form Measuring System

UMAP Vision System TYPE2	M-9

Data Processing Software

QVPAK	M-10
Application software	M-11

QM-Fit Series

QM-Fit	M-12

QUICK SCOPE Series

QS-L/AFC	M-13

QUICK IMAGE Series

Quick Image	M-14
Quick Guide to Precision Measuring Instruments	M-15

SMS Smart Measuring System

Smart Measuring System

An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational statuses of measuring machines within a production process.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring machines by simply combining the functions necessary for your purpose.

Mitutoyo guarantees the product quality. Mitutoyo guarantees the product quality. PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

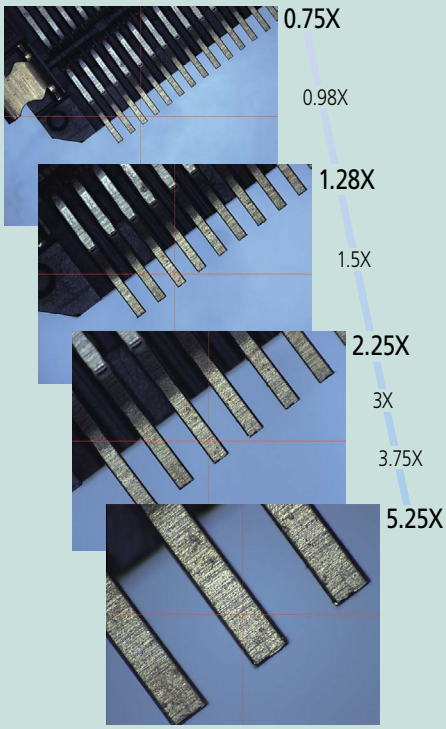
MiCAT
Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
VISION

Vision Measuring Systems

QV Active
CNC Vision Measuring System

- Cost effective, multifunction, CNC Vision Measuring System.
- Usability has been improved through a color camera and 8-step zoom optics.
- The zoom ratio of 7X (14X at maximum by changing the fixed-magnification objective lens) enables a wide range of inspection from wide view measurement at low magnification to micro-measurement at high magnification.
- The 74 mm maximum working distance (1X optional objective) promotes safe working by reducing the risk of collision, and allows greater freedom in fixture design.

QV Active 404



From wide view measurement to micro-measurement

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 (mm)	Horizontal (H)	13.60	10.46	9.07	8.00	6.94	6.80	5.31	5.23	4.53	4.00	3.40	3.02	2.72	2.27	1.94	1.81	1.70	1.36	1.30	0.97
	Vertical (V)	10.80	8.31	7.20	6.35	5.51	5.40	4.22	4.15	3.60	3.18	2.70	2.40	2.16	1.80	1.54	1.44	1.35	1.08	1.03	0.77
Total magnification (on the monitor)		13.20	17.10	19.80	22.40	25.80	26.40	33.70	34.30	39.50	44.80	52.70	59.30	65.90	79.10	92.30	98.90	105.50	131.80	138.40	184.50
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																			

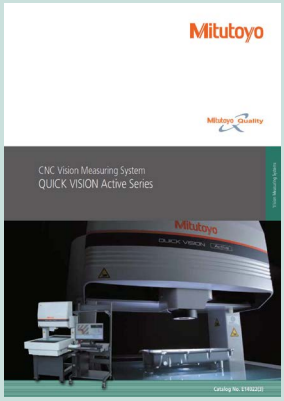
Note: The total magnification indicates the magnification on the monitor when the size of the **QVPAK** video window is 178.8×143.0 mm (default).

Mitutoyo
Find a Distributor

SPECIFICATIONS

Model No.		QV Active 202	QV Active 404
Type		Standard model	Standard model
Measuring range (X×Y×Z)		250×200×150 mm 10"x8"x6"	400×400×200 mm 16"x16"x8"
Observation unit		Zoom unit (8 positions)	
Imaging device		Color CMOS camera	
Vision measuring accuracy*	E_{1X}, E_{1Y}	(2 + 3L/1000) µm	
	E_{1Z}	(3 + 5L/1000) µm	
	E_2	(2.5 + 4L/1000) µm	
	Accuracy guaranteed with optics specified	Objective: 1.5X, Optical magnification: 5.25X	
Accuracy guaranteed temperature		20±1 °C	20±1 °C

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)



Refer to the **QUICK VISION Active** Series Brochure (**2206**) for more details.

M

Vision Measuring Systems

QV APEX Pro/QV HYPER Pro
CNC Vision Measuring System

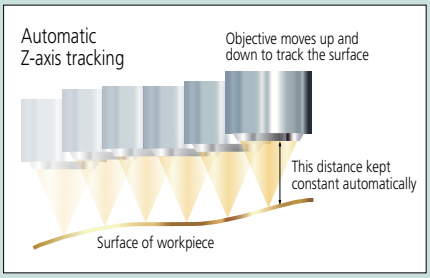
- Equipped with a strobe light and StrobeSnap, **QUICK VISION Pro** models deliver high-speed, high-accuracy measurements.
- The STREAM function is an optional upgrade to improve productivity by up to five times.

QV APEX 404 Pro

QV HYPER 302 Pro

Tracking Auto Focus (TAF)

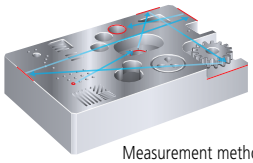
Laser transmitted through the objective lens allows automatic focusing.
The system automatically keeps the object in focus based on its shape, eliminating the task of focus adjustment and increasing measurement throughput.

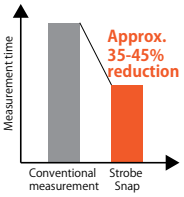


Laser source	Semiconductor laser (peak wavelength: 690 nm)
Laser safety	Class 2 (JIS C6802: 2014, EN/IEC 60825-1: 2014)
Auto focus system	Objective co-axial autofocusing (knife-edge method)

StrobeSnap

All the **QUICK VISION Pro** models are equipped with a strobe light and "StrobeSnap" which delivers measurements with both high throughput and high accuracy. Regardless of the spacing of measuring positions, measuring time can be shortened by about 35 to 45% for most measurement samples.


Measurement method

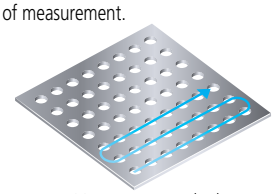


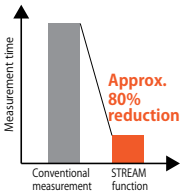
Note: Comparison with old specifications using our demo sample

STREAM function (optional)

The STREAM function provides an amazingly high throughput due to the non-stop measurement where the camera motion and the strobe light are synchronized. It can shorten measuring time more than StrobeSnap on account of continuous element measurement as shown in the following conceptual image of measurement.


XY=0.2 mm pitch, 626
Measured with a field of view of 0.62×0.47 mm
STREAM measurement 36 sec.


Measurement method



Note: Comparison with old specifications using our demo sample

SPECIFICATIONS

QV APEX Pro

Items \ Model No.		QV APEX 302 Pro	QV APEX 404 Pro	QV APEX 606 Pro
Measuring range (X×Y×Z)		300×200×200 mm 12″x8″x8″	400×400×250 mm 16″x16″x10″	600×650×250 mm 24″x26″x10″
Observation unit		Programmable power turret 1X-2X-6X		
Imaging device		B&W CMOS		
Vision measuring accuracy*	$E_{UX}/E_{UY, MPE}$	(1.5 + 3L/1000) µm		
	$E_{UXY, MPE}$	(2.0 + 4L/1000) µm		
	$E_{UZ, MPE}$	(1.5 + 4L/1000) µm		

QV HYPER Pro (Specifications other than as quoted in the table are the same as the QV APEX Pro specifications.)

Items \ Model No.		QV HYPER 302 Pro	QV HYPER 404 Pro	QV HYPER 606 Pro
Imaging device		B&W CMOS		
Vision measuring accuracy*	$E_{UX}/E_{UY, MPE}$	(0.8 + 2L/1000) µm		
	$E_{UXY, MPE}$	(1.4 + 3L/1000) µm		
	$E_{UZ, MPE}$	(1.5 + 2L/1000) µm		

* L=length between two arbitrary points (mm)

Refer to the **QUICK VISION** Series Brochure (**2316**) for more details.

M

Vision Measuring Systems

QV ACCEL
Large CNC Vision Measuring System

- This is a vision measuring machine with moving-bridge type main unit structure suitable for measuring large, thin workpieces.
- **QV ACCEL 1212** (range: 1250×1250×100 mm) and **QV ACCEL 1517** (range: 1500×1750×100 mm) are available to special order.
- As the stage is fixed, you can use simple fixturing or even no fixturing to fix a workpiece.

QV ACCEL 808

SPECIFICATIONS

Items \ Model No.			QV ACCEL 808	QV ACCEL 1010
Measuring range (X×Y×Z)			800×800×150 mm 32″x32″x6″	1000×1000×150 mm 39″x39″x6″
Observation unit			Programmable power turret 1X-2X-6X	
Imaging device			B&W CCD (1/2 in)	
Vision measuring accuracy*	E_{1X}, E_{1Y}		(1.5 + 3L/1000) µm	
	E_{1Z}		(1.5 + 4L/1000) µm	
	E_{2XY}		(2.5 + 4L/1000) µm	
Repeatability*	Short dimension	X, Y-axis	3σ≤0.2 µm	
	Long dimension		3σ≤0.7 µm	
Tracking auto focus device			Optional	

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

Got Questions?

Refer to the **QUICK VISION** Series Brochure (**2316**) for more details.

M

MeasurLink® ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

Vision Measuring Systems

ULTRA QV
Ultra-High Accuracy CNC Vision Measuring System

ULTRA QV 404

- Ultra-high accuracy CNC vision measuring machine with a measuring accuracy of 0.35µm.
- Our proprietary high-resolution (Resolution: 0.01 µm) and high-accuracy low-expansion glass scales are used on the X, Y and Z axes.
- The main unit utilizes a highly rigid moving Y-axis table with a fixed bridge. The base is made of high-stability granite.
- This model is standard-equipped with an automatic temperature compensation function that uses a temperature sensor on the main unit of the measuring machine and a temperature sensor for the workpiece.

SPECIFICATIONS

Items \ Model No.		ULTRA QV 404
Measuring range (X×Y×Z)		400×400×200 mm 16″x16″x8″
Observation unit		Programmable power turret 1X-2X-6X
Imaging device		B&W CMOS camera
Vision measuring accuracy*1	E_{UX} / $E_{UY, MPE}$	(0.35 + 1.3L/1000) µm
	$E_{UXUY, MPE}$	(0.5 + 2L/1000) µm
	E_{UZ}	(1.5 + 2L/1000) µm
Tracking auto focus device		Optional

*1 Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)
*2 Verified at shipment from factory.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

Hyper QVWLI
Non-contact 3D Measuring System


Hyper QVWLI 606

- **Hyper QVWLI** is a high-accuracy dual 3D measurement system consisting of **QV** and a white light interferometer.
- You can perform 3D surface texture analysis from 3D data captured by the WLI optical system. You can also perform dimension measurement and cross-section measurement at a specific height using the 3D data.

SPECIFICATIONS

Items \ Model No.			Hyper QVWLI 302	Hyper QVWLI 404	Hyper QVWLI 606
Measuring range (X×Y×Z)	Vision measuring area		300×200×190 mm 12″x8″x7.5″	400×400×240 mm 16″x16″x9.5″	600×650×220 mm 24″x26″x8.5″
WLI optical head unit					
View field (H×V)			5X lens: approx. 0.64×0.48 mm/10X lens: approx. 0.32×0.24 mm/ 25X lens: approx. 0.13×0.10 mm/50X lens: approx. 0.064×0.048 mm		
Z repeatability			$2\sigma \leq 0.08$ µm		
Vision optical head unit					
Observation unit			Programmable power turret 1X-2X-6X		
Imaging device			B&W CCD (1/2 in)		
Vision measuring accuracy*2	Vision	E_{UX}/$E_{UY, MPE}$	(0.8 + 2L/1000) µm		
		$E_{UXUY, MPE}$	(1.4 + 3L/1000) µm		
		$E_{UZ, MPE}$	(1.5 + 2L/1000) µm		
	Stream (optional)	E_{IX}, E_{IY}	(1.5 + 3L/1000) µm		
		E_{2X}	(2.0 + 4L/1000) µm		

*1 Movable range of **WLI** optical head.
*2 Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

Refer to the **QUICK VISION** Series Brochure (**2316**) for more details.

M

Mitutoyo

Vision Measuring Systems

QV TP Active/QV TP Pro
CNC Vision Measuring System Equipped with a Touch Trigger Probe

Non-contact and contact measurement on one machine

- **QV** touch-trigger probe unit enables both vision measurement and touch-trigger probe measurement.

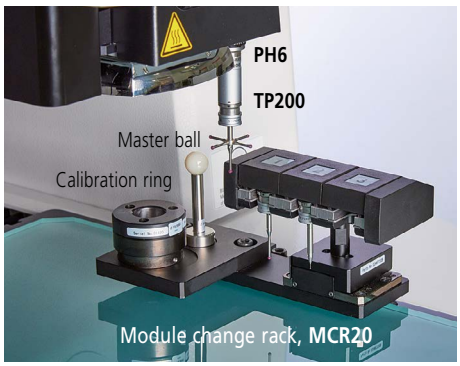
3D workpiece measurement

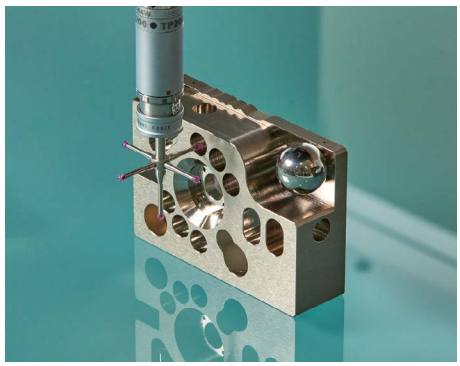
- Enables 3D measurement of workpieces, such as press-molded products, plastic-molded products, and machined products, that, until now, could not be measured with image processing alone.

Module change rack available

- Using the module change rack enables switching between vision measurement and touch probe measurement during an automatic measuring sequence.

QV TP HYPER 404 Pro





Refer to the **QUICK VISION** Series Brochure (**2316**) for more details.

SPECIFICATIONS WITH TOUCH-TRIGGER PROBE OPTIONS MOUNTED

Items	Model No.	QV TP Active 202	QV TP Active 404
Measuring range*1 (XxYxZ)	Vision	250×200×150 mm 10″x8″x6″	400×400×200 mm 16″x16″x8″
	Common to Touch-trigger Probe	184×200×150 mm 7.25″x8″x6″	334×400×200 mm 13″x16″x8″
Measuring accuracy*2 (Touch-trigger probe)	E_{1X}, E_{1Y}, E_{1Z}	(2.4 + 3L / 1000) µm	(2.4 + 3L / 1000) µm

Items	Model No.	QV TP APEX 302 Pro	QV TP APEX 404 Pro	QV TP APEX 606 Pro	QV TP HYPER 302 Pro	QV TP HYPER 404 Pro	QV TP HYPER 606 Pro
Measuring range*1 (XxYxZ)	Vision	300×200×200 mm 12″x8″x8″	400×400×250 mm 16″x16″x10″	600×650×250 mm 24″x26″x10″	300×200×200 mm 12″x8″x8″	400×400×250 mm 16″x16″x10″	600×650×250 mm 24″x26″x10″
	Common to Touch-trigger Probe	234×200×200 mm 9″x8″x8″	334×400×250 mm 13″x16″x10″	534×650×250 mm 21″x26″x10″	234×200×200 mm 9″x8″x8″	334×400×250 mm 13″x16″x10″	534×650×250 mm 31″x26″x10″
Measuring accuracy*2 (Touch-trigger probe)	$E_{X,\ MPE}$/$E_{Y,\ MPE}$/ $E_{Z,\ MPE}$	(1.8 + 3L / 1000) µm			(1.7 + 3L / 1000) µm		

*1 When a module change rack, a master ball, and a calibration ring are mounted, the measurement ranges are smaller than those in the table. Other specifications are the same as those for **QV Active**, **QV APEX Pro**, and **QV HYPER Pro**. Please contact your nearest M³ Solution Center for more details.

*2 L=length between two arbitrary points (mm)

Talk to Sales

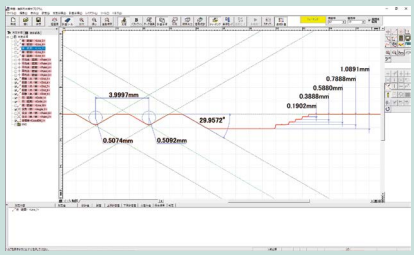
Vision Measuring Systems

QV Hybrid Type 4
CNC Vision Measuring System Equipped with CPS Non-contact Displacement Sensor

- This dual system with a non-contact displacement sensor for scanning that enables measurement of minute height differences and 3D shapes.
- The non-contact displacement sensor (CPS probe) uses the wavelength confocal method.
- The LED used as the light source of the displacement sensor has an auto-brightness control function that enables seamless measurement of materials with different reflectivity.

QVH4 HYPER 606 Pro

Example of 3D form comparison



Features: QVH4 Pro

- Enables detection of high inclination angles for both mirror and diffused surfaces.
- The automatic lighting adjustment function allows for high accuracy measurements.
- Surface roughness or thickness measurement of thin and transparent objects such as film.

COMMON SPECIFICATIONS

Items \ Model No.		QVH4 APEX 302 Pro	QVH4 APEX 404 Pro	QVH4 APEX 606 Pro	QVH4 HYPER 302 Pro	QVH4 HYPER 404 Pro	QVH4 HYPER 606 Pro
Measuring range (X×Y×Z)	Vision	300×200×200 mm 12"x8"x8"	400×400×250 mm 16"x16"x10"	600×650×250 mm 24"x26"x10"	300×200×200 mm 12"x8"x8"	400×400×250 mm 16"x16"x10"	600×650×250 mm 24"x26"x10"
Vision measuring accuracy*1	$E_{UX}/E_{UY,\ MPE}$	(1.5 + 3L/1000) µm			(0.8 + 2L/1000) µm		
	$E_{UXY,\ MPE}$	(2.0 + 4L/1000) µm			(1.4 + 3L/1000) µm		
	$E_{UZ,\ MPE}$	(1.5 + 4L/1000) µm			(1.5 + 2L/1000) µm		
Displacement sensor measuring accuracy*1*2	E_{1Z}	(1.5 + 4L/1000) µm			(1.5 + 2L/1000) µm		

*1 L=length between two arbitrary points (mm) *2 Inspected to a Mitutoyo standard.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

CLASS 1 LASER PRODUCT

Safety precautions regarding QV HYBRID TYPE1

This product uses a low-power invisible laser (780 nm) for measurement. The laser is a CLASS 1 EN/IEC 60825-1 device. A warning and explanation label, as shown above, is attached to the product as appropriate.

QV HYBRID TYPE1
CNC Vision Measuring System equipped with Laser Non-contact displacement sensor

- This dual system with a non-contact displacement sensor for scanning enables measurement of minute height differences and 3D shapes.
- The double-pinhole technique is used as the detection method of the displacement sensor. It is less directional compared with the knife-edge and triangulation techniques.
- The small laser spot with diameter of about 2 µm makes it possible to measure minute shapes.

Features: QV HYBRID TYPE1

- The focusing point method minimizes the difference in the measuring face reflectance and achieves high measurement reproducibility.
- Capable of measuring detailed shapes in high resolution.

COMMON SPECIFICATIONS

Items \ Model No.		QVH1 Apex 302	QVH1 Apex 404	QVH1 Apex 606	Hyper QVH1 302	Hyper QVH1 404	Hyper QVH1 606
Measuring range (X×Y×Z)	Vision	300×200×200 mm 12"x8"x8"	400×400×250 mm 16"x16"x10"	600×650×250 mm 24"x26"x10"	300×200×200 mm 12"x8"x8"	400×400×250 mm 16"x16"x10"	600×650×250 mm 24" x26"x10"
Vision measuring accuracy*	E_{1X}, E_{1Y}	(1.5 + 3L/1000) µm			(0.8 + 2L/1000) µm		
	E_{1Z}	(1.5 + 4L/1000) µm			(1.5 + 2L/1000) µm		
	E_{2XY}	(2.0 + 4L/1000) µm			(1.4 + 3L/1000) µm		
Displacement sensor measuring accuracy*	E_{1Z}	(1.5 + 4L/1000) µm			(1.5 + 2L/1000) µm		

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

M

Vision Measuring Systems

MeasurLink® ENABLED
Data Management Software by Mitutoyo

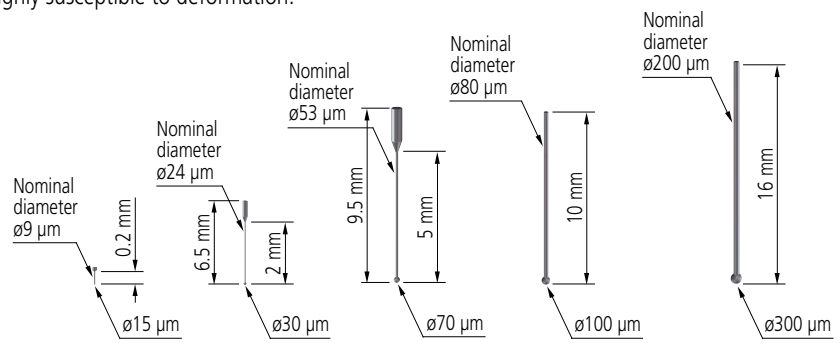
PROPRIETARY INSPECTION CERTIFICATE

UMAP Vision System TYPE2
Micro Form Measuring System

Ultrasonic Micro Probe UMAP

Contact measurement of a small diameter and its section or contour is possible, which is difficult with a conventional Vision Measuring System or CMM. Capable of high accuracy, sophisticated, non-contact and contact measurement on one machine. With a minimum measuring force of 1 μN, it is not only less likely to mark workpiece surfaces, but also enables measurement of workpieces that are highly susceptible to deformation.

Micro probe, UMAP



UMAP 101 Stylus

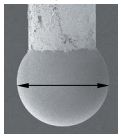
ø15 μm

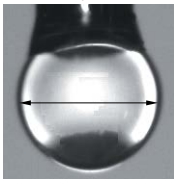
UMAP 103 Stylus

ø30 μm

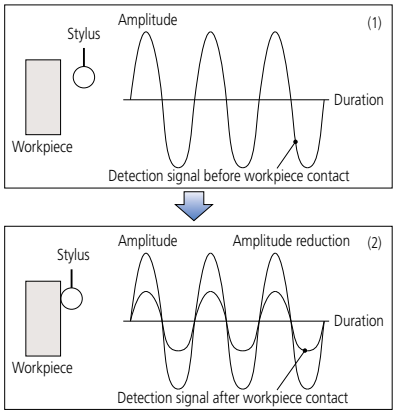
UMAP 107 Stylus

ø70 μm

UMAP 110 Stylus

ø100 μm

UMAP 130 Stylus

ø300 μm

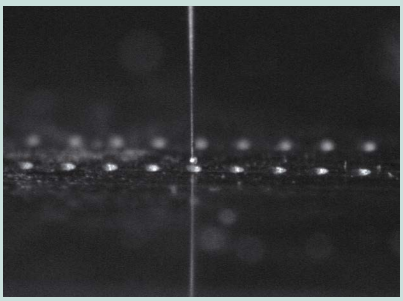
Detection of surface principle



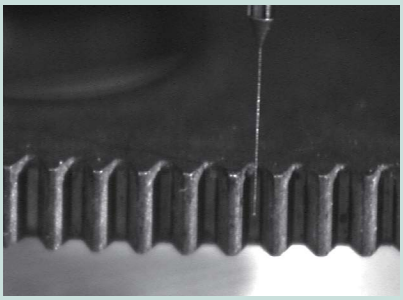
(1) In this drawing, the stylus is vibrating with micro amplitude. If it does not come into contact with the workpiece, the vibration state is maintained.

(2) As the stylus comes into contact with the workpiece surface, the vibration amplitude decreases as the contact increases. When the decreasing amplitude falls below a certain level, a touch-trigger signal is generated.

Typical applications



Contour measurement of a ø0.125 mm hole



Measuring form of micro gear teeth

SPECIFICATIONS

Items \ Model No.			Hyper UMAP 302	ULTRA UMAP 404
Measuring range (common to vision and **UMAP**)	X-axis×Y-axis		185×200 mm 7″x8″	285×400 mm 11″x16″
	Z-axis	**UMAP 101/103**	175 mm / 6.9″	
		UMAP 107/110	180 mm / 7″	
		UMAP 130	185 mm / 7.3″	
Vision measuring accuracy*	Vision	$E_{UX,MPE}$, E_{UYMPE}	(0.8 + 2L/1000) μm	(0.35 + L/1000) μm
		$E_{UZ,MPE}$	(1.5 + 2L/1000) μm	(1.5 + 2L/1000) μm
		$E_{UXY,MPE}$	(1.4 + 3L/1000) μm	(0.5 + 2L/1000) μm
	Stream (optional)	E_{1x}, E_{1Y}	(1.5 + 3L/1000) μm	-
		E_{2XY}	(2.0 + 4L/1000) μm	-
	Optical Magnification		2.5x objective & middle magnification tube lens	5x objective & middle magnification tube lens
	UMAP	E_{1x}, E_{1Y}	(1.7 + 3L/1000) μm	(1.5 + 3L/1000) μm
Repeatability	Dimensional measurement within FOV		-	$3\sigma \leq 0.1$ μm
	UMAP	**UMAP 101/103/107**	$\sigma \leq 0.1$ μm	$\sigma \leq 0.08$ μm
		UMAP 110/130	$\sigma \leq 0.15$ μm	$\sigma \leq 0.12$ μm

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

Refer to **UMAP Vision System** Brochure (**E14000**) for more details.

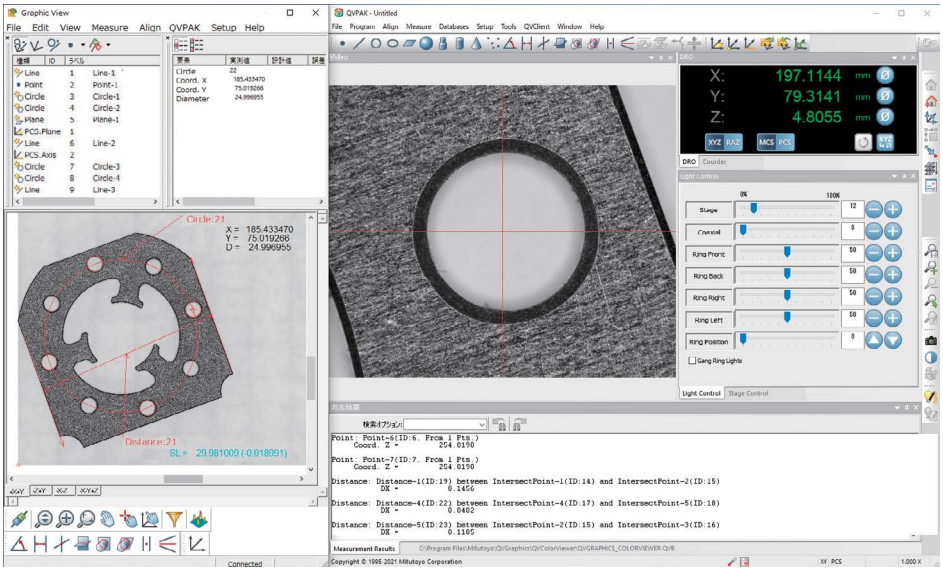
MeasurLink® ENABLED
Data Management Software by Mitutoyo

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

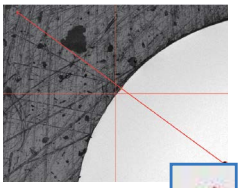
Vision Measuring Systems

QVPAK
Operating Software for Quick Vision Systems

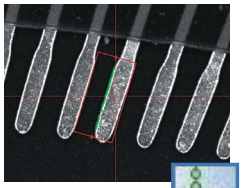
- **QVPak** is the control software used on all Quick Vision machines. It is used to write programs, run programs, and perform manual measurements.



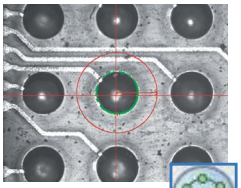
Edge Detection Tools



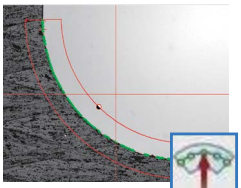
Simple Tool
This is a basic tool for detecting one point.



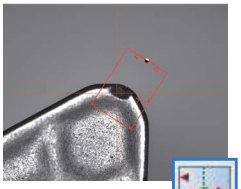
Box Tool
This tool detects straight edges with a minimum of one pixel interval. Compared to the simple tool, the Box tool can perform averaging and remove abnormal points, which enables stable measurements.



Circle Tool
This tool detects rounded edges with a minimum of one pixel space. Edges can be specified easily with a single click.

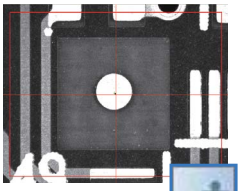


Arc Tool
This tool is suited for detection of arcs and corner radii.

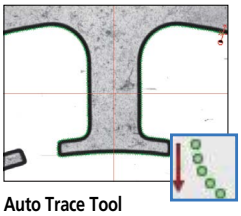


Maximum / Minimum Tool
This tool detects the maximum or minimum on the specified edge.

Area Centroid Tool
This tool detects the position of a form's centroid, and is suited for locating the position of different forms.



Pattern Search Tool
This tool performs pattern matching to detect a position, and is optimal for positioning alignment marks and similar tasks.



Auto Trace Tool
This is a shape-measuring tool that automatically tracks a contour with input consisting only of a start point and end point.

Where to Buy

Refer to the **QUICK VISION** Series Brochure (**2316**) for more details.

M

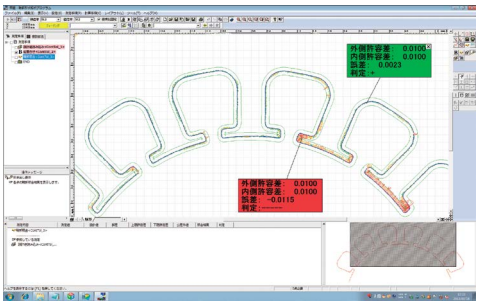
Mitutoyo

Vision Measuring Systems

Application Software (Optional)

Form assessment/analysis software
FORMTRACEPAK-AP

Verification of designed value and form analysis are performed on the basis of the contour data obtained via the QV auto trace tool, non-contact displacement sensor, PFF, and WLI.

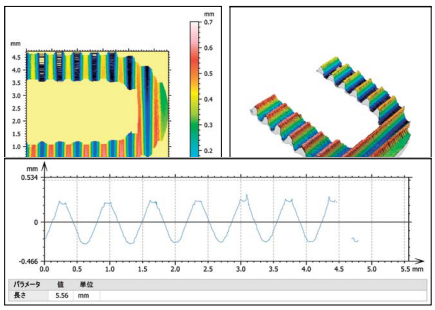


FORMTRACEPAK-PRO

This software performs 3D form analysis from the data obtained via the non-contact displacement sensor of the **QV HYBRID** Series.

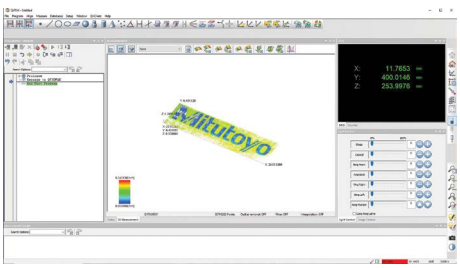
MCubeMap

Allows you to analyze parameters compliant with JIS B681-2: 2018 (ISO25178-6: 2010), such as Sa, Sq and other height parameters from the 3D data captured by **QVWLI**.



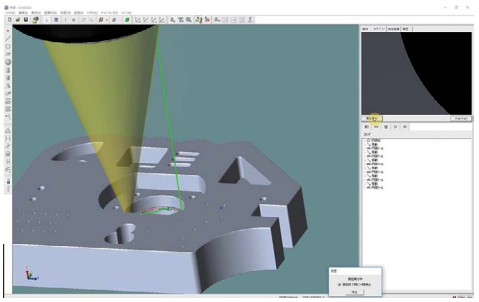
QV3D Function

This option generates 3D forms from the PFF (Points From Focus) or WLI (White Light Interferometer) data.



Measurement support software
QV3DCAD

QV3DCAD uses 3D CAD models to easily create **QVPAK** part programs both online and offline.



Offline teaching software
EASYPAG-PRO

This software creates **QVPAK** measurement procedure programs using 2D CAD data.

Statistical processing software
MeasurLink®

This software enables statistical arithmetic processing of measurement results.

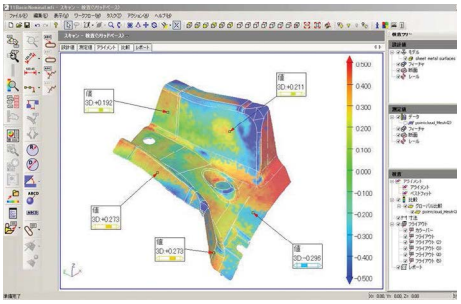
MeasurLink®

External control software
QVEio

Allows you to externally control or output the operating status of a QV connected to a PLC or PC.

MSurf-I

This software compares scanned points collected by the QV system to a solid model allowing profile of a surface measurement.



Get a Quote

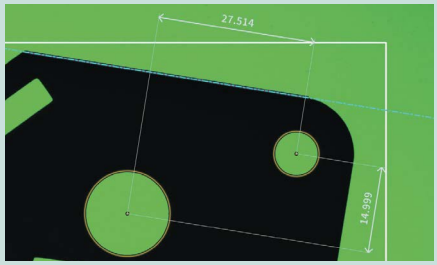
M

Vision Measuring Systems

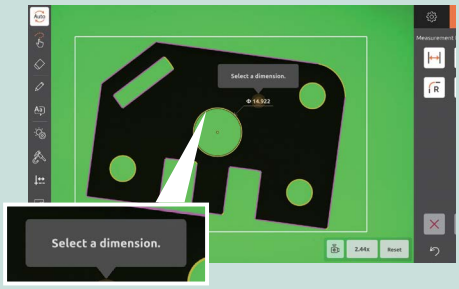
QM-Fit
Smart Vision System

- Measurements are automatically detected based on the workpiece. To start measuring a workpiece, simply place it on the measuring stage.
- Intuitive, touch interface.
- Standalone machine with integrated PC and display.
- More compact than conventional measuring machines and can be installed almost anywhere.

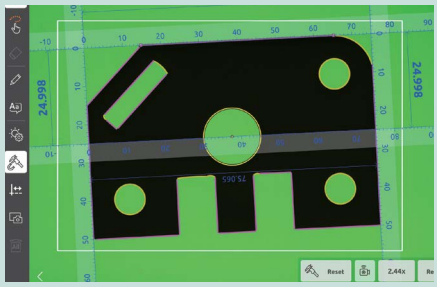
Automatic Element Detection



Guidance Display



Caliper Snap



SPECIFICATIONS

QM-Fit		Description
Image sensor		20-megapixel color CMOS
Touch panel monitor	Size	15.6 in
	Resolution	1980 x 1080
	Zoom magnification (digital)	Max. 100X
Illumination	Stage light	Green LED
	Ring light	White LED: 8 segments
	Max. loading capacity	22 lbs / 10 kg (uniformly disibuted load)
Measurement specifications (Accuracy assurance temperature: 20±1°C)	Measurement accuracy*	±10 µm
	Repeatability*	2σ 4 µm
	Measurement range	4.5 x 2.95 in / 115 x 75 mm
	Max. workpiece height	1.4 in / 36 mm

* Based on in-house inspection criteria

Refer to the **QM-Fit** Series Brochure (**E14032-US**) for more details.

M

Vision Measuring Systems

MeasurLink® ENABLED
Data Management Software by Mitutoyo

QS-L/AFC
Manual Vision Measuring System

- Manual vision measuring system with a high speed, high-definition auto focus 3-megapixel camera.
- High-speed height measurement with motorized auto focus.
- A 4-quadrant high-intensity LED ring light provides excellent observation performance.
- The zoom unit and interchangeable objectives achieve a maximum magnification ratio of 14X. Viewing possibilities extend from low magnification wide view measurement to high magnification micro-measurement.

QS-L3017Z/AFC

Auto focus image

From wide view measurement to micro-measurement

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 (mm)	Horizontal (H)	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																			

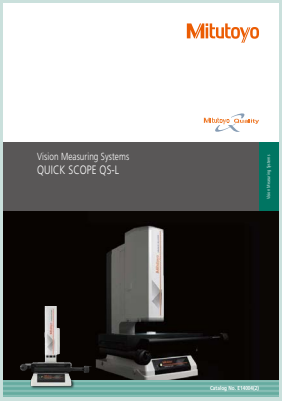
Note: The total magnification indicates the magnification on the monitor when the size of the **QSPAK** video window is 252.7×214.9 mm (default).

Find Training

SPECIFICATIONS

Model No.		QS-L2010Z/AFC	QS-L3017Z/AFC	QS-L4020Z/AFC
Drive method		Auto focus equipped, X, Y-axis: manual; Z-axis: motor-operated		
Measuring range (X×Y×Z)		200×100×150 mm 8″x4″x6″	300×170×150 mm 12″x6.7″x6″	400×200×150 mm 16″x8″x6″
Resolution/Scale unit		0.1 µm/Linear encoder		
Vision measuring accuracy*1*2	X-axis, Y-axis	(2.2 + 0.02L/1000) µm		
	Z-axis	(4.5 + 0.006L/1000) µm		
Accuracy guaranteed temperature		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 detection method		3 megapixel, CMOS color camera (1/2 in)		
Illumination	Transmitted light	White LED		
	Co-axial light	White LED		
	Ring light	4-quadrant white LED		

*1 Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)
*2 3X lens magnification or greater
*3 1X and 2X objective lenses are optional



Refer to the **QUICK SCOPE QS-L** Brochure (**2319**) for more details.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

Vision Measuring Systems

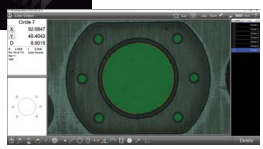
Quick Image
Non-contact 2D Vision Measuring System

- This series of 2D vision measuring machines offers high-efficiency measurement by employing a telecentric optical system that has a deep focal depth and a wide field of view.
- Includes Metlogix M3 software for easy, intuitive operation.
- The stitching function enables the entire view of a large workpiece so that highly accurate and speedy measurement can be performed.
- An optional model with a motorized stage offers easy and comfortable stage operation.
- A single click enables multiple measurements in one display. A batch measurement can be applied to multiple workpieces in the display after executing a pattern search based on the workpiece position.
- This series is equipped with a 3-megapixel color camera. Even with low magnification, high repeatability can be obtained.
- The choice of five stage sizes makes it easy to choose a machine to suit the user's application.

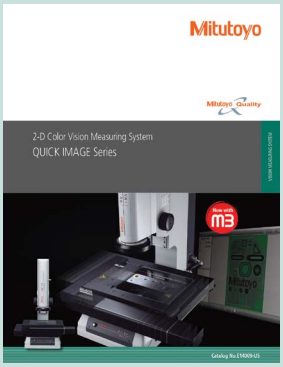
M3

QI-C2017D

Motorized stage on QI-C



M3 software



Refer to the **QUICK IMAGE** Series Brochure (**E14009-US**) for more details.

SPECIFICATIONS

			Manual stage model					Motorized stage model		
Model No.			QI-A1010D	QI-A2010D	QI-A2017D	QI-A3017D	QI-A4020D	QI-C2010D	QI-C2017D	QI-C3017D
Order No.			361-850A	361-851A	361-852A	361-853A	361-854A	361-860A	361-861A	361-862A
Package No.			361-850M3Pk	361-851M3PK	361-852M3PK	361-853M3PK	361-854M3PK	361-860APK	361-861APK	361-862APK
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
View field			1.26" x 0.94" (32×24mm)
Measurement mode			High resolution mode / Normal mode *4
Travel range (Z-axis)			3.94"(100mm)
Accuracy	Measurement accuracy within the screen *1		±4μm
	Repeatability within the screen (±2σ) *2	High resolution mode	±1μm
		Normal mode	±2μm
	Measurement accuracy (E1xy) *1		±(3.5+0.02L)μm L: arbitrary measuring length (mm)
Monitor magnification *3			7.6X
Optical system	Magnification (Telecentric Optical System)		0.2X
	Depth of focus	High resolution mode	±0.6mm
		Normal mode	±11mm
	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)

M

Mitutoyo

Quick Guide to Precision Measuring Instruments

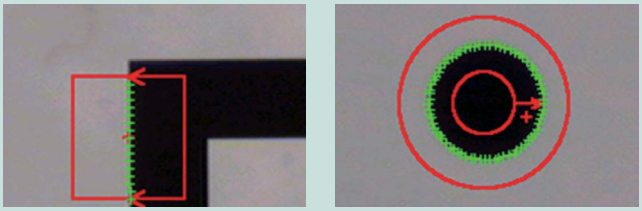
Vision Measuring Machines

Vision Measurement

Vision measuring machines mainly provide the following processing capabilities.

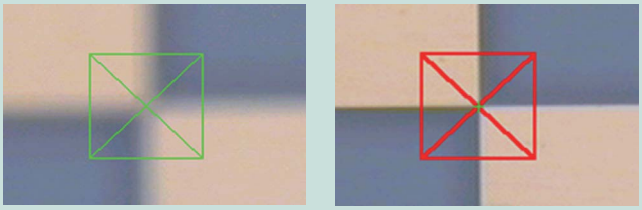
- **Edge detection**

  Detecting/measuring edges in the XY plane



- **Auto focusing**

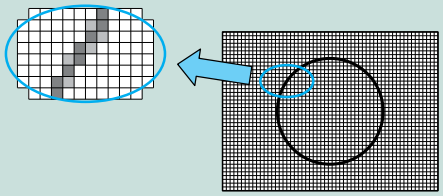
  Focusing and Z-axis measurement



- **Pattern recognition**

  Alignment, positioning, and inspecting a feature

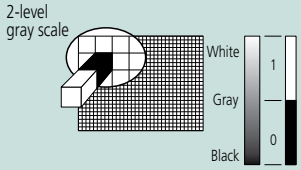
Image Storage



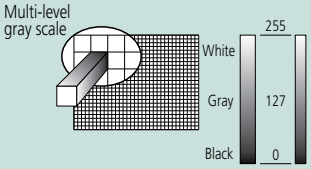
An image is comprised of a regular array of pixels. This is just like a picture on fine plotting paper with each square solid-filled differently.

Gray Scale

A PC stores an image after internally converting it to numeric values. A numeric value is assigned to each pixel of an image. Image quality varies depending on how many levels of gray scale are defined by the numeric values. The PC provides two types of gray scale: two-level and multi-level. The pixels in an image are usually displayed as 256-level gray scale.



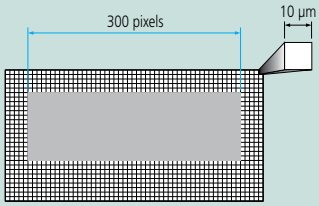
Pixels in an image brighter than a given level are displayed as white and all other pixels are displayed as black.



Each pixel is displayed as one of 256 levels between black and white. This allows high-fidelity images to be displayed.

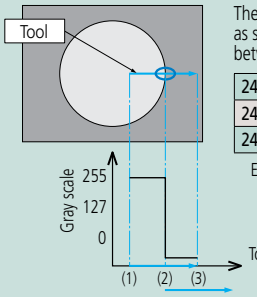
Dimensional Measurement

An image consists of pixels. If the number of pixels in a section to be measured is counted and is multiplied by the size of a pixel, then the section can be converted to a numeric value in length. For example, assume that the total number of pixels in the horizontal size of a square workpiece is 300 pixels as shown in the figure below. If a pixel size is 10 µm under imaging magnification, the total length of the workpiece is given by 10 µm×300 pixels=3000 µm=3 mm.



Edge Detection

How to actually detect a workpiece edge in an image is described using the following monochrome picture as an example. Edge detection is performed within a given domain. A symbol which visually defines this domain is referred to as a tool. Multiple tools are provided to suit various workpiece geometries or measurement data.



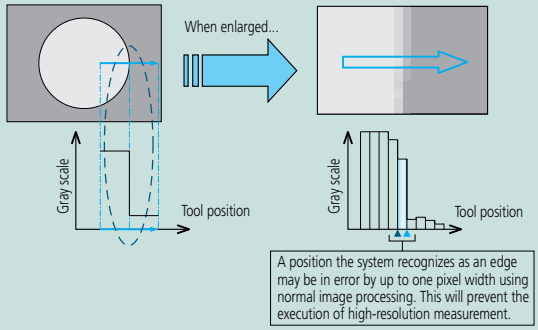
The edge detection system scans within the tool area as shown in the figure at left and detects the boundary between light and shade.

244	241	220	193	97	76	67	52	53	53
243	242	220	195	94	73	66	54	53	55
244	246	220	195	94	75	64	56	51	50

Example of numeric values assigned to pixels on the tool

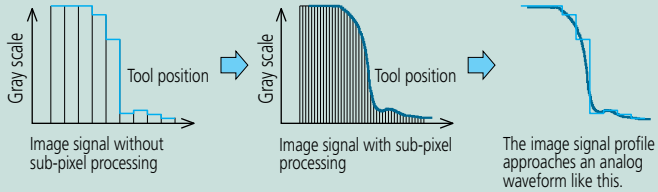
(1) Scan start position
(2) Edge detection position
(3) Scan end position

High-resolution Measurement



A position the system recognizes as an edge may be in error by up to one pixel width using normal image processing. This will prevent the execution of high-resolution measurement.

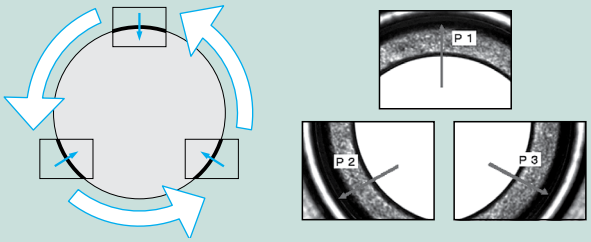
To increase the accuracy in edge detection, sub-pixel image processing is used. An edge is detected by determining an interpolation curve from adjacent pixel data as shown below.
As a result, it allows measurement with a resolution better than 1 pixel.



M

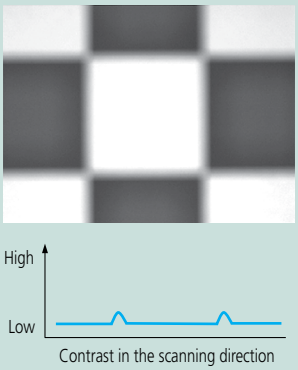
Measurement along Multiple Portions of an Image

Large features that do not fit on one screen have to be measured by precisely controlling the position of the sensor and stage so as to locate each reference point within individual images. By this means, the system can measure even a large circle, as shown below, by detecting the edge while moving the stage across various parts of the periphery.

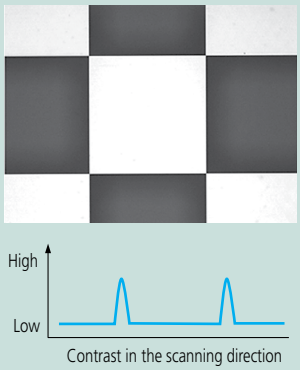


Variation in Contrast Depending on the Focus Condition

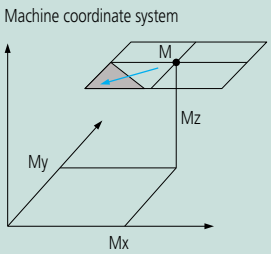
Edge contrast is low due to out-of-focus edges.



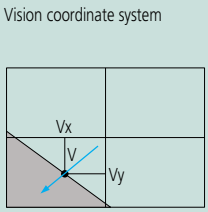
Edge contrast is high due to sharp, in-focus edges.



Composite Coordinates of a Point



Measuring machine stage position
M = (Mx, My, Mz)



Detected edge position (from the center of vision)
V = (Vx, Vy)

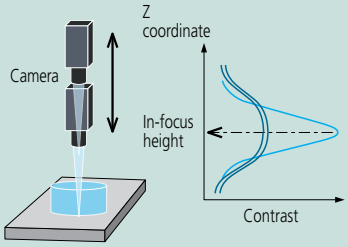
Actual coordinates are given by X=(Mx+Vx), Y=(My+Vy), and Z=Mz, respectively.

Since measurement is performed while individual measured positions are stored, the system can measure dimensions that cannot be included in one screen, without problems.

Principle of Auto Focusing

The system can perform XY-plane measurement, but cannot perform height measurement using only the camera image. The system is commonly provided with the Auto Focus (AF) mechanism for height measurement. The following explains the AF mechanism that uses a common image, although some systems may use a laser AF.

The AF system analyzes an image while moving the camera up and down in the Z-axis. In the analysis of image contrast, an image in sharp focus will show a peak contrast and one out of focus will show a low contrast. Therefore, the height at which the image contrast peaks is the just-in-focus height.



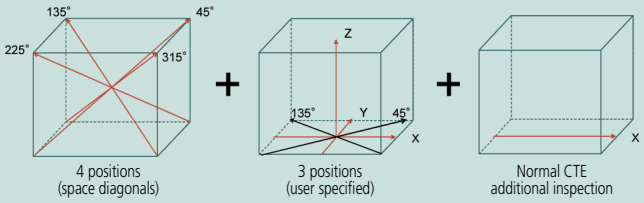
Overview of ISO 10360-7:2011

ISO 10360-7:2011 (Geometrical product specifications (GPS) -- Acceptance and reverification tests for coordinate measuring machines (CMM) -- Part 7: CMMs equipped with imaging probing systems) was published on June 1, 2011.
Some inspection items are listed in ISO 10360-7:2011. The following summarizes the test method for determining length measurement error (E) and probing error (P_{F2D}).

Length measurement error, *E*

Five test lengths in seven different directions within the measuring volume, each length measured three times, for a total of 105 measurements. Four directions are the space diagonal. Remaining three directions are user specified; default locations are parallel to the VMM axes.

When CTE (coefficient of thermal expansion) of the test-length artifact is < 2×10^{-6}/K, additional measurement using an artifact with a normal CTE (8 to 13×10^{-6}/K) is performed.

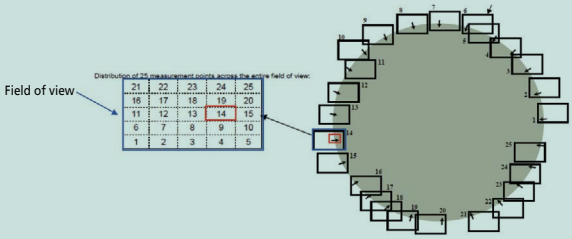


Probing error, P_{F2D}

Measure 25 points distributed evenly around the test circle (14.4° pitch).

Each of the 25 points shall be measured using the specified 25 areas of the field of view.

Calculate probing error as the range of the 25 radial distances (Rmax - Rmin) from the center of the least-square circle.



M