

## Non-contact 3D Measuring System QUICK VISION WLI Pro Series



# Non-contact 2D Measurement and 3D Shape Measurement in a Single System

Advanced High Precision Dual Head Measuring System equipped with White Light Interferometer (WLI) Optical Head

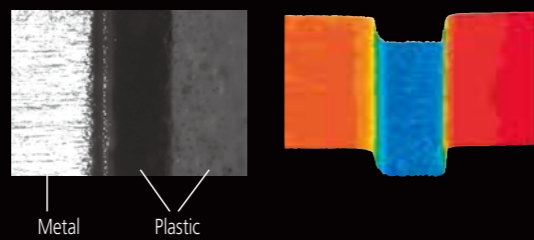


## Non-contact 2D/3D measurement with high precision and high resolution

White light interferometer (WLI optical head) applied to vision measuring systems enables a wide range of powerful measurements, from 2D measurement of coordinates and dimensions, surface analysis in microscopic areas, depth measurement of small-diameter holes, and to high-precision 3D measurement of wiring dimensions on a printed circuit board.

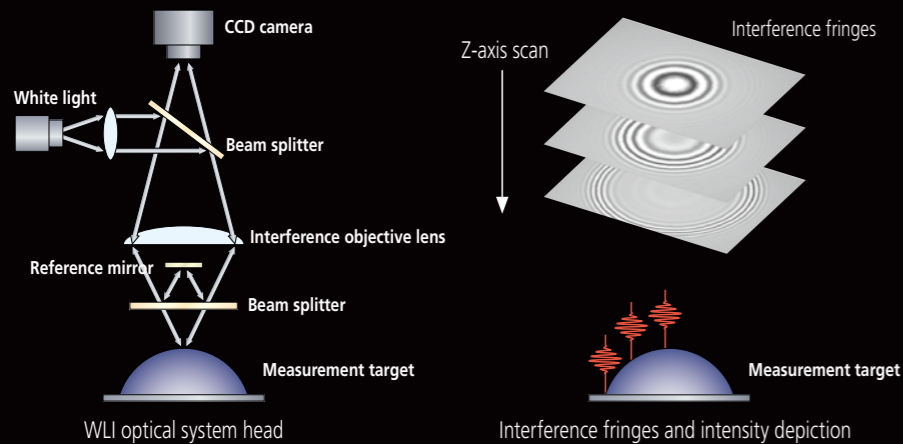
## Capable of measuring a wide variety of surfaces

In addition to online programming using 3D CAD models, an offline program can be created from an image or with a touch probe. This makes it possible to increase up-time of the QUICK VISION Pro main unit, thereby shortening production lead times.



## Principle of WLI measurement

A white light is split into two beams, one for the reference mirror within the interference objective lens and the other for the measurement sample. When the interference objective lens is swept in the Z-direction, white interference fringes are generated only in the area of the measurement sample that is focused. The three dimensional shape of the object being measured is calculated by detecting the peak position of the interference fringe intensity at each pixel position of the CCD camera.

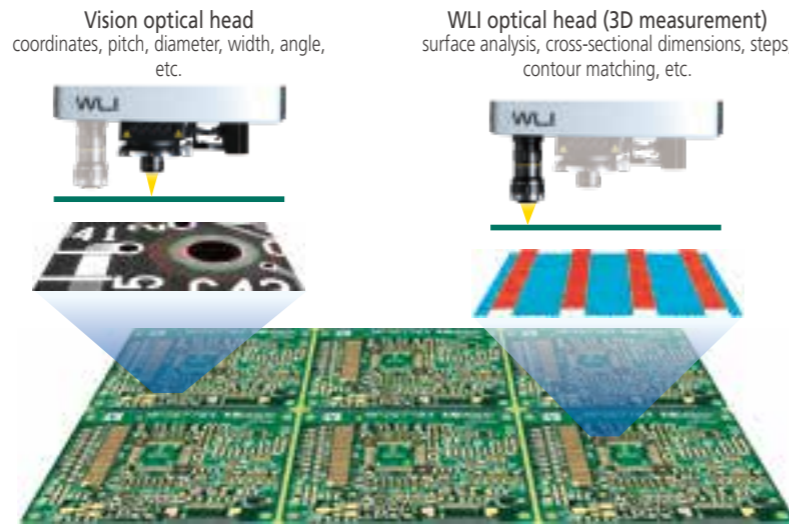


# PERFORMANCE

Top Performance Presented by Continuously Evolving Vision Measuring Function and Advanced WLI Optical Head

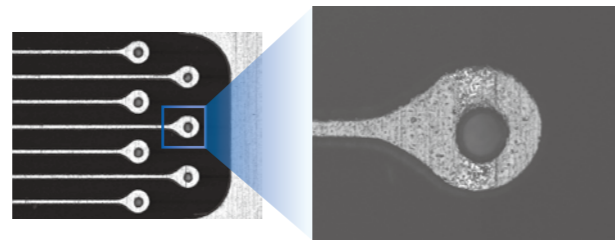
High-efficiency measurement achieved by a single machine performing two roles

Coordinate dimension measurement has inherited all of the proven vision measuring functions of Quick Vision Pro. Switches to 3D measurements without setup changes following vision measurement. Seamlessly continuous measurement is made possible by Quick Vision Pro's automatic control.



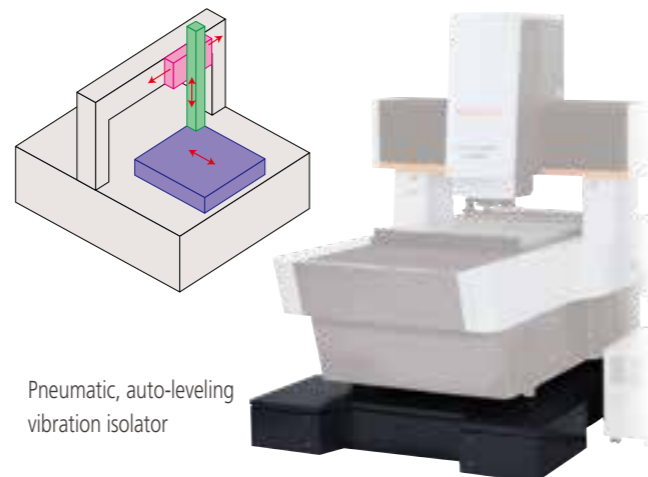
Easy targeting of measurement position

Offset amount of vision optical head and WLI optical head is calibrated with high accuracy. Switching to high-magnification WLI optical head after positioning with vision optical head of low magnification and a wide field of view does not lose sight of the targeted area, thus guaranteeing a highly efficient measurement.



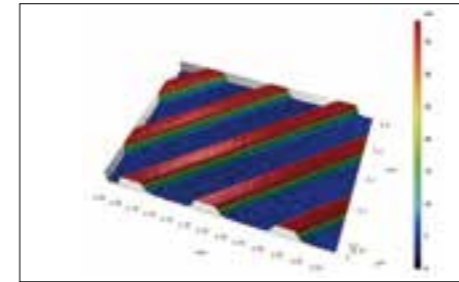
Advanced-design platform culminating from Mitutoyo's high accuracy technology

Main frame structure boasting a large stage and high accuracy is achieved by structure having a fixed bridge and a translation stage providing mutually independent X-axis and Y-axis movements, which are advantageous for achieving high accuracy. For added stability of measurement, a pneumatic auto-leveling vibration isolator is provided as a standard structure. Unique design principle of Quick Vision WLI Pro series guarantees superb vibration isolation performance. Achieves high precision measurement for a wide range of applications, from long dimensions of large workpieces to minute dimensions.



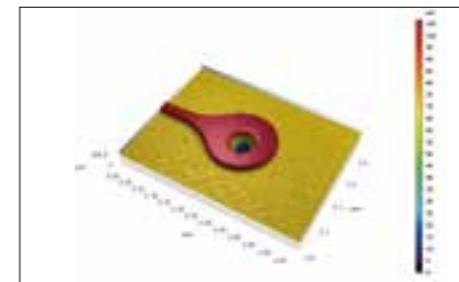
# APPLICATION

Semiconductor package substrate



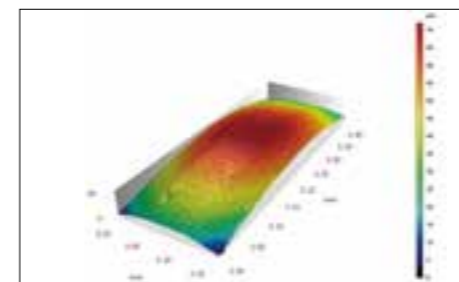
Surface analysis

Semiconductor package substrate



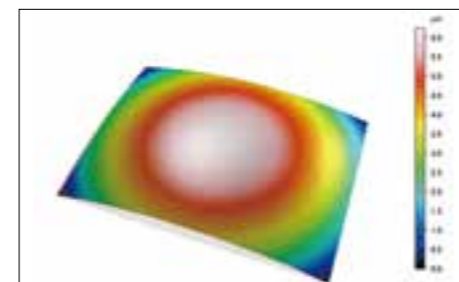
ID and depth measurements

Board-to-Board connector



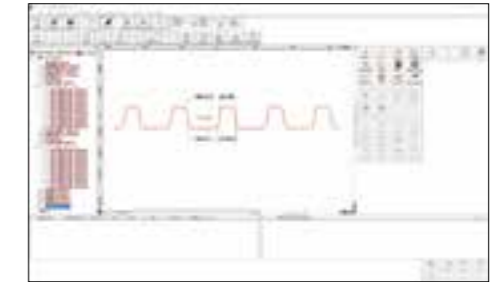
Cross-sectional shape measurement

Microscopic precision machined part



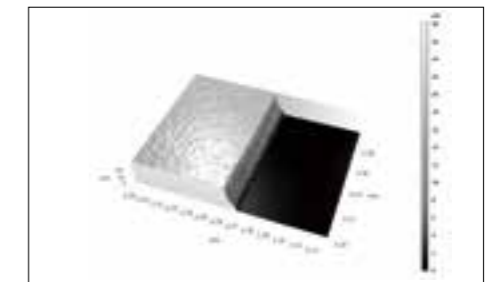
Cross-sectional shape measurement

Semiconductor package substrate



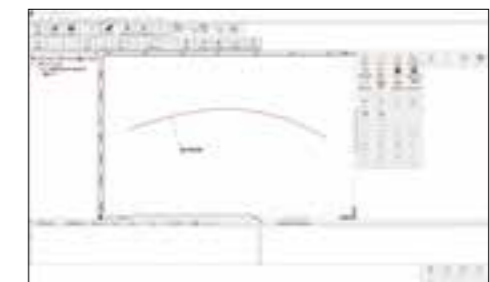
Cross-sectional shape measurement

Metal thin film



Surface analysis, and step measurement

Board-to-Board connector



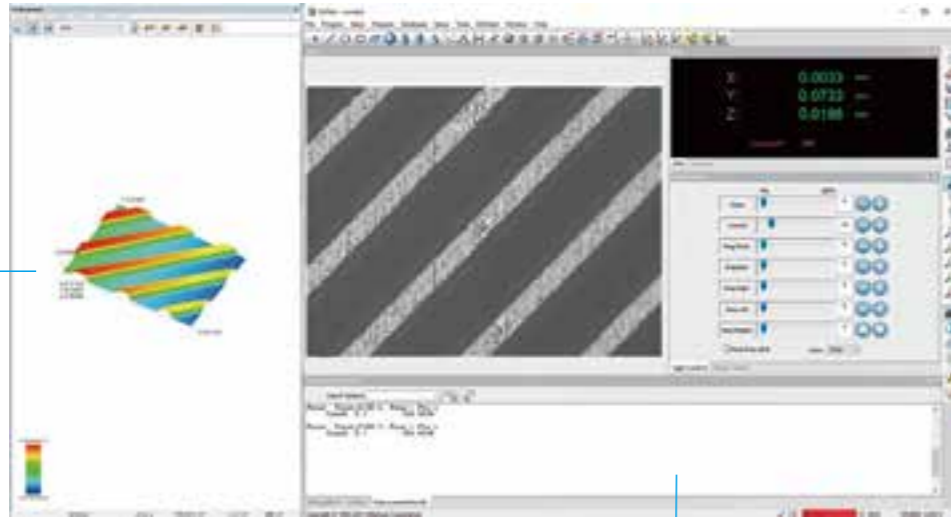
Coordinate-position, OD, and height measurements

3D Surface Texture Analysis



Surface analysis, step, and cross sectional measurements

# SOFTWARE



3D data-synthesizing software  
**QV3D Function**

System-controlling main software  
**QVPAK**

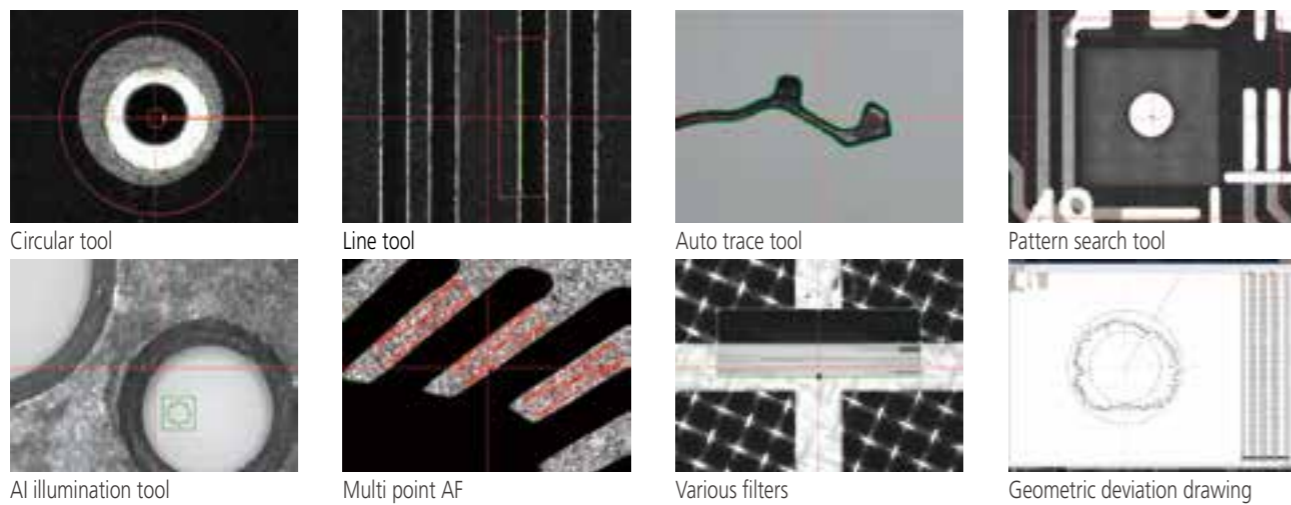
## QVPAK

A function for acquiring interference fringes is added to QVPAK Software having high functionality and universal application capabilities for vision measuring systems. The measurement procedure program prepared by QVPAK automatically controls the coordinates and dimensions in vision measurement, 3D data synthesis in WLI measurement, data output, and shape/evaluation analysis software (optional) thus providing a highly efficient measurement system.

### Examples of computational capabilities



### Versatile vision measurement

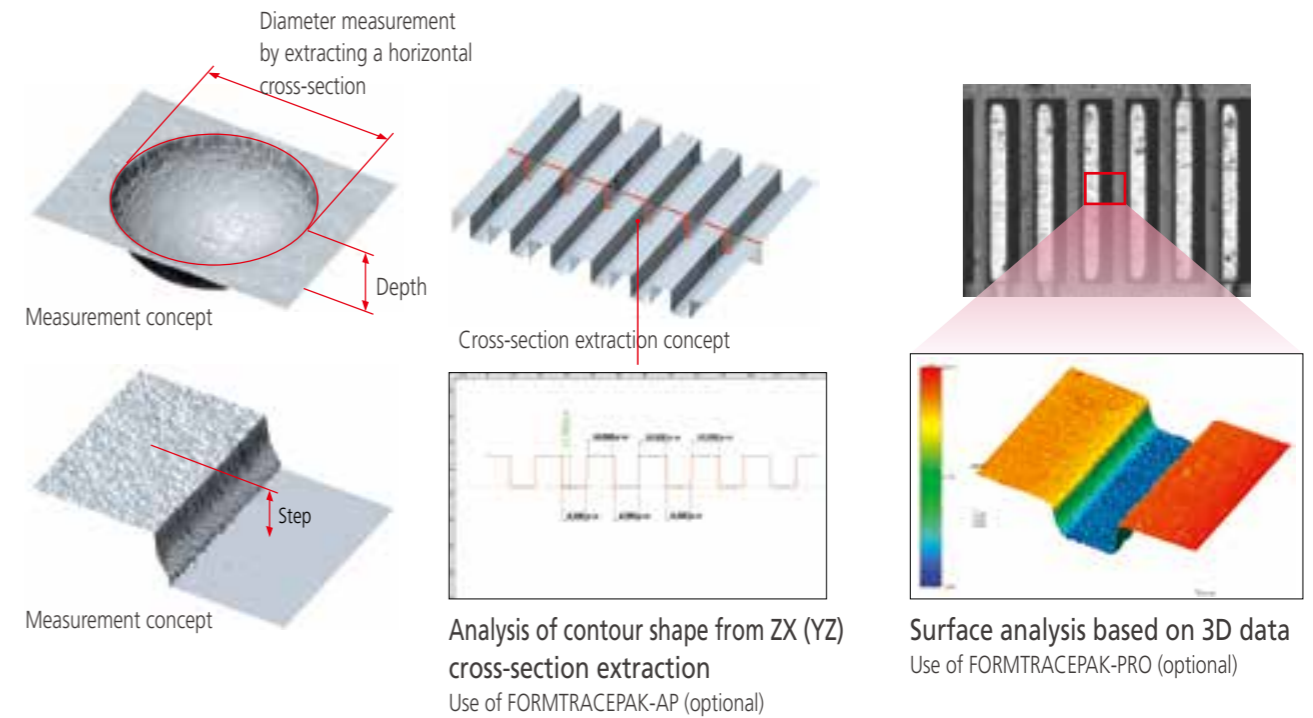


## QV3D Function (optional)

Synthesizes three dimensional shape data from interference fringes to display shapes or outputs point cloud data to external sources. Point cloud data can be used for generating surfaces, as well as for outputting height, and internal/outer diameter. Also, 3D data can be transferred to the shape/evaluation analysis software (optional) to implement shape measurement and surface analysis.

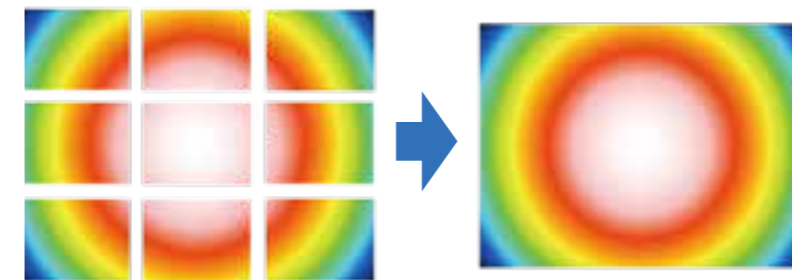
### Applications

Enables you to switch from inaccurate visual inspections to accurate measurements based on automatic computation.



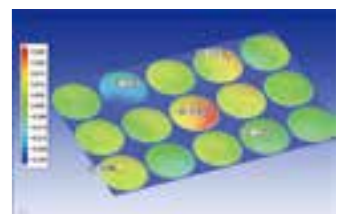
### 3D Profile Stitching

This function allows concatenation of multiple fields of 3D profile data unless only single field measurement can cover an object area to be measured. The running of 3D profile stitching enables a wide range of measurement or analysis while maintaining a high resolution.



### MSURF-I

Conducts analysis or comparison verification of measured point cloud data through QVH1 Pro/QVH4 Pro and QV WLI Pro in reference to nominal data (supporting CAD data import). Note: A separate PC is necessary for MSURF-I analysis.



OPTIONAL SOFTWARE

FORMTRACEPAK-AP

Form Evaluation and Analysis Software

Contour Tolerancing Function

- Design data creation
- CAD data conversion, master workpiece conversion, function specification, text file conversion, and aspherical surface design value creation
- Tolerancing
- Normal vector direction tolerancing, axial direction tolerancing, and best-fit tolerancing
- Result display
- Result listing, error graph, error developed view, error coordinate value display function, analysis result display

Report Creation Function

- Measurement result, error graph, and error developed view

Other Functions

- Recording and executing analysis procedures
- External output function: CSV, text or DXF/IGES format output
- Fairing process
- Quadratic curve fitting function
- Quasi-roughness analysis function

Microscopic Form Analysis

- Analyzed items: point measurement, line measurement, circle measurement, distance measurement, intersection measurement, angle measurement, origin setting, and axial rotation
- Calculated items: maximum, minimum, average, standard deviation, and area



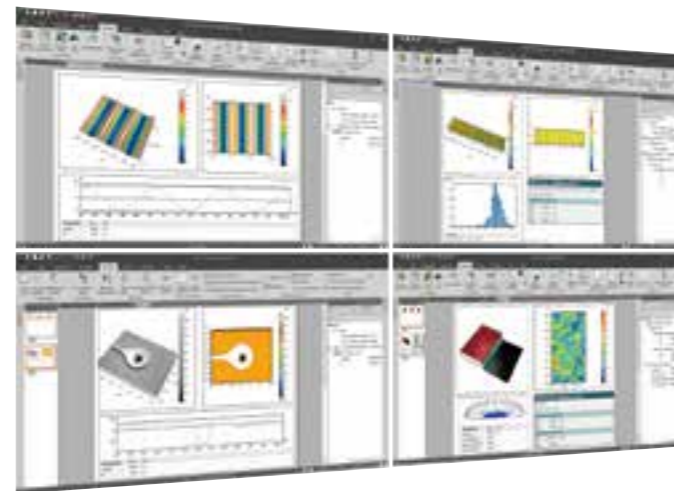
MCubeMap

3D Surface Property Analyzing Software

Clear and informative imaging of analyzed data using powerful graphics technology.

The software conforms to the latest ISO25178-2 3D Surface Texture Parameter Specifications, allowing analysis of parameters such as height of Sa, Sq, etc., space, compound and volume.

The user can easily create a graphical report where analysis results are freely laid out.



Other optional software programs for Quick Vision are also available. For detailed information, refer to the Quick Vision Pro series catalog.

Abundant Data Manipulation and Analysis Functions

This function handles leveling, outlier processing, form elimination, bearing area curve, peak distribution, twist analysis, hole/protrusion volume, texture orientation, and others.

# OPTIONS



QV Objectives

Objective	QV-SL0.5x <sup>*1</sup>	QV-HR1x	QV-SL1x	QV-HR2.5x	QV-SL2.5x	QV-HR5x	QV-5x	QV-HR10x <sup>*1</sup>	QV-10x <sup>*1</sup>	QV-25x <sup>*1</sup>
Code No.	02AKT199	02AKT250	02ALA150	02AKT300	02ALA170	02AWD010	02ALA420	02AKT650	02ALG010	02ALG020
Set of objectives that support PFF	-	-	-	02AKX895B	-	02AXA915B	02AKX900B	02AKX905B	-	02AKX910B
Working distance [mm]	30.5	40.6	52.5	40.6	60.0	20.0	33.5	20.0	30.5	13.0
Field of view [mm] <sup>*2</sup> (H)×(V)	Turret 1x	12.54×9.4	6.27×4.7	2.49×1.86		1.24×0.93		0.62×0.47		0.25×0.18
	Turret 2x	6.27×4.7	3.13×2.35	1.24×0.93		0.62×0.47		0.31×0.23		0.12×0.09
	Turret 6x	2.09×1.56	1.04×0.78	0.41×0.31		0.20×0.15		0.10×0.07		0.04×0.03
	Digital magnification 12x	1.04×0.78	0.52×0.39	0.20×0.15		0.10×0.07		0.05×0.03		0.02×0.01

\*1 When the QV-SL0.5x, QV-HR10x, QV-10x, or QV-25x objective is used, some limitations, such as the illumination being insufficient depending on the workpiece, may occur.  
\*2 The values for field of view are not guaranteed values, but representative values.

WLI interference objective lens



Objective Lens	Code No.	Interference Method	Monitor Magnification	Field of View <sup>*1</sup> (mm)	Operating Distance (mm)
QVWLI A-5x	02ALY400	Mirror	270x	0.64 x 0.48	13.2
QVWLI A-10x	02ALT630	Mirror	540x	0.32 x 0.24	12.6
QVWLI A-25x	02ALT670	Mirror	1350x	0.13 x 0.10	4.7
QVWLI A-50x	02AWB150	Mirror	2700x	0.064 x 0.048	2.4

Monitor magnification shown here is that of Size 24 Liquid Crystal Display (resolution WUXGA).  
\*1 Tube lens 2x is provided as a standard equipment. Also, The values for field of view and monitor magnification are not guaranteed values, but representative values.

Collision detection unit



It is a collision prevention sensor equipped with QVWLI. It is available for QVWLI A-25x and QVWLI A-50x. The collision prevention sensor contacts stages or workpieces to stop the movement of the Z-axis to prevent the WLI interference objective lens from damage.

Calibration

Tilt compensation jig for WLI optical head

Enables to compensate the mounting posture of WLI optical head. It helps to achieve measurement of the highest accuracy by compensating the tilting error of WLI optical head.



Interference fringe adjustment jig

Enables to adjust the focusing position of WLI interference objective lens with the position where interference fringes occur. It is used in combination with the calibration chart.



Calibration chart

A calibration chart is used to compensate for the pixel size of the camera imaging chip and for the auto focus accuracy and optical axis offset at each magnification of the variable magnification unit (PPT).



Note: There are limitations on the function, depending on the lens. For details, contact your Mitutoyo sales office.

QV compensation chart

This glass chart is used to perform compensation for distortions within the screen caused by the optical system, and auto focus compensation, which reduces auto focus variations that are caused by differences between the workpiece pattern and texture.



Note: There are limitations on the function, depending on the lens. For details, contact your Mitutoyo sales office.

# LINE-UP



QVWLI HYPER 404 Pro



QVWLI HYPER 606 Pro

## Specifications

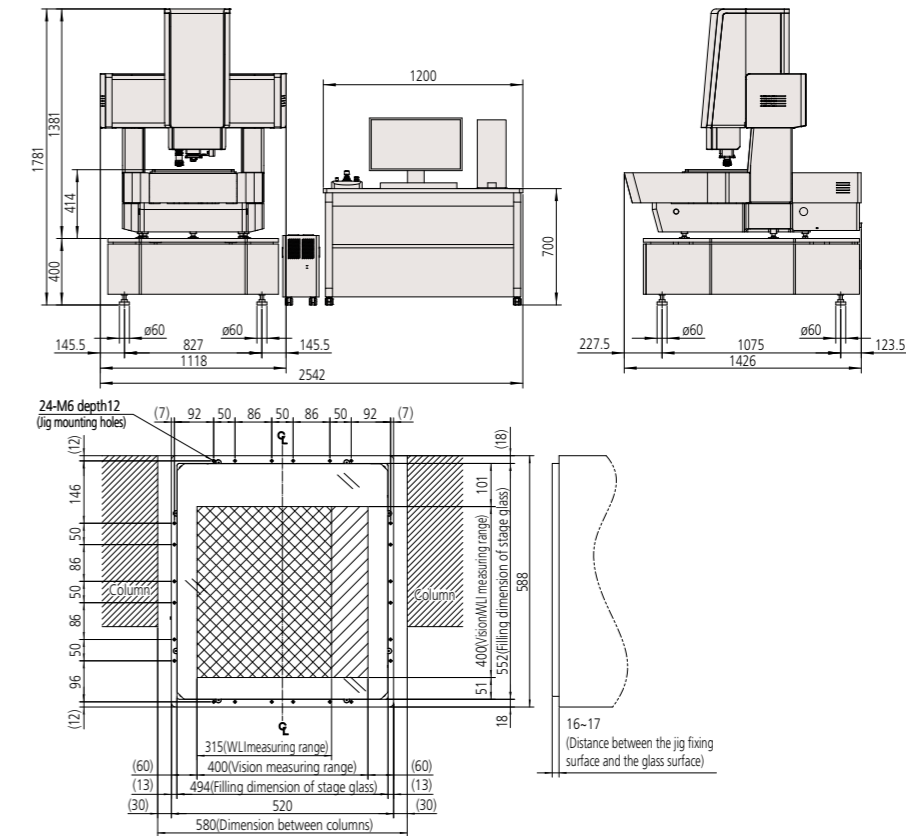
Model name	QVWLI HYPER 404 Pro	QVWLI HYPER 606 Pro	
Model code	QVW-H404P1L-E	QVW-H606P1L-E	
Main unit			
Measuring range (XxYxZ) [mm]	400x400x240	600x650x220	
Measuring range common to vision and WLI (XxYxZ) [mm]	315x400x240	515x650x220	
External dimensions (WxDxH) (Including vibration isolator) [mm]	1118x1426x1781	1400x1994x1794	
Stage glass (WxD) [mm]	493x551	697x758	
Main unit mass (Including vibration isolator) [kg]	1205	2275	
Vision measuring accuracy [ $\mu\text{m}$ ]*1	Vision	E <sub>LUX</sub> / E <sub>LUX</sub> , MPE	(0.8 + 2L / 1000)
		E <sub>LXY</sub> , MPE	(1.4 + 3L / 1000)
	STREAM*2 (optional)	E <sub>LZ</sub> , MPE	(1.5 + 2L / 1000)
		E <sub>LX</sub> , E <sub>LY</sub>	(1.5 + 3L / 1000)
		E <sub>ZXY</sub>	(2.0 + 4L / 1000)
Optical magnification	2.5x objective (QV-HR2.5x or QV-SL2.5x) and middle magnification tube lens		
WLI repeatability [ $\mu\text{m}$ ]*2	2 $\sigma$ ≤ 0.08		
Resolution of scale [ $\mu\text{m}$ ]	0.01		
Accuracy guaranteed environment	Ambient temperature	20 ± 1 °C	
	Temperature variation	0.5 °C/1H and 1 °C/24H	
	Acoustic condition	70 dB or less	
Maximum stage loading [kg]*3	25	35	
Observation unit	Image capturing device	Vision: B&W CMOS digital camera WLI: CCD camera	
	Power turret*4	Programmable power turret 1x, 2x, 6x, (12x)*5	
Illumination unit	Stage light	White LED	
	Vertical coaxial light (Vision)	White LED	
	Vertical coaxial light (WLI)	Halogen	
	PRL	White LED	
Air supply	Pressure	0.4 MPa*6	

\*1 L: arbitrary measuring length (unit: mm) \*2 Determined by Mitutoyo's inspection method. \*3 An excessively biased or concentrated load is excluded.  
\*4 Programmable power turret 1x, 2x, 4x, 6x model is available by special order. Digital magnification function allows 8x and 12x in addition to 1x, 2x, 4x. 6 steps of magnification are available in total.  
\*5 The value in parenthesis is for digital magnification change. \*6 Air supply pressure to be in range 0.45 to 0.7 MPa.

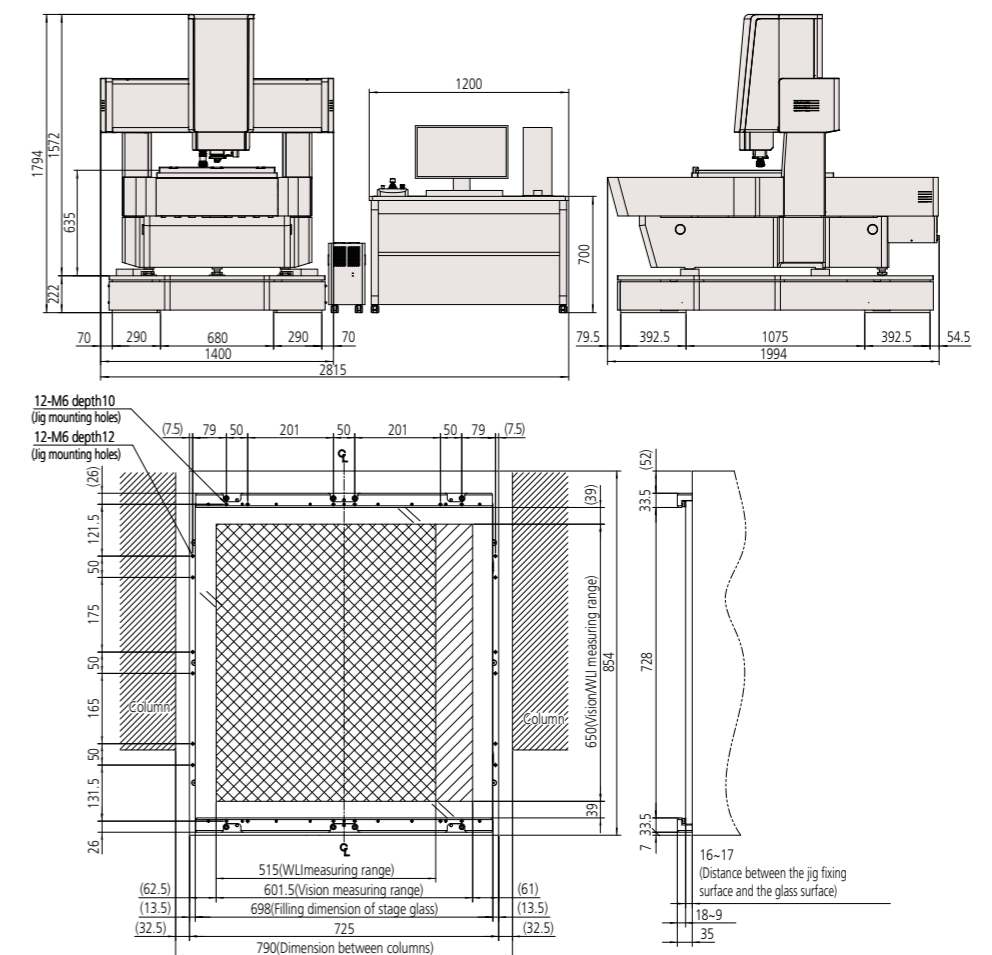
## Dimensions

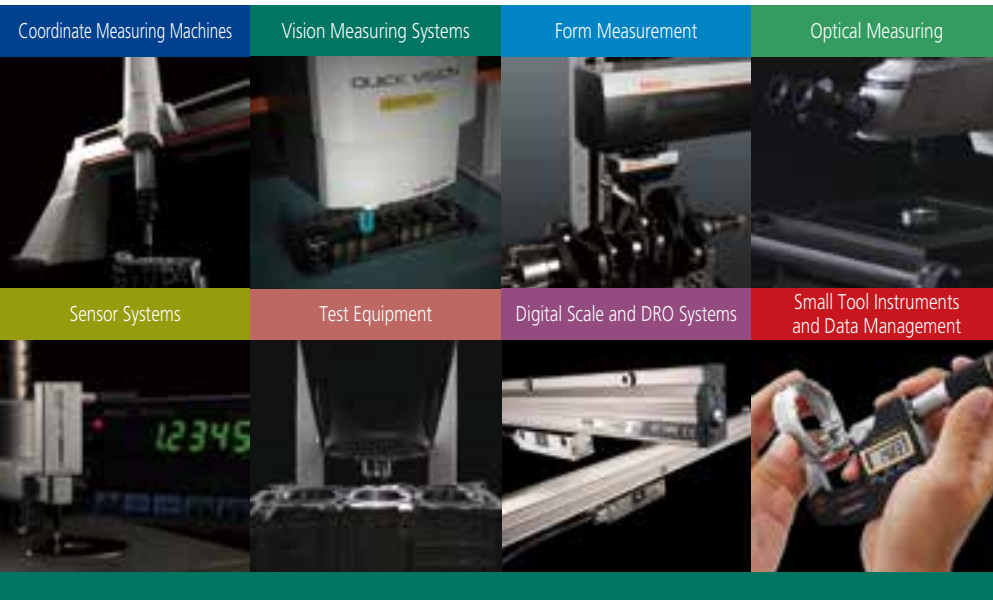
unit: mm

### QVWLI HYPER 404 Pro



### QVWLI HYPER 606 Pro





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

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

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



Find additional product literature  
and our product catalogue

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All product information contained in this brochure is current as of February 2024.

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