

Non-contact 3D Measuring System Hyper Quick Vision WLI Series

Catalog No. E14001(2)



Mitutoyo

Coordinate Measurement and Non-contact 3D Measurement in a Single System

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

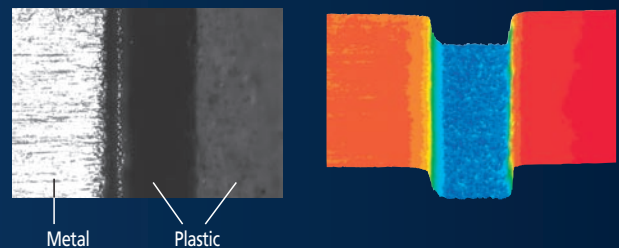
White light interferometer (WLI optical head) applied to vision measuring systems enables a wide range of powerful measurements, from 2D measurement of coordinates and dimensions, surface analysis in microscopic areas, depth measurement of small-diameter holes, and to high-precision 3D measurement of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



Capable of handling a wide variety of measurement surfaces

WLI method can handle a wide variety of measurement surfaces including diffusing surfaces and mirrored surfaces.

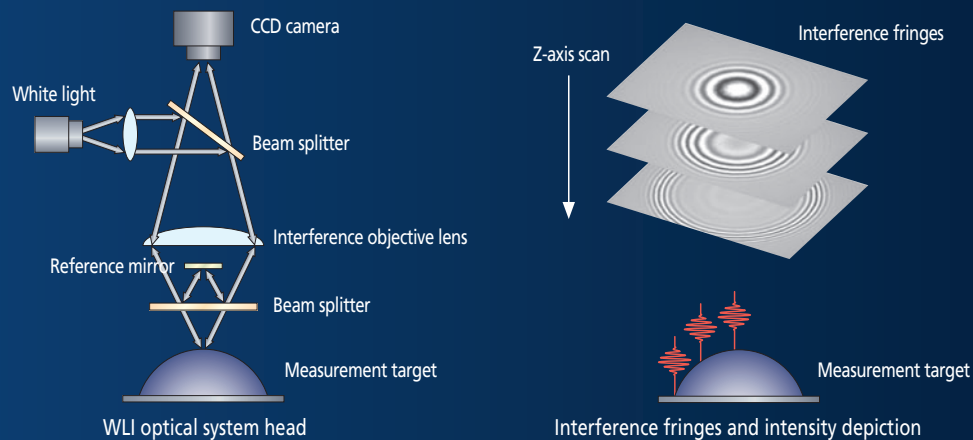
Using Mitutoyo's proprietary algorithm, WLI can also handle surfaces with large brightness differences, e.g., where plastic and metal coexist in mixed states.



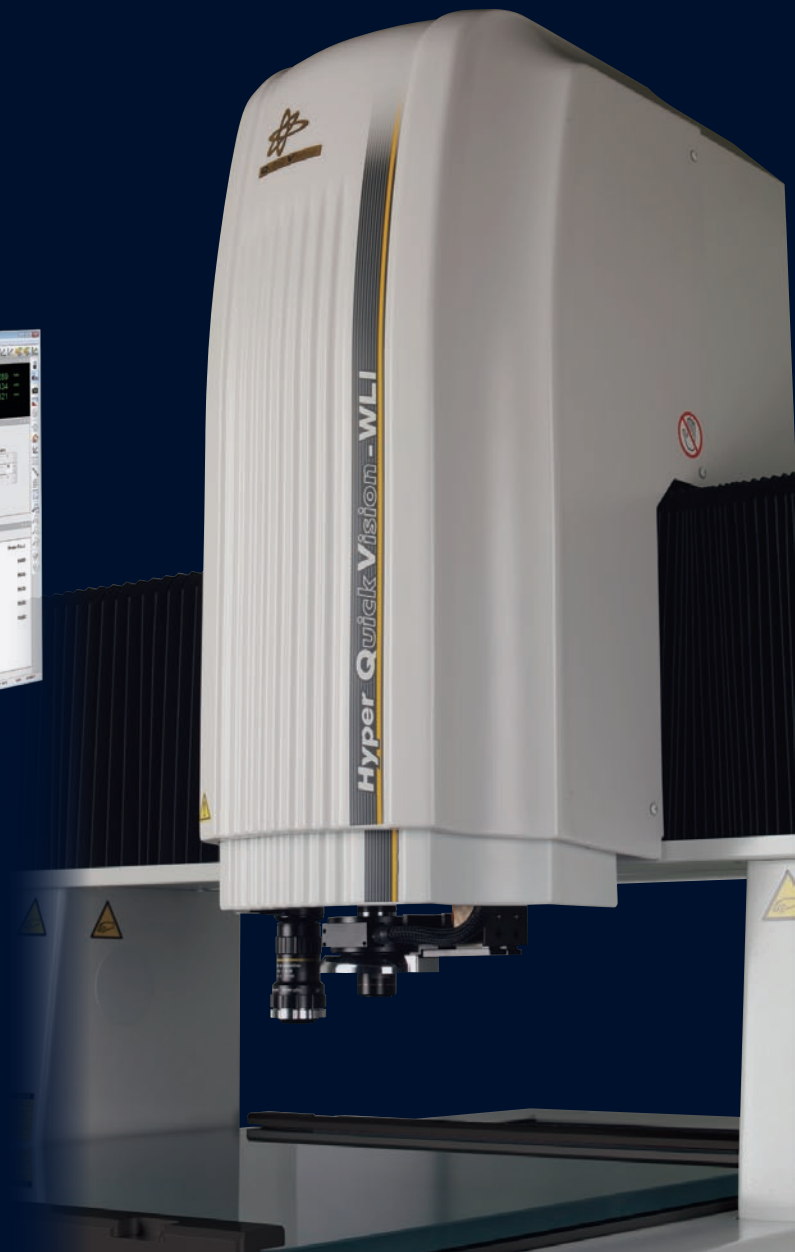
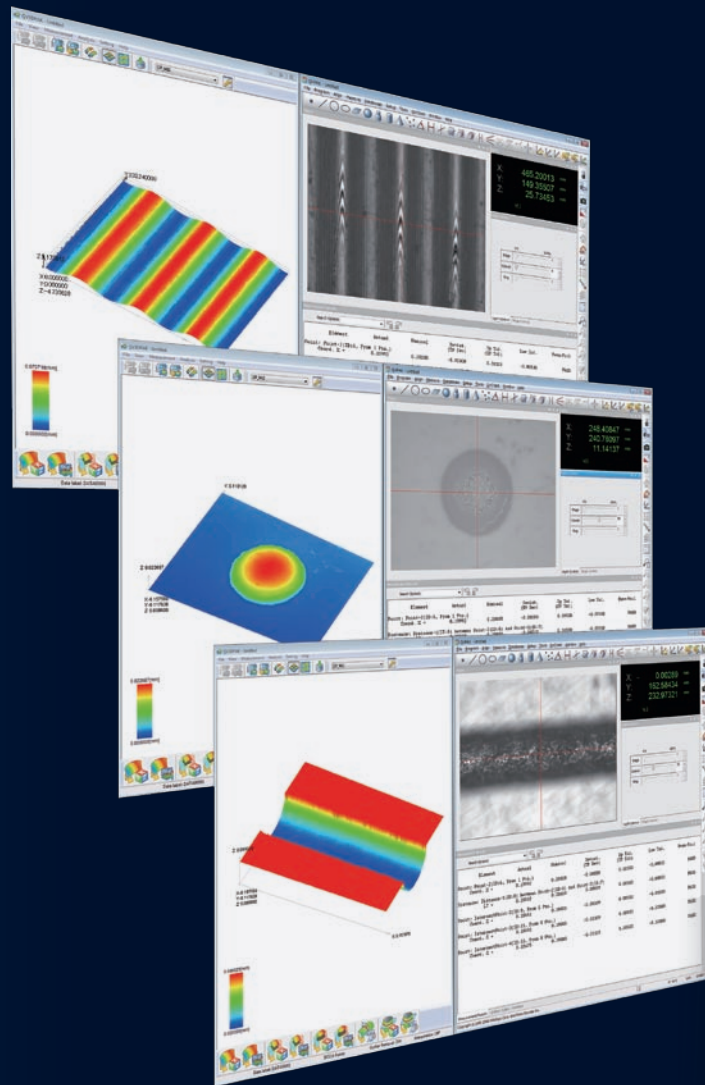
Principle of WLI measurement

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.



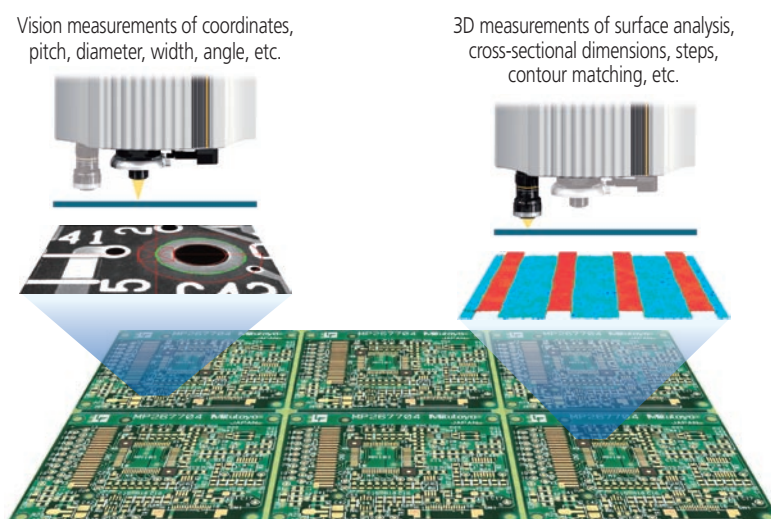
Advanced High Precision Dual Head Measuring System equipped with White Light Interferometer (WLI) Optical Head



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. Switches to 3D measurements without setup changes following vision measurement. Seamlessly continuous measurement is made possible by Quick Vision's automatic control.



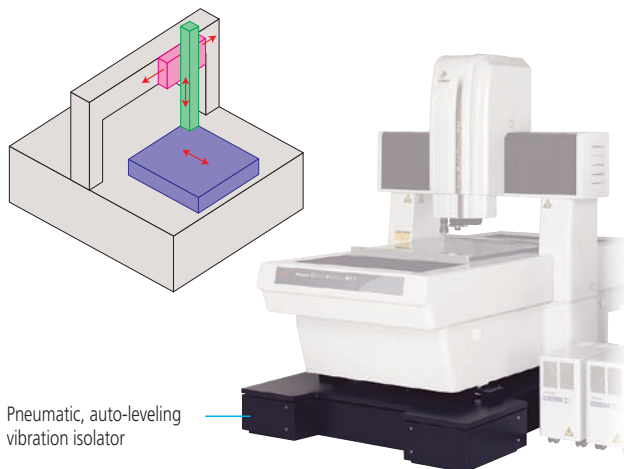
Easy targeting of measurement position

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 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.

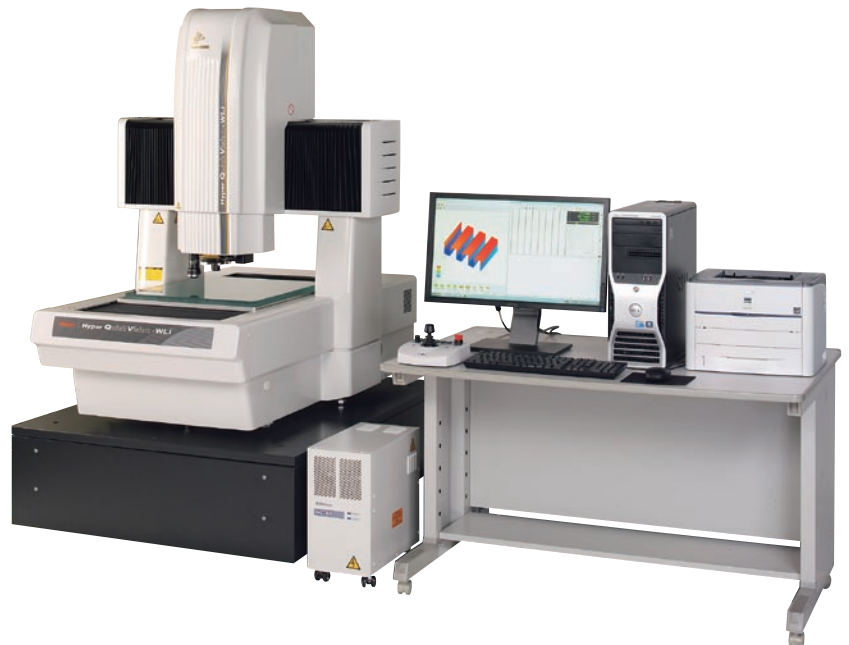


Lineup

Hyper Quick Vision WLI302



Hyper Quick Vision WLI404

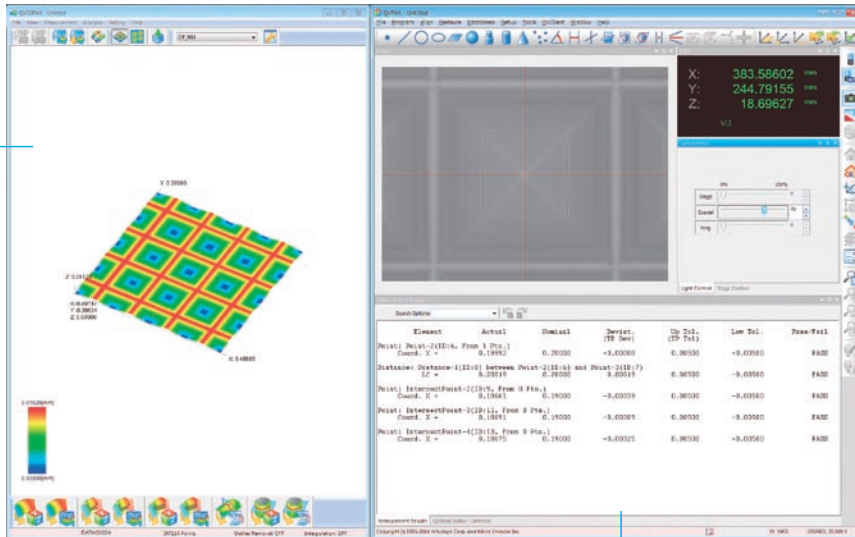


Hyper Quick Vision WLI606



Software

Powerfully supporting high functionality and measurement efficiency



3D data-synthesizing software
QV3DPAK

System-controlling main software
QVPAK

QVPAK2000

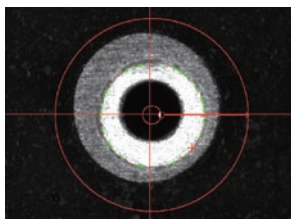
A function for acquiring interference fringes is added to QVPAK Software having high functionality and universal application capabilities for vision measuring systems.

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.

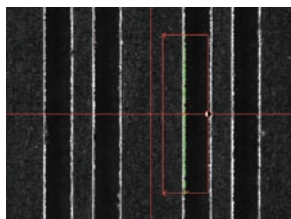
Examples of computational capabilities



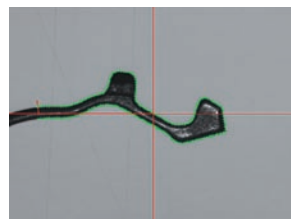
Versatile vision measurement



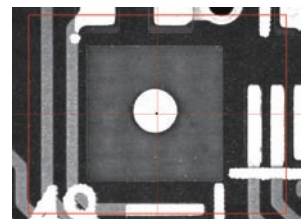
Circular tool



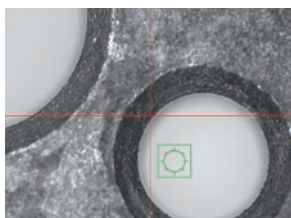
Line tool



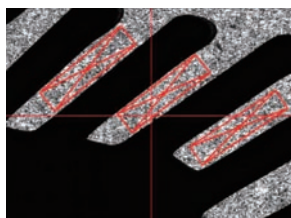
Auto trace tool



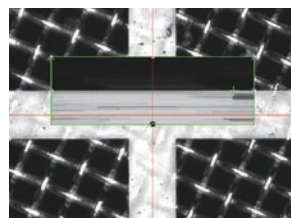
Pattern search tool



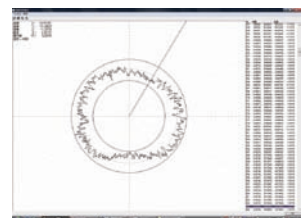
AI illumination tool
(automatic compensation of light)



Multi point AF



Various filters



Geometric deviation drawing

Mitutoyo

QV3DPAK

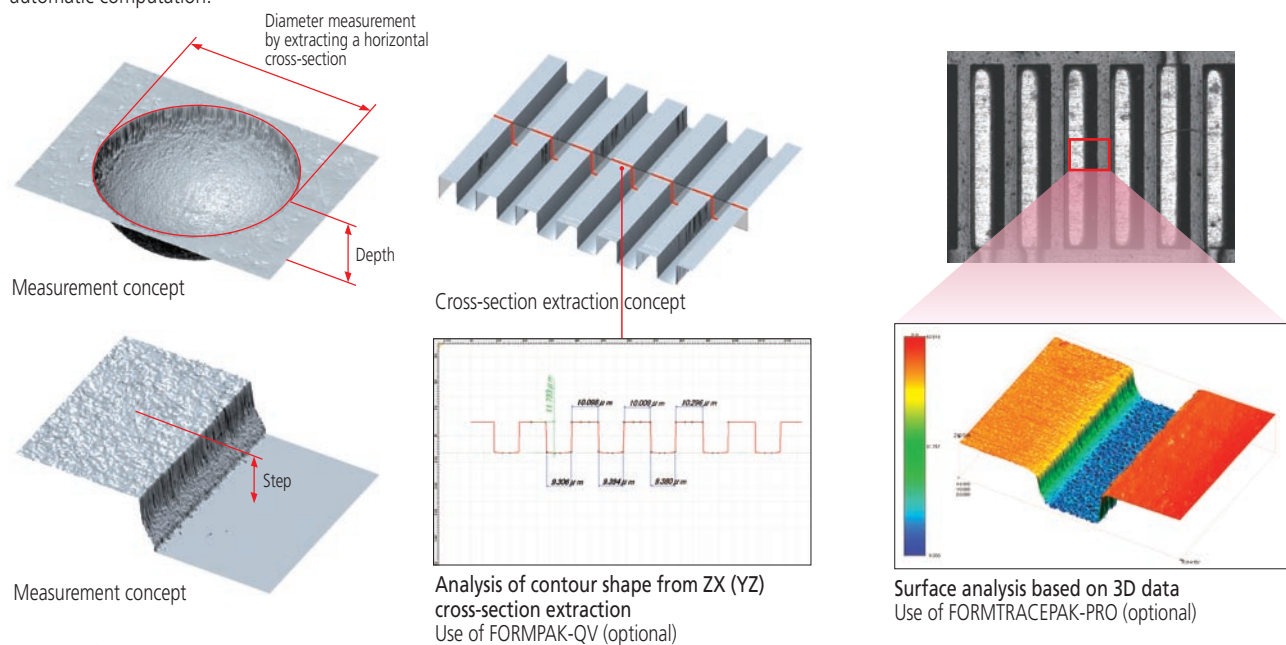
Synthesizes three dimensional shape data from interference fringes to display shapes or outputs point cloud data to external sources.

Point cloud data can be used for generating surfaces, as well as for outputting height, ID and OD dimensions.

Also, 3D data can be transferred to the shape/evaluation analysis software (optional) to implement shape measurement and surface analysis.

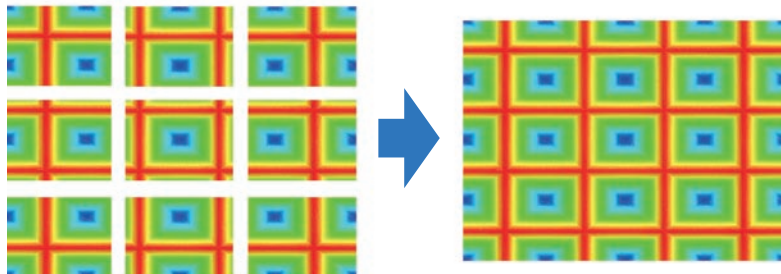
Applications

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



3D Profile Stitching

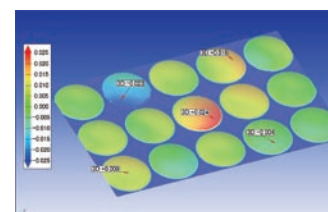
This function allows concatenation of multiple fields of 3D profile data unless only single field measurement can cover an object area to be measured. The running of 3D profile stitching enables a wide range of measurement or analysis while maintaining a high resolution.



MSURF-I

This software allows extraction of a geometric feature, assessment of a free-curved surface and profile, and tolerancing with master data by using point cloud data on the 3D profile surface acquired with a vision measuring system such as QV Hybrid and HQV-WLI/PFF.

* A separate PC is required for analysis by MSURF-I.



Optional Software

Shape evaluation and analysis software FORMPAK-AP

Performs design value cross-referencing and shape analysis based on shape data obtained using QV's Auto Trace Tool and WLI optical head.

Contour cross-referencing function

- Preparation of statistical data
CAD data conversion, master work conversion, function designation, text file conversion, aspheric design value preparation
- Design value referencing
Normal direction referencing, axial direction referencing, best fit referencing
- Result display
Result listing, error line chart, error development diagram, error coordinate value display function, analysis result display

Microscopic shape analysis

- Analysis items: point measurement, line measurement, circle measurement, distance measurement, cross point measurement, angle measurement,

- Computational items: maximum value, minimum value, mean value, standard deviation, area

Report preparation function

Measurement report, error line chart, error development diagram

Other functions

- Recording/execution of analysis procedure
- External output function
CSV-format output, text output, and DXF/IGES format output
- Fairing process
- Quadratic curve fitting function
- Quasi-roughness analysis function



Shape evaluation and analysis software FORMTRACEPAK-PRO

Software for conducting analysis process based on point cloud data obtained via WLI optical head. If a two-dimensional analysis does not provide sufficient and reliable results, the software provides a three-dimensional evaluation and analysis method.

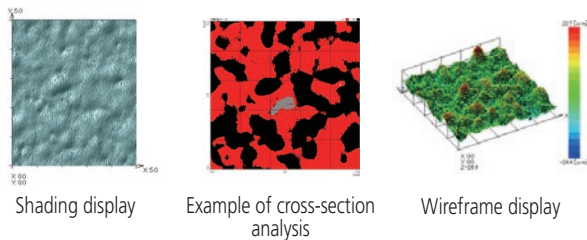
Major functions

Three-dimensional display

Capable of wireframing, shading, contouring, setting up of color setting free for contour fill, and illumination setting, and allows the user to freely rotate, enlarge, shrink, or move the analysis target.

Trend compensation, filter process

Capable of trend compensation using planes, spheres, cylindrical surfaces, and polyhedrons. Filter process can be chosen from one-dimensional digital filter and two-dimensional digital filter for each profile.



Rich functions for digitization and graphical display of surface shapes

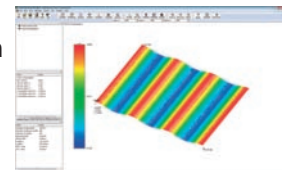
Capable of evaluation of wear and oil sump using relative load curves and area distribution curves.

Spectral analysis, analysis of cross-sectional areas and volumes, calculation of tilt angles of peaks and valleys, and histogram calculation of number of peaks and valleys.

Rich feature-extraction functions based on measurement data

Capable of slope intensification, simultaneous analysis of peaks and valleys of cross section, and extraction of arbitrary cross-sections.

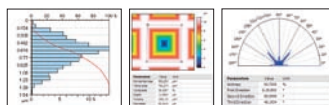
Other optional software for Quick Vision is also available.
For details, please refer to the catalog for the Quick Vision series.



3D Surface Texture Analysis Software MCubeMap

Clear and informative imaging of analyzed data using powerful graphics technology

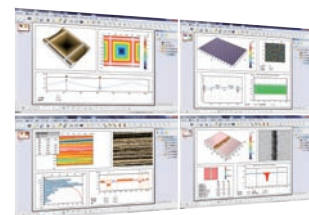
The software is compatible with the latest ISO25178-2 3D Surface Texture Parameter Standard, allowing analysis of parameters such as height of Sa, Sq, etc., space, compound and volume. The user can easily create a graphical report where analysis results are freely laid out.



* The specifications of a measuring system are decided in consultation with the customer.

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.



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

Hardware Options

Objective lens

QV objective lens



Objective Lens	Code No.	PPT Magnification	Monitor Magnification	Field of View (mm)	Operating Distance*1 (mm)
QV-SL0.5×*2	02AKT199	1×	14×	12.54×9.4	30.5
		2×	28×	6.27×4.7	
		6×	83×	2.09×1.56	
QV-HR1× QV-SL1×	02AKT250 02ALA150	1×	28×	6.27×4.7	40.6 52.5
		2×	55×	3.13×2.35	
		6×	165×	1.04×0.78	
QV-HR2.5× QV-SL2.5×	02AKT300 02ALA170	1×	69×	2.5×1.88	40.6 60
		2×	138×	1.25×0.94	
		6×	415×	0.41×0.31	
QV-5×	02ALA420	1×	138×	1.25×0.94	33.5
		2×	276×	0.62×0.47	
		6×	829×	0.2×0.15	
QV-HR10×*2 QV-10×	02AKT650 02ALG010	1×	276×	0.62×0.47	20 30.5
		2×	553×	0.31×0.23	
		6×	1672×	0.1×0.07	
QV-25×*2*3	02ALG020	1×	961×	0.25×0.18	13
		2×	1382×	0.12×0.09	
		6×	4147×	0.04×0.03	

Monitor magnification shown here is that of Size 24 Liquid Crystal Display (resolution WUXGA).

*1 PRL lighting unit can be shorter than the operating distance due to the operating position of the Programmable Ring Light (PRL) depending on the location of PRL.

*2 Illumination can be insufficient in some cases depending on the workpiece.

*3 There is a limitation to the operating position of PRL.

WLI interference objective lens



Objective Lens	Code No.	Interference Method	Monitor Magnification	Field of View*1 (mm)	Operating Distance (mm)
QV WLI A-5×	02ALY400	Mirror	270×	0.64×0.48	13.2
QV WLI A-10×	02ALT630	Mirror	540×	0.32×0.24	12.6
QV WLI A-25×	02ALT670	Mirror	1350×	0.13×0.10	4.7

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 field of view may be smaller than those shown here due to pixel calibration.

Calibration

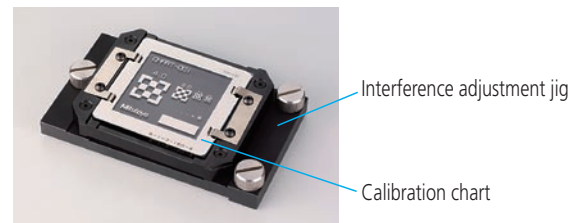
Tilt compensation jig for WLI optical head

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 (for vision optical head & WLI optical head)

Used for pixel size compensation of CCDs and for compensating auto-focusing accuracy and optical axis offset at various magnifications of variable magnification PPT/zooming.

Note: There are some limitations to the function of each lens. Please contact one of our sales offices for details.

QV compensation chart (for vision optical head)

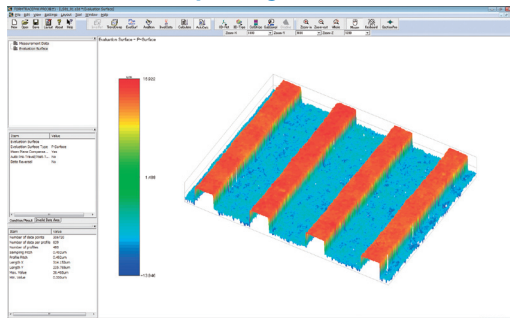


Glass chart designed for "in-screen compensation" to compensate for the distortion occurring in the screen caused by the optical system and for "auto-focusing compensation" to minimize auto-focusing fluctuations caused by the object's pattern and texture.

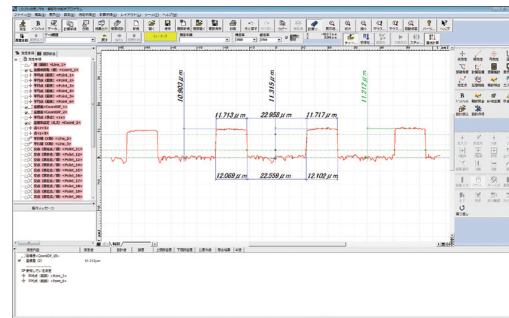
Note: There are some limitations to the function of each lens. Please contact one of our sales offices for details.

Measurement Examples

Semiconductor package substrate

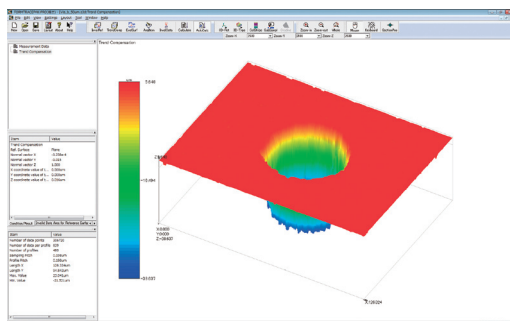


Surface analysis



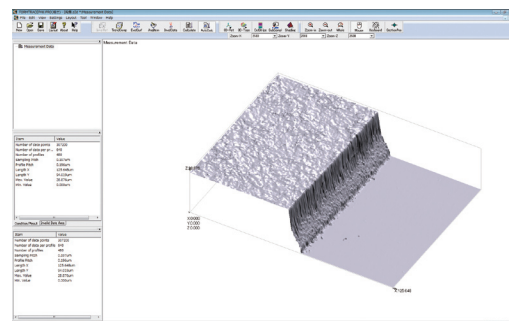
Cross-sectional shape measurement

Laser-machined hole



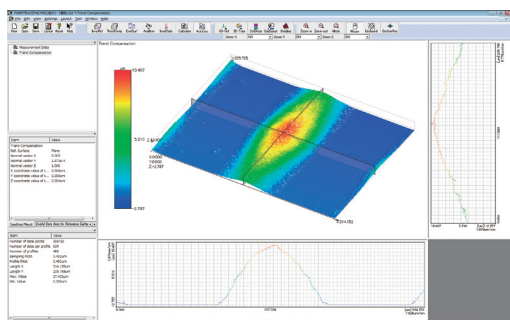
ID and depth measurements

Metal thin film



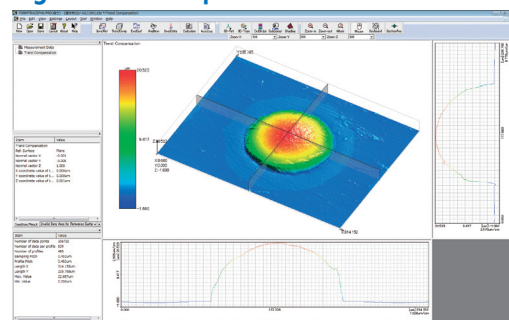
Surface analysis, and step measurement

Pole



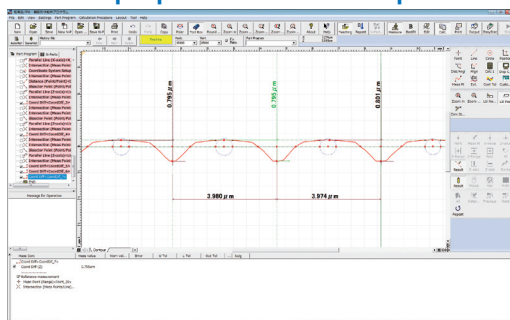
Cross-sectional shape measurement

Light induction plate



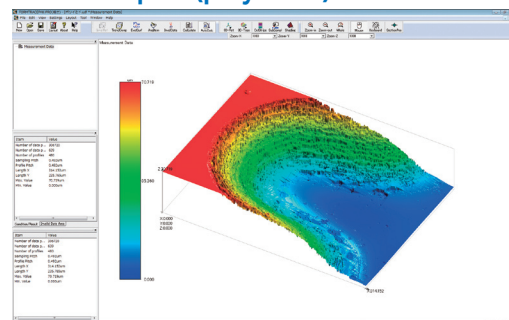
Coordinate-position, OD, and height measurements

Microscopic precision machined part



Cross-sectional shape measurement

Electronic part (polyimide)



Surface analysis, step, and cross sectional measurements

Specifications

Model			Hyper Quick Vision WLI 302	Hyper Quick Vision WLI 404	Hyper Quick Vision WLI 606
Optical system			QVW-H302P1L-D	QVW-H404P1L-D	QVW-H606P1L-D
Order No.			363-713	363-714	363-715
WLI optical head unit					
Measuring range*1 (XxYxZ)			215 X 200 X 190mm	315 X 400 X 240mm	515 X 650 X 220mm
CCD camera			Black & White		
Illumination Unit Co-axial Light			Halogen		
Z-axis maximum measuring range			QVWLI A-5x: 3.6mm, QVWLI A-10x: 3.6mm, QVWLI A-25x: 2.2mm		
Z-axis Repeatability			2σ≤0.08 μm		
Vision optical head unit					
Measuring range (XxYxZ)			300 X 200 X 190mm	400 X 400 X 240mm	600 X 650 X 220mm
Observation unit			PPT 1X-2X-6X		
CCD camera			Black & White		
Illumination Unit	Co-axial Light		White LED		
	Transmitted Light		White LED		
	PRL		White LED		
Measuring accuracy*2	E1X, E1Y		(0.8+2L/1000) μm		
	E1Z		(1.5+2L/1000) μm		
	E2XY		(1.4+3L/1000) μm		
Main unit					
Guide method			Linear hard bearing		
Resolution of scale / Scale type			0.01 μm / Linear Encoder		
Stage glass size			399 X 271mm	493 X 551mm	697 X 785mm
Maximum stage loading*3			15kg	25kg	35kg
Main unit external dimensions			859 X 950 X 1606mm	1027 X 1407 X 1781mm	1309 X 1985 X 1792mm
Main unit mass (including the sub-base)			490kg	1160kg	2275kg
Installation environment condition					
Accuracy-guaranteed environment	Temperature condition	Range	20±1℃		
		Fluctuation	0.5℃ / 1H		
		Slope	1℃ /m (height and horizontal direction)		
	Vibration		Max. amplitude ≤2 μm at frequency of 10Hz or lower		
	Acoustic condition		70db or lower		
Operating air pressure			0.4 MPa		
Power source voltage			AC100 - 240V		
Temperature compensation function			Automatic		

*1 Movable range of WLI optical head. Three dimensional shape measurement using WLI is allowed within one field of vision.

*2 Determined by Mitutoyo's inspection method. L is measured length (mm).

The optical condition for accuracy assurance is to be (QV-HR2.5X or QV-SL2.5X) + Middle magnification of the tube lens.

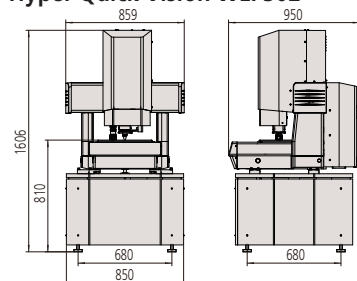
*3 An excessively biased or concentrated load is excluded.

* Append "S" to the end of order number to order a QV machine compatible with ISO10360-7:2011 Accuracy Assurance.

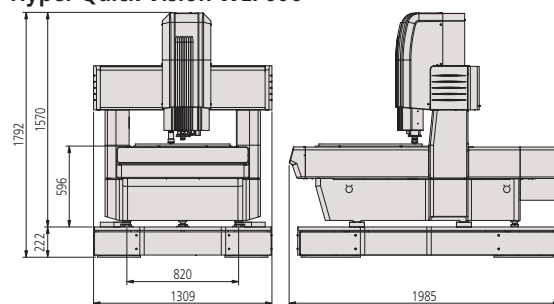
* Hyper QV WLI is not compatible with the Easy Editor function of QVPAK.

External view dimension chart

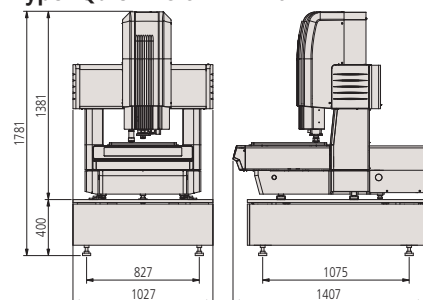
Hyper Quick Vision WLI 302

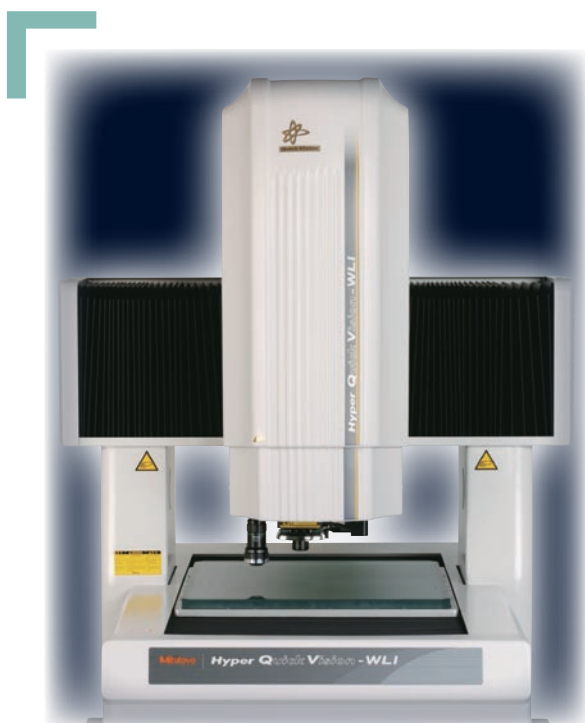


Hyper Quick Vision WLI 606



Hyper Quick Vision WLI 404





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- 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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