KEYENCE

NEW **Digital Microscope**

VHX-5000

Large Depth of Field & Clear 3D Imaging

VHX

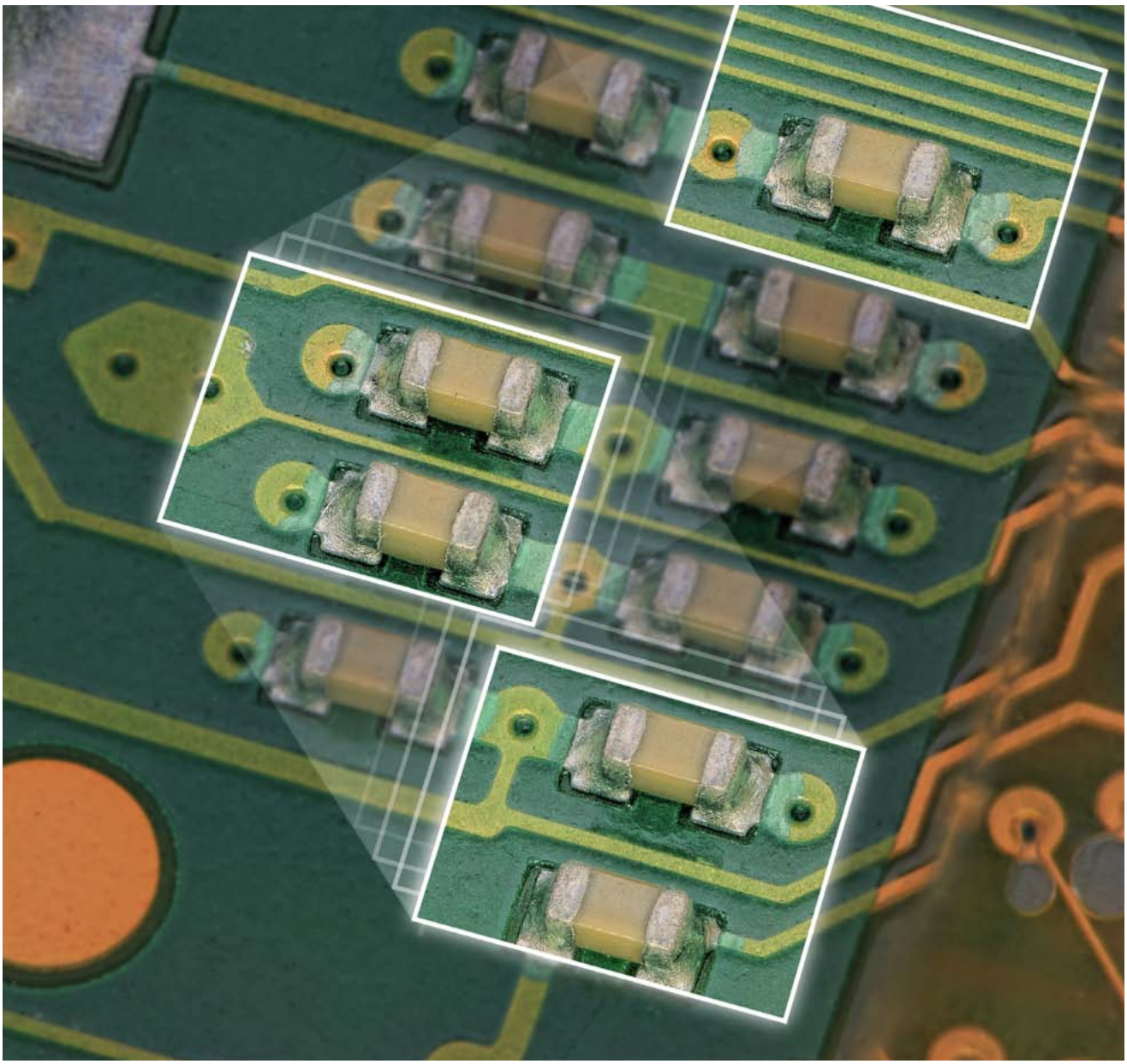
DIGITAL MICROSCOPE

The 4th Generation of our VHX Digital Microscope

In our experience easy of use and functionality are crucial to obtaining clear images and performing precise measurements quickly and efficiently.

VHX
DIGITAL MICROSCOPE

Focus Images in a matter of seconds



Introducing
Live Depth Up P.8

CONTINUOUS EVOLUTION OF KEYENCE'S DIGITAL MICROSCOPES

We use your feedback to constantly improve our microscopes.
By combining high image quality and precise measurement capabilities with a fast and easy operation, we aim to provide you the best user experience possible.

THE FIRST GENERATION

Fast, easy & intuitive

Close to 25 years ago, we developed our first digital microscope.
Back then we already set the goal for a microscope that enables you to obtain results in a quick and easy way.

from **1990**

THE FIRST GENERATION

from **2003**

THE SECOND GENERATION

VH-6000 VH-6300 VH-7000 VH-8000 VHX-100 VHX-200

THE SECOND GENERATION

3D observation

Observing a fully focused image.
This was made possible by depth composition function, that further paved the way to 3D observation.

THE THIRD GENERATION

16-bit observation for high contrast and fine details

Removing glare from an image. Viewing a white surface clearly. These wishes have been fulfiled with a technology of capturing images at different brightness levels and then producing an image with fine gradation data.

from **2006**

THE THIRD GENERATION

from **2014**

THE FOURTH GENERATION

VHX-500

VHX-600

VHX-900

VHX-1000

VHX-2000

VHX-5000

THE FOURTH GENERATION

Live Depth Up

Observing a point you want to view without adjusting the focus. A fully focused image is obtained in a matter of seconds by simply setting a position.

Basic Concept

Ease of Use & Flexibility

The VHX covers all basic analysis operations - “Observation, Capture, and Measurement” in a single unit and enables you to make observations quickly and efficiently.

Even large samples can be observed.

OBSERVATION

Large depth of field

It is one of the fundamental features of digital microscopes to provide usability. All of the lenses, camera, and graphics engine are internally designed to enable observation providing good balance between depth and brightness.

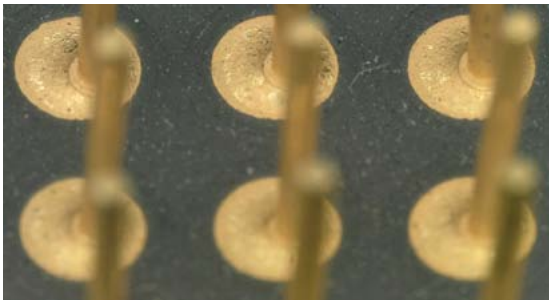


Image with low depth of field

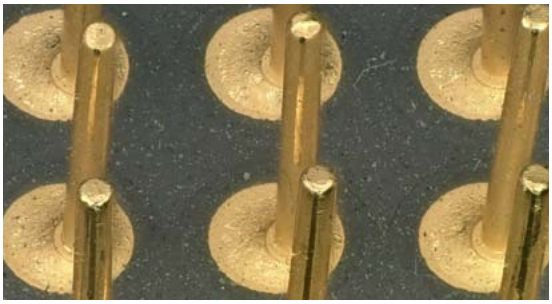
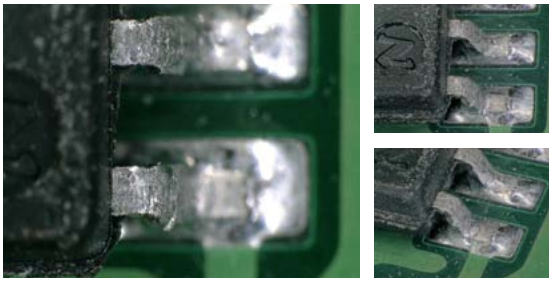


Image with large depth of field Pins (100x)

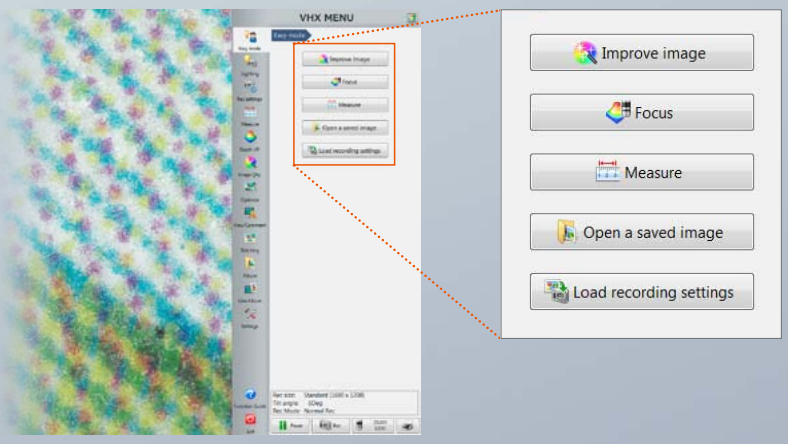
Multi-angle observation

The field of view does not change even when the lens is tilted or the stage is rotated. This allows observation from multiple angles. It is unnecessary to touch the target, which ensures high observation repeatability.



Easy mode offering quick access to advanced functions

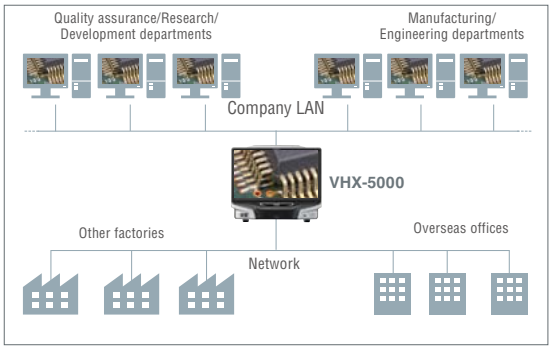
The Easy mode contains frequently used menu items to enable analysis under optimal conditions. Even first time users can make the most of advanced functions.



CAPTURE

Direct saving of observation screens

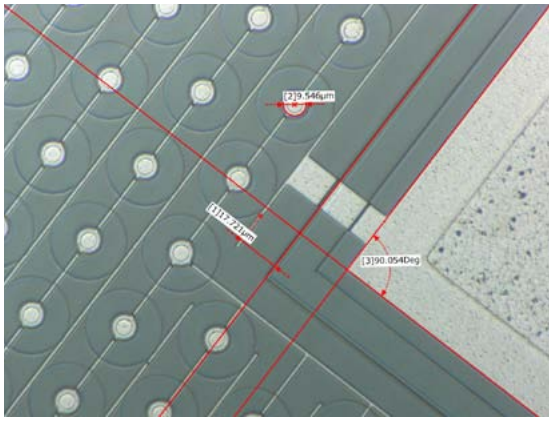
The built-in hard drive allows observation screens to be saved directly. The saved images can be used on a PC or other devices easily via Network or USB. It is also possible to use commercially available software to prepare template based reports automatically.

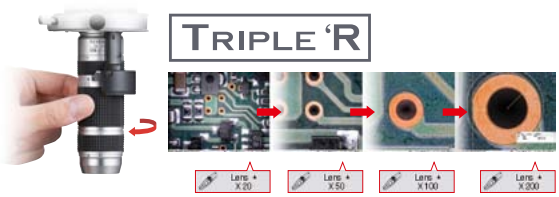


MEASUREMENT

Real-time calculation

Dimension measurement can be made on screen with mouse operation only. The measurement result can be saved together with the image and exported to other software.

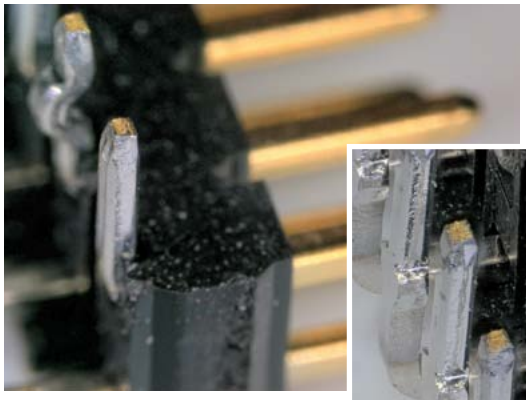




Advanced Functions

Quick depth composition of a desired point
Live depth composition

The VHX can recognise the focus information automatically when the field of view is moved and then create a depth composition image quickly. This allows intuitive and instant focusing on a point you want to observe.



Without depth composition

With depth composition

Connector pins (50x)

You can quickly observe a depth composition image by just moving the motorised X-Y stage to view a desired point.

Quick depth composition	Faster observation and better analysis using more sample data

Without depth composition is used

No need for focus adjustment

No need for depth composition operation

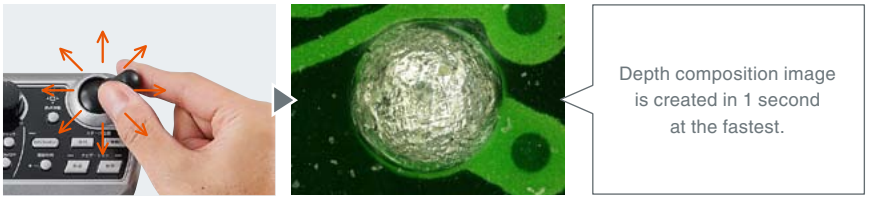
Observation by just selecting a field of view

Once the position is set, a depth composition image is created in one second at the fastest. To observe another position, just move the stage and you can quickly observe a depth composition image of your desired point.

Conventional KEYENCE product (using an XYZ manual stand)

Select the field of view... adjust the position to start composition, move the stage in the range of composition, and then... Depth composition image

VHX-5000

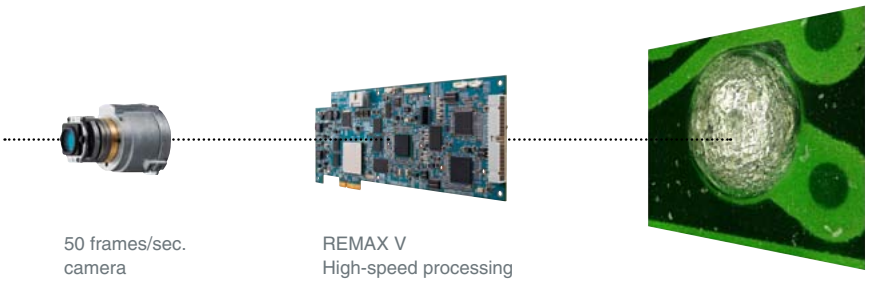


Just select the field of view, and... Depth composition image

Depth composition image is created in 1 second at the fastest.

High speed digital imaging technology

The 50 frames per second camera captures a large amount of image data with different focus positions, and the REMAX V high-speed processing graphics engine processes it at high speed. We have developed a technology that adopts best focus data for each pixel to allow for clear, fully focused images to be observed on-screen.



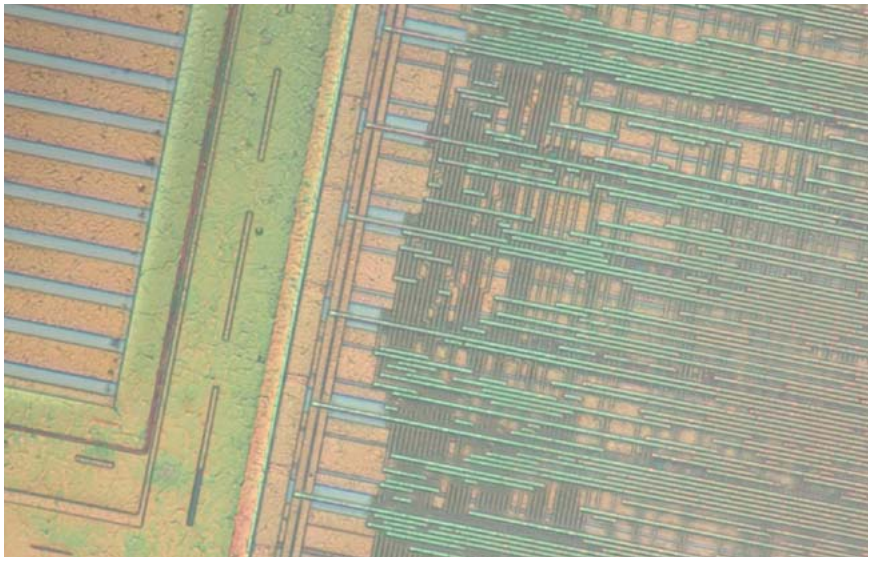
50 frames/sec. camera

REMAX V High-speed processing graphics engine

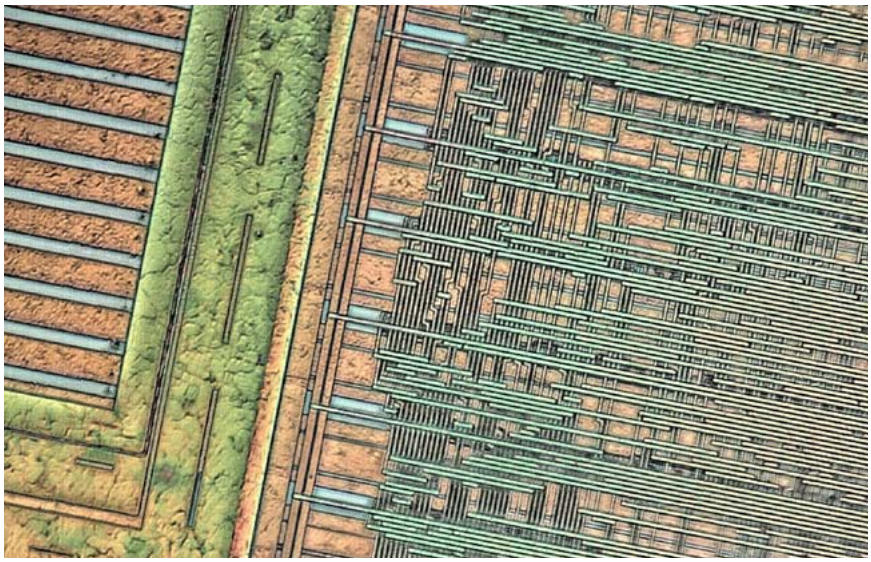
Advanced Functions

Optical resolution improved by up to 25%*: High detail HDR

A high resolution image is obtained with single-wavelength light and the HDR (High Dynamic Range) function, that captures multiple images by varying the shutter speed, to produce a fine detail image. These two functions enable high resolution and high contrast observation.



IC (1500x) without high optical resolution HDR function of VHX-5000



IC (1500x) with optical resolution function of VHX-5000

* Comparison of the cases with and without using the high resolution HDR function of the VHX-5000

Automatic selection of optimal wavelength for higher resolution

Pixel shift technology

Optimal wavelength is selected according to the lens characteristics to ensure capturing of clear images that is less affected by chromatic aberration. Such high resolution observation is enabled by the automatic selection of optimal wavelength and pixel shift technology.

Chart | With optimal wavelength | Without optimal wavelength

HDR Plus function

HDR High Dynamic Range

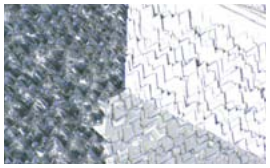
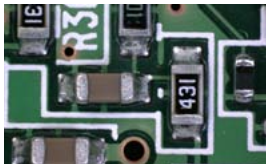
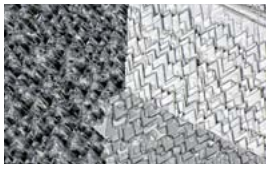
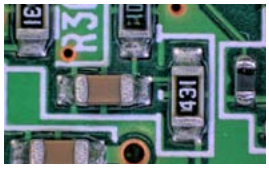
The camera captures multiple colour images at different brightness levels by varying the shutter speed, and then produces an image with high level gradation data. This allows clear observation of even targets with glare or with low colour gradation. An algorithm that faithfully represents the colours of the target makes observation more similar to that with naked eye.

DISADVANTAGES

- The narrow range of brightness levels causes glare in areas that are oversaturated.
- Subtle changes in contrast cannot be rendered because of coarse resolutions.
- Colours can be different between the observation with naked eye and the captured image.

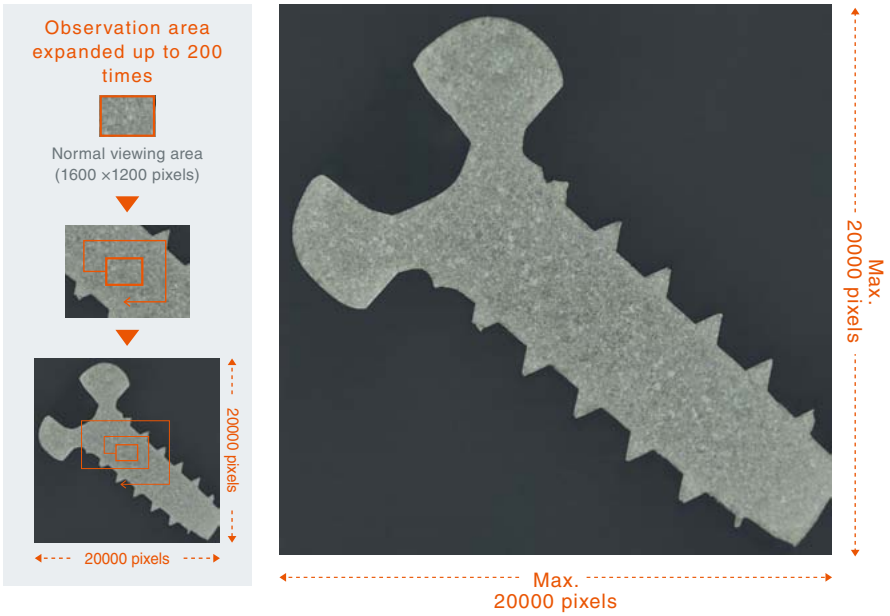
ADVANTAGES

- A wider range of brightness levels diminishes the perceived glare.
- Enhances low contrast areas for improved detail.
- Images can be captured in live colours similar to those seen with naked eye.

Observation after contrast enhancement	Observation after glare is removed	Observation in colours similar to those seen with naked eye
		
Without HDR function [8 bits]	Without HDR function [8 bits]	Without HDR function [8 bits]
		
HDR [16 bits] Plastic cap (50x)	HDR [16 bits] Solar cell (50x)	HDR [16 bits] PC board (50x)

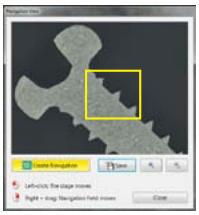
20000 x 20000 Pixels:
High-speed Image Stitching Function

A wide area, high resolution image can be captured with just a button press on the console. Using the VHX XYZ-stage, images in a wide area can be stitched in short time without misalignment. This allows for a large field of view to be captured and observed at once. Images can be stitched up to 20000 (V) x 20000 (H) pixels.



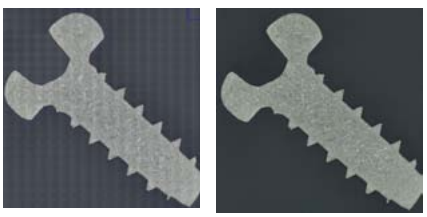
Navigation function

A navigation overview can be created using image stitching. Clicking on the position that you wish to observe will automatically move the stage to the selected location. The current field-of-view is outlined in a yellow frame and the previously viewed field-of-view is outlined in a red frame, making it easier to maneuver the stage. When performing high magnification observation, this function is very helpful for quickly understanding which part of the target is being observed.



Auto correct function

This function produces a high quality stitched image by automatically suppresses seams in the image resulted from uneven brightness that is why should we tell the customer about effects of lens aberration=negative during image stitching.



Without auto correct function

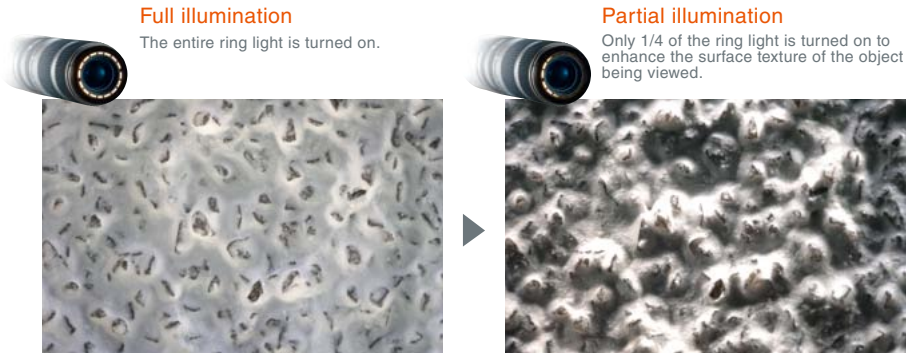
With auto correct function

Optimal image function

A press of the OPTIMIZE button previews nine different illumination options or settings. From there, all you need to do is to click the image that is ideal for your observation purpose.

Light shift function

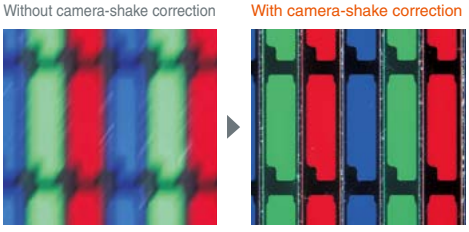
Just pushing the Light Shift button on the console quickly changes the illumination mode. The lighting can be switched from full illumination, to partial illumination that enhances the projections and depressions of the target.



Grind stone (50x)

Image stabilisation function

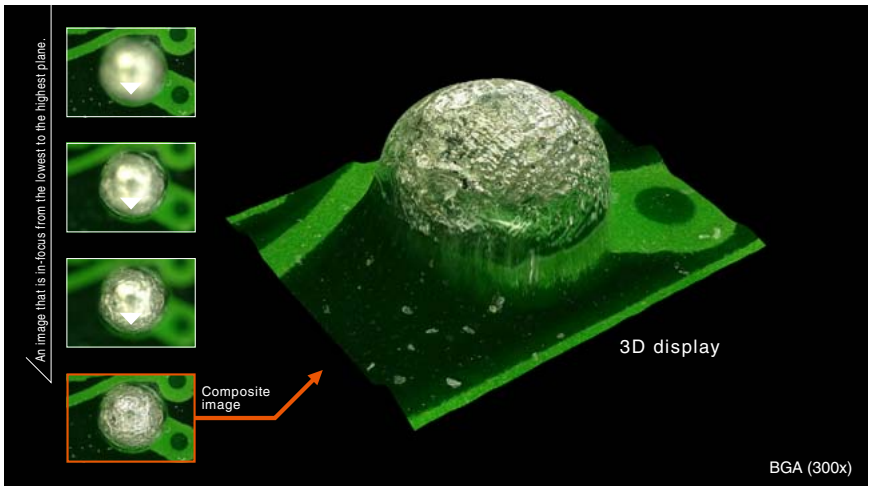
Through advanced image processing, the VHX-5000 is able to correct for position misalignments in an image at the sub-pixel level. This function makes it possible to perform high-magnification observation while reducing influence of environmental vibration.



LCD colour filter (500×)

3D View and Measurement

Even when a target has an uneven surface, a depth composition image can be obtained quickly by compiling images at different focal planes. The 3D display allows observation of surface profiles from desired angles. By using the motorised stage, you can display this 3D image easily by just operating console buttons.



Accurate D.F.D. method

We have developed an algorithm that uses the fine changes in texture to estimate height data. A 3D image can be constructed from a smaller number of images.

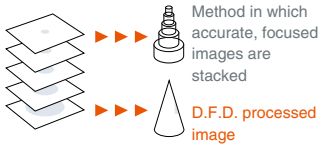

Without Accurate D.F.D method

Accurate D.F.D. method

Bolt

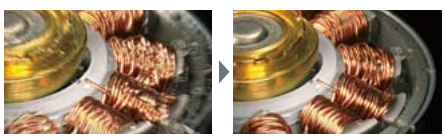
[D.F.D. (Depth from Defocus) method]

A method to obtain 3D information from the analysis of blurriness of a 2D image. Even if an image is not captured in perfect focus, a calculation is made to obtain height data. This allows accurate 3D image construction from a smaller number of samples.



Auto adjust function allowing depth composition for observation at an angle

Edge displacement and vibration caused during image capture are automatically corrected and a comprehensive, depth composition image is constructed. The composition can use not only images captured from directly above but also those captured from angles.

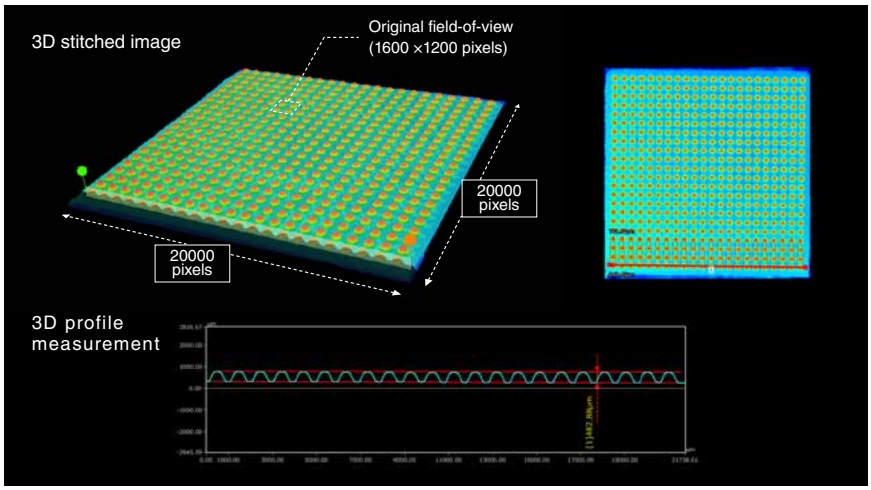

Without Auto Adjust function

Auto Adjust function

Coil (20x)

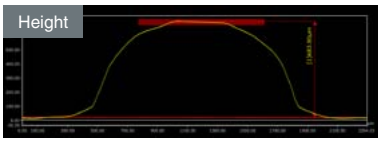
Wide Field 3D View & Measurement

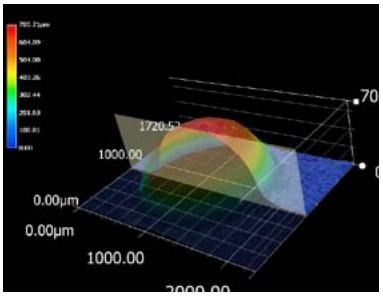
A 3D image is created from images captured automatically. You can observe the profile by checking the height profile data along a desired line. When used in conjunction with the image stitching function, a wide-field 3D image can be generated to allow users the ability not only of partial 3D observation but also to understand the topography of a surface over an entire target.

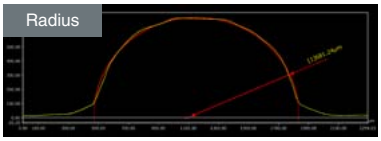


Height color/Scale display

Colour bars that indicate height are displayed on a 3D image. The highest position is displayed in red and the lowest position is displayed in blue, allowing you to see height differences clearly at a glance.



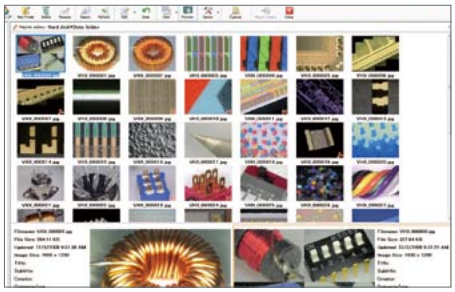




Further advanced measurement menu

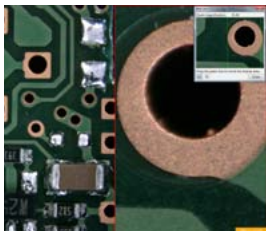
Easy Recording

The main unit has been equipped with a large-capacity hard disk drive, so images can be easily recorded on site just as they are viewed. Our original high speed data management ensures effortless handling of a high volume of images. File names, titles, organisation names, lenses and comments can be registered, providing for quick image searches.

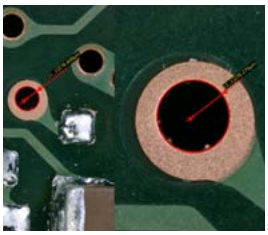


Split screen function

The display area can be moved individually for comparison. Images improving usability. Moreover, measurement of images of different magnifications can be made using different calibration settings according to their magnifications.



Each display area can be moved independently on the split screen.



Images of different magnifications can be measured individually.

Video recording function

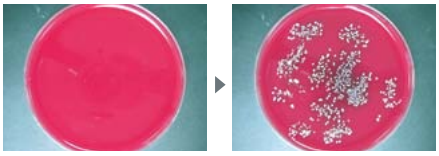
Accurately capture an object's motion by recording a video at 50 frames per second with recording times of up to one hour. Users can fast forward, advance a single frame, and capture a still image from the video file. Each video is saved as an AVI file that can be played on the VHX-5000 or a separate computer.

Video recording
up to 1 hour long

Ant (50×)

Timer capture function

The VHX can be programmed to capture images based on a given time interval. This allows you to monitor a process over a given period of time by loading the saved images to the PC via LAN.



Bacterial growth

Capture conditions saved simultaneously

Saves previously captured conditions such as the brightness during observation or capture settings for the camera. It is possible to perform observation under the same conditions as a previously captured image just by loading the file and then pressing the reproduce settings button.

Shutter Speed	Light Shift	White Balance
Gain	Edge Enhance	Lamp Lighting

PC mode/Anti-virus software

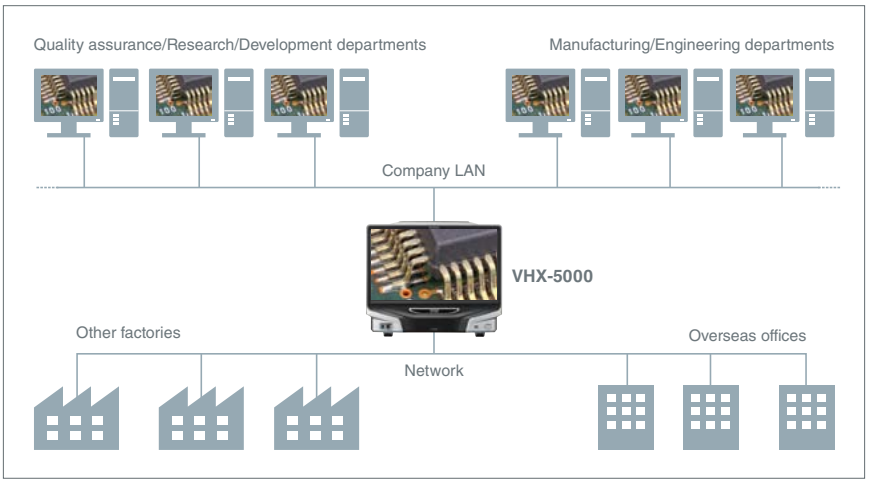
With the PC mode, it is possible to install various drivers for peripheral equipment on the microscope itself, including drivers for Microsoft Word, Excel, and printers. This makes it possible to use the microscope in a way that best fits your operating environment. Users can install anti-virus software onto the VHX according to the environment.

Report function (report preparation)

Quickly create reports containing images by installing Microsoft Word or Excel and then setting up a standard template. Details such as the capture date, lens, and magnification will be recorded automatically.

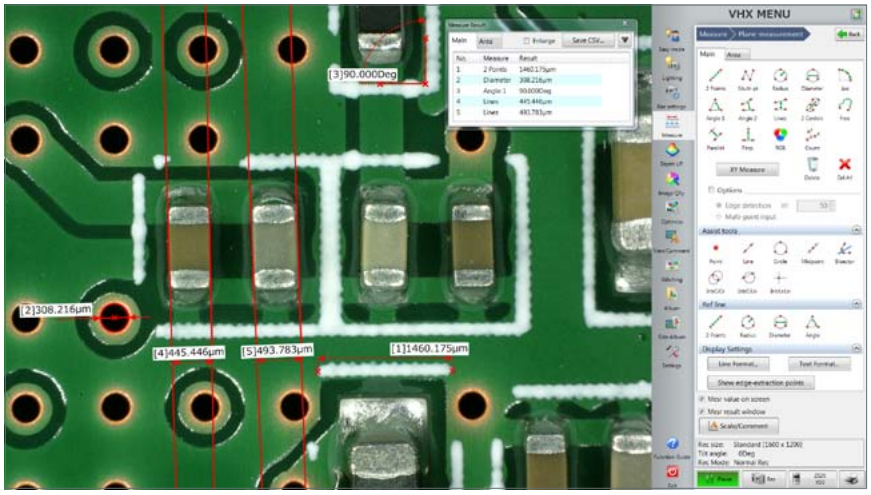
Network compatible

The VHX can be connected to a network via LAN to allow quick and easy sharing/transfer of images with other departments or remote locations. This image and data sharing ensures speedy and accurate action in urgent situations.



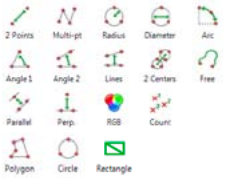
Real-time Measurement during Observation

The system allows users to complete various measurements on the screen in real-time with just a few mouse clicks. It is significantly easy and fast to repeat measurements while changing the field-of-view.



Various measurement tools

The quantity and variety of measurement tools has been increased to a total of 21, including 18 basic measurements and 3 automatic measurement tools. Also, with the measurement point re-positioning function and measurement-free display function, ease-of-use has been greatly increased as well.

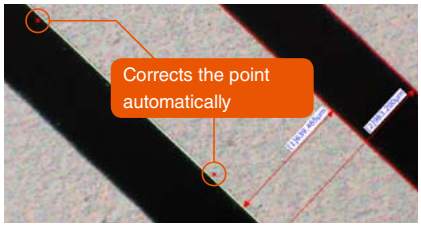


TRIPLE'R function for advanced automatic recognition

KEYENCE's advanced sensor technology and accumulated microscopy/optical expertise have been combined to allow the VHX to recognise three types of information: lens connection, lens type, and observation magnification, in real time. It is unnecessary to change calibration settings every time magnification is changed, or to set magnification for stage control.

Automatic edge extraction function

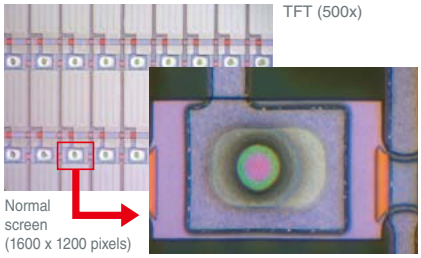
Even when the measurement point selected on the image is not perfectly on the edge of the target, this function will automatically re-adjust the measurement point to the correct edge location. This reduces variation caused by different operators to ensure high repeatability of dimension measurement.



Print pattern (150x)

High-resolution dimensional measurement function

With the pixel shift method, it is possible to specify a measurement area on a captured image that is 9 times larger than a standard image (4800 x 3600 pixels), thus making it possible to perform measurements with greater accuracy.



Magnified screen (4800 x 3600 pixels)

MEASUREMENT MICROSCOPE

Moving the manual stage allows you to measure a target in sizes of up to 100 mm x 100 mm. You can even measure a large target that cannot fit in the field-of-view of the camera.

Display unit OP-84483

The display unit is useful when the moved distance cannot be confirmed on the monitor.

Transmitted illumination unit OP-84484

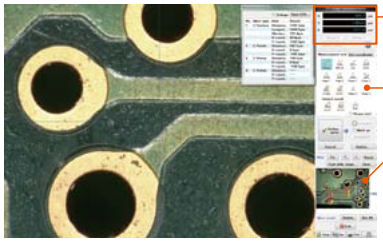
Clearly projects edges of a target

X-Y measurement system VH-M100E

Traceability supported, highly reliable measurement

The X-Y measurement system ensures highly reliable measurements based on a traceability system that complies with international standards.

Measurement software for further improved usability VHX-H2M2



Real-time screen display

The XY measurement results are displayed on the monitor screen in real time.

Various measurement modes

Distance, radius, angle and other measurement modes are included.

Wide image capture

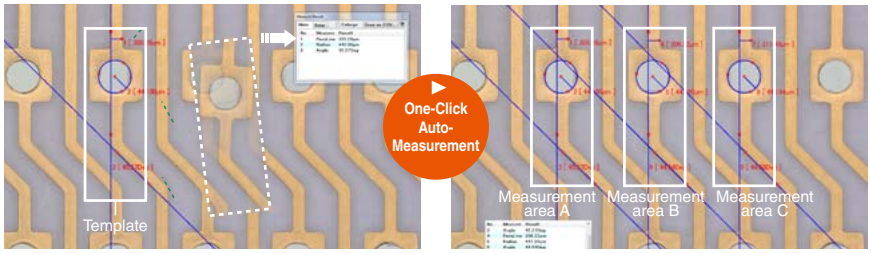
Once a wide-field image captured under low magnification is registered, the current measurement point is always indicated even after the field-of-view is changed under higher magnification. The measurement point can be easily checked for an entire image.

One-click Auto-measurement

With the VHX-5000, multiple measurements are saved to a template (template data) and pattern matching technology is used to match the template to enable automatic batch measurement as well as data compilation.

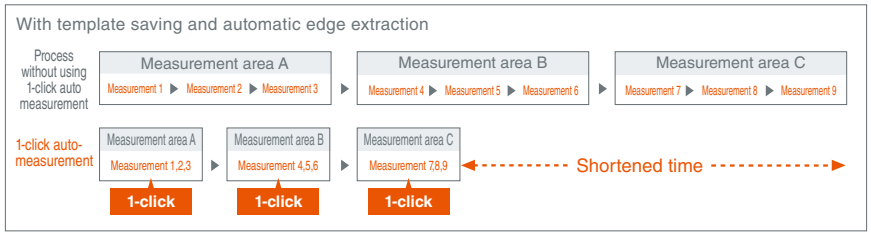
Automatic Measurement

Automatic edge extraction | Save measurement templates



[Template saving]
The appearance of the template searching for the recognition targets

[1-click auto-measurement]
The appearance of auto-measurement



One push calibration

ONE TOUCH

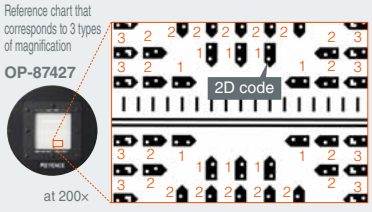
The VHX-5000 allows easy and accurate calibration.

Automatic focus & position alignment

Automatic calibration is possible just by settling the scale and pressing a button. No further steps are needed.

Reading 2D codes

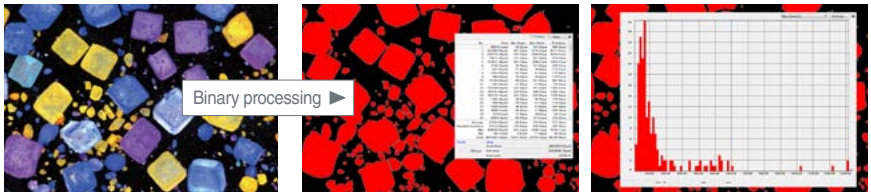
2D codes are embedded in the special scale to allow automatic movement to the position of the optimal reference chart according to the magnification. The system accurately reads the position of the reference chart, eliminating calibration errors.



Automatic area measurement/count

Area Measurement | Binary conversion | Grain (colony) count

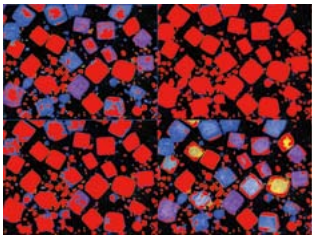
Easily perform area measurements or use the count tool for targets in a specified range. It is also possible to remove unnecessary items and separate overlapping items. Easy operation enables analysis with high accuracy.



Crystal (100×) | Measurement result list | Measurement result (histogram)

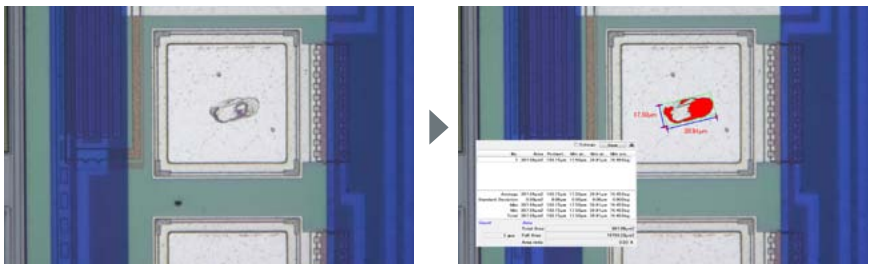
Binary conversion preview

Displays a preview with 4 types of binary conversion algorithms, making it possible to easily operate and make adjustments to reach the optimal binary converted image. Even when the captured image has uneven brightness, the automatic shading correction function allows desired binary processing.



Maximum area measurement

You can quickly measure the area of the largest object within a range by just selecting the range with the mouse. Measurements can be performed with ease even when measuring complicated shapes.



Probe dent (1000×)

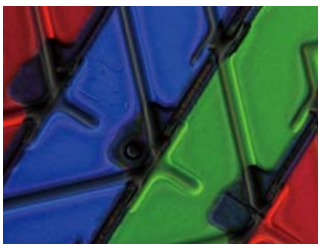
Extraction condition reproduction function

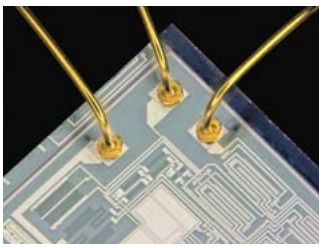
The system automatically saves the conditions that were used during extraction. When analysing different targets, it is possible to implement extraction with the same conditions. This ensures analysis under reproducible conditions regardless of who made extraction, eliminating variation caused by different operators.

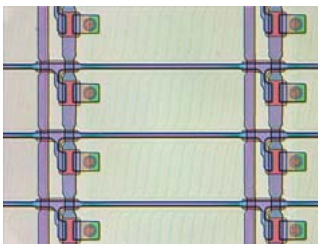
ABLE TO SUPPORT A WIDE-VARIETY OF APPLICATIONS

DIGITAL MICROSCOPE APPLICATIONS

Semiconductor Industry


Colour filter (1000×)

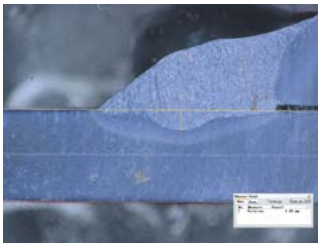

Wire bonding (300×)


ITO film (1000×)

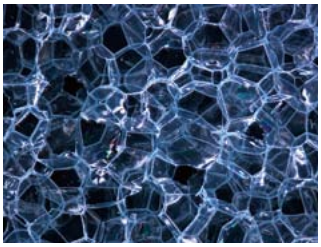
Metal Industry

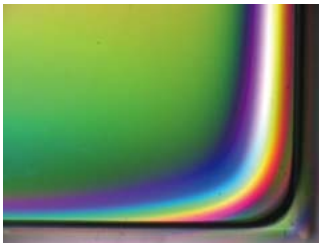

Metal structure (400×)

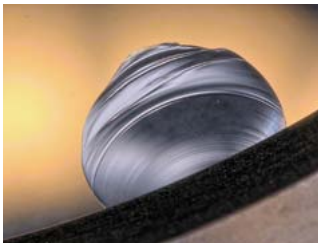

Metal fracture surface (200×)


Weld penetration (5×)

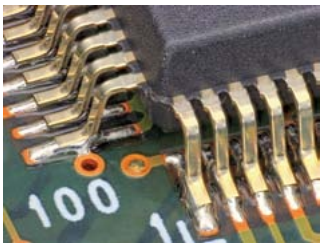
Raw Materials & Chemicals Industry


Heat insulating materials (100×)

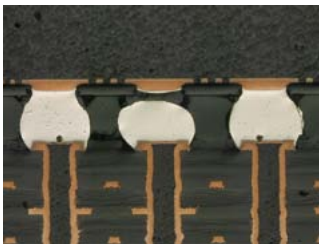

Residual stress (700×)


Glass bead (50×)

Electronics Industry



Electronic PC board (50×)

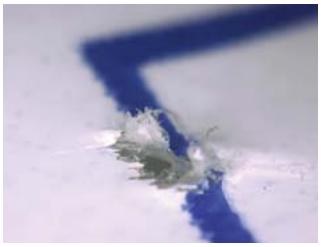

Solder ball cross-section (200×)


Solar cell (800×)

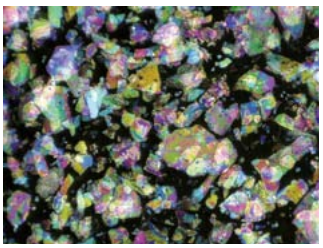
Pharmaceutical & Food Products Industry


Crystal (150×)

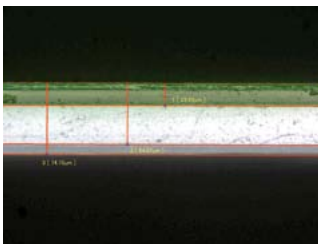

Hair (3000×)


A tear in wrapped packaging (100×)

Other Industries



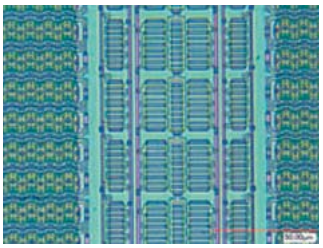
Mica (500×)



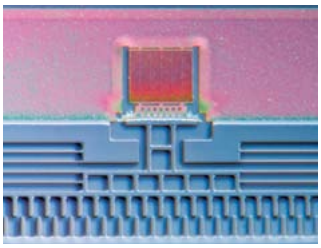
Cross-section of multi-layered film (1000×)

Human skin (50×)

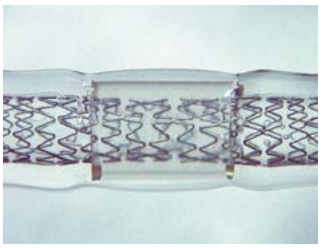
Universities



LSI (2000×)

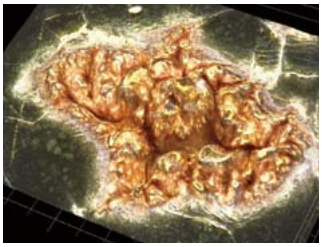


MEMS red pitch variable guided-mode resonant grating (1000×)



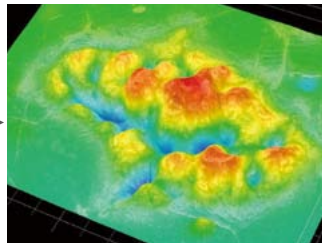
Stent (100×)

Advanced Functions/ Applications

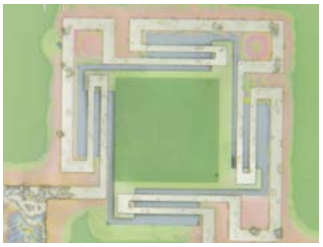


Laser ablation (500×)

3D image

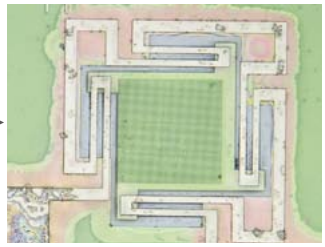


Height colour image



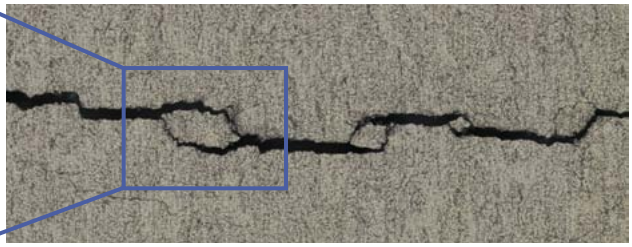
Photonic crystal filter (1000×)

8-bit image



16-bit HDR image

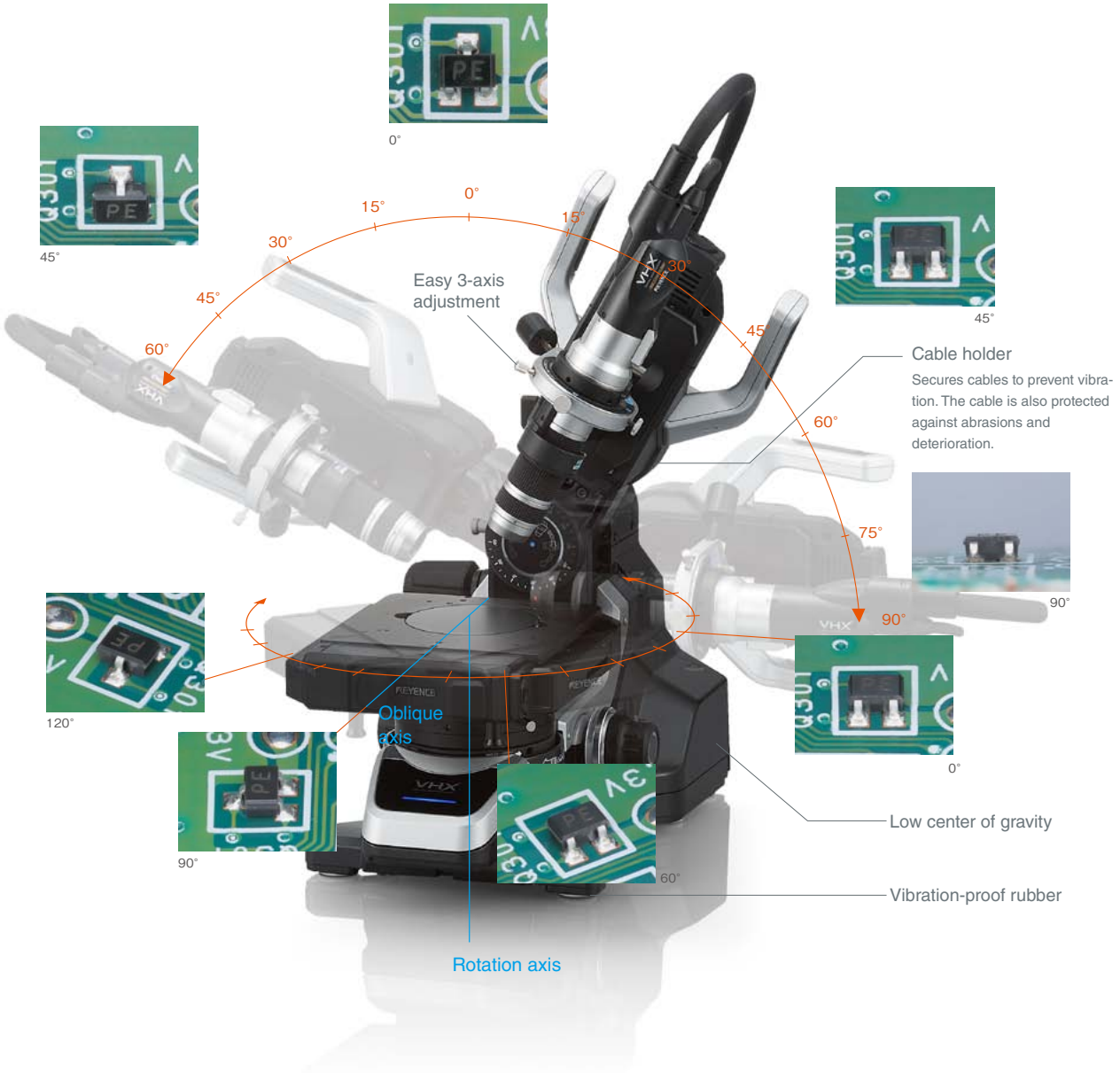
Cracks in stainless steel (300×)



Stitched image

Free-angle observation (XYZ motorised)

An adjustment mechanism that can easily adjust three axes of the field-of-view, rotation, and inclination. It has achieved eucentricity to let the target almost stay in the field-of-view, even when the lens unit is inclined or rotated.



Faster Z-axis movement

The maximum speed of the motorised Z-axis stage has become faster to 17 mm/sec. This greatly improves the speed of depth composition.

0-degree locking mechanism

A mechanism has been incorporated to lock the stage in the status where it is not inclined (0 degree). This improves observation repeatability.

Improved seismic capacity

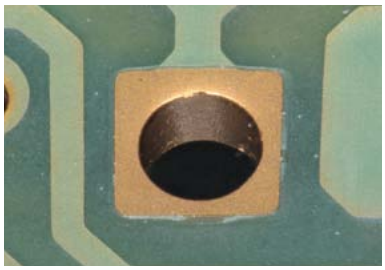
An aluminium diecast main frame has been employed. The reviewed stage structure has improved seismic capacity.

Inclination angle sensor incorporated

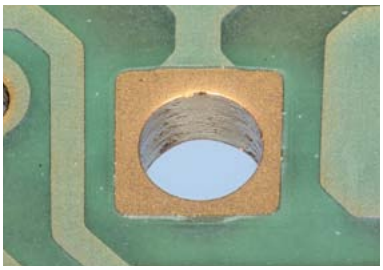
A built-in sensor detects the inclination angle of the stage. Now it is possible to display the angle on the observation screen or to save the condition during recording.

LED transmitted illumination

LED transmitted illumination is standard with the XY motorised stage free-angle system. With light that produces consistent brightness, vivid observation is possible from low to high magnification. In addition to transmitted illumination, it is also possible to use the LED lighting in conjunction with vertical illumination from the lens. The light can be adjusted for each type of illumination, making it possible to perform observation with an optimum balance of light intensity.



Vertical illumination

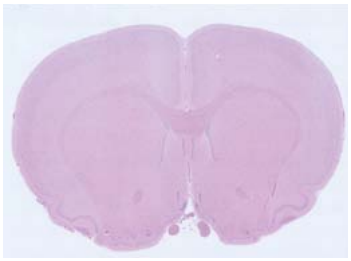


Vertical + transmitted illumination

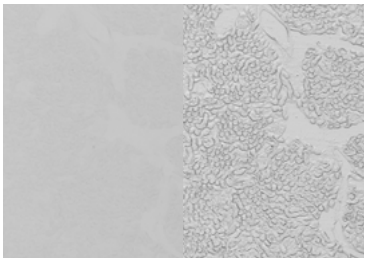
PCB through-hole (100×)

Transmitted light switching mechanism

During low magnification observation, the light is applied uniformly to the entire target. During high magnification observation, the light is converged to a relevant area. This reduces uneven brightness even during transmitted light observation, showing edges clearly.



Slice of brain tissue (200x, composite of 120 images)



Mouse kidney section (150x comparison image)

“Angle sensor” for recognition of rotation information

The XY motorised stage also allows θ rotation and incorporates an “angle sensor” to recognise the rotation information of the stage. Even when the stage is rotated, it can be operated in the exact direction as you see on the screen.

Just move the joystick to desired directions.

Rotation angle: 0 degree	Regardless of the rotation angle

The TRIPLE'R compliant lenses are fitted with Automatic Lens/Zoom Recognition units.

High-Performance Low-Range Zoom Lens **VH-Z00R/Z00T**

0.1 ▸ 50

Macro zoom lens

With a range from 0.1x - 50x magnification, a target can be viewed from its entirety down to more in-depth observation. This macro lens excels in workability and high performance with click-style magnification adjustment, an aperture mechanism, and a viewing distance of 95 mm or more.

Model		VH-Z00R/Z00T						
Magnification [1]		0.1x	0.5x	1x	5x	10x	30x	50x
Field-of-view (mm)	Horizontal	3200	640	320	61	30.5	10.2	6.1
	Vertical	2400	480	240	45.5	22.8	7.6	4.6
	Diagonal	4000	800	400	76.2	38.1	12.7	7.6
Working distance (mm)		Aprrox. 7700	Aprrox. 1500	Aprrox. 720	95			

1. Magnification on a 15-inch monitor

Small, High-Performance Zoom Lens **VH-Z20R/Z20T**

20 ▸ 200

Versatile lens provides high-resolution imaging with large depth-of-field

The VH-Z20R/Z20T offers high-resolution observation at general purpose magnifications of 20x - 200x. This lens has been designed to optimise both depth-of-field and resolution and can be used in handheld mode.

Model		VH-Z20R/Z20T					
Magnification [1]		20x	30x	50x	100x	150x	200x
Field-of-view (mm)	Horizontal	15.24	10.16	6.10	3.05	2.03	1.52
	Vertical	11.40	7.60	4.56	2.28	1.52	1.14
	Diagonal	19.05	12.70	7.62	3.81	2.54	1.91
Depth-of-field [2] (mm)		34	15.5	6.0	1.6	0.74	0.44
Working distance (mm)		25.5					

1. Magnification on a 15-inch monitor
2. The value when the lens is set with priority to depth-of-field. The depth-of-field changes depending on the setting of the aperturering.

Wide-Range Zoom Lens **VH-Z100R/Z100T**

100 ▸ 1000

High-performance lens with long working distance

This innovative lens was developed to satisfy the need for high-resolution, long working distance and large depth-of-field.
Provides both ring light and bright field illumination.

Model		VH-Z100R/Z100T					
Magnification [1]		100x	200x	300x	500x	700x	1000x
Field-of-view (mm)	Horizontal	3.05	1.53	1.02	0.61	0.44	0.30
	Vertical	2.28	1.14	0.76	0.46	0.33	0.23
	Diagonal	3.81	1.90	1.27	0.76	0.54	0.38
Working distance (mm)		25 (20 [2])					

1. Magnification on a 15-inch monitor
2. When the triple light is attached.

Dual Light High-Magnification Zoom Lens **VH-Z250R/Z250T**

250 ▸ 2500

Observe with both bright field and dark field at high-magnification

Easily switch between ring light and coaxial illumination with just the touch of a button. View objects at up to 2500x magnification while still maintaining a 6.5 mm working distance.

Bright-field | Dark-field

Model		VH-Z250R/Z250T						
Magnification [1]		250x	300x	500x	1000x	1500x	2000x	2500x
Field-of-view (mm)	Horizontal	1.22	1.02	0.61	0.31	0.2	0.15	0.12
	Vertical	0.92	0.76	0.46	0.23	0.15	0.11	0.09
	Diagonal	1.52	1.27	0.76	0.38	0.25	0.19	0.15
Working distance (mm)		6.5						

1. Magnification on a 15-inch monitor

High-Resolution Zoom Lens **VH-Z500R/Z500T**

500 ▸ 5000

Our highest magnification/ resolution zoom lens

This zoom lens incorporates high-quality fluorite optics. With an N.A. of 0.82, achieve up to 5000x magnification with a 4.4 mm working distance.

Model		VH-Z500R/Z500T				
Magnification [1]		500x	1000x	2000x	3000x	5000x
Field-of-view (µm)	Horizontal	610	305	152	102	61
	Vertical	457	229	114	76	46
	Diagonal	762	381	191	127	76
Working distance (mm)		4.4				

1. Magnification on a 15-inch monitor

A single lens that can perform a variety of observations

RZ LENS Real Zoom Lens

The TRIPLE'R compliant lenses are fitted with Automatic Lens/Zoom Recognition units.

Universal Zoom Lens **VH-Z20UR/Z20UT**

20 ▸ 200

Optimal lighting with the touch of a button

This lens has the ability to perform bright/dark field and DIC observation, even at lower magnification ranges. A unique illumination system allows users to switch between three different types of lighting by simply pressing a button.

Bright-field	Dark-field
Partial	Differential interference contrast

Model		VH-Z20UR/Z20UT					
Magnification [1]		20x	40x	80x	100x	160x	200x
Field-of-view (mm)	Horizontal	15.24	7.62	3.81	3.05	1.91	1.52
	Vertical	11.40	5.70	2.85	2.28	1.43	1.14
	Diagonal	19.05	9.53	4.76	3.81	2.38	1.91
Working distance (mm)		20.8 [2]					

1. Magnification on a 15-inch monitor.
2. sWith the wide-area illumination attachment equipped.

Universal Zoom Lens **VH-Z100UR/Z100UT**

100 ▸ 1000

Differential Interference Contrast (DIC) lens

Bright/dark field, polarisation, transmission and DIC observation can be performed with this lens. DIC observation makes it possible to clearly visualise surface topography of low-contrast and transparent objects.

Bright-field	Dark-field
Polarisation	Differential interference contrast

Model		VH-Z100UR/Z100UT					
Magnification [1]		100x	200x	300x	500x	700x	1000x
Field-of-view (mm)	Horizontal	3.05	1.53	1.02	0.61	0.44	0.30
	Vertical	2.28	1.14	0.76	0.46	0.33	0.23
	Diagonal	3.81	1.90	1.27	0.76	0.54	0.38
Working distance (mm)		25(20 [2])					

1. Magnification on a 15-inch monitor.
2. When the triple light is attached.

Change illumination with a single button

Easily switch the type of lighting being used by simply pushing a button eliminating the need for complex lighting adjustments.

Coin (60x) Dark-field

Bright-field

Capture clear images from a distance

LW LENS Long Working Lens

The TRIPLE'R compliant lenses are fitted with Automatic Lens/Zoom Recognition units.

Long-Focal-Distance, High-Performance Zoom Lens **VH-Z50L/Z50T**

50 ▸ 500

Long Range Lens with a 85 mm Working Distance

Enables high-magnification observation while maintaining a long working distance. This lens is ideal for viewing objects that have highly-irregular surfaces or recesses that cannot be observed up close.

Model		VH-Z50L/Z50T					
Magnification [1]		50x	100x	200x	300x	400x	500x
Field-of-view (µm)	Horizontal	6.09	3.05	1.53	1.02	0.76	0.61
	Vertical	4.57	2.28	1.14	0.76	0.57	0.46
	Diagonal	7.62	3.81	1.90	1.27	0.95	0.76
Working distance (mm)		85					

1. Magnification on a 15-inch monitor.

Long distance lens - 85 mm working distance

With its optical design and advanced illumination technology, the LW lens achieves a maximum magnification of up to 500x and a working distance of 85 mm. The LW lens can capture deep recesses in the target clearly and offers ample working space for dramatically improved observation efficiency.

Easy observation of deep, recessed areas of the target

Aluminium surface (500x)

VHX Series System Line Up

RZ LENS [1.]

- High-resolution zoom lens **VH-Z500R/Z500T** — 500x to 5000x
- Dual-light High-magnification zoom lens **VH-Z250R/Z250T** — 250x to 2500x
- Wide-range zoom lens **VH-Z100R/Z100T** — 100x to 1000x
- Universal Zoom Lens **VH-Z100UR/Z100UT** — 100x to 1000x
- Universal Zoom Lens **VH-Z20UR/Z20UT** — 20x to 200x
- Small, high-performance zoom lens **VH-Z20R/Z20T** — 20x to 200x
- High-performance low-range zoom lens **VH-Z00R/Z00T** — 0.1x to 50x

LW LENS

- Long-focal-distance, high-performance zoom lens **VH-Z50L/Z50T** — 50x to 500x

ZOOM LENS

- Zoom Lens **VH-Z25** — 25x to 175x
- Long-focal-distance zoom lens **VH-Z35** — 35x to 245x
- Middle-range zoom lens **VH-Z150** — 150x to 800x

REAL BORE LENS [4.]

VH-B55 · **VH-B100** · **VH-B18** · **VH-B27** · **VH-B40** — **VH-BA**

FIBRESCOPE [5.]

VH-F61 — **VH-F111**

Polarisation observation set
OP-87821

Differential interference set
OP-86943

Ring illumination unit for Z100/Z100U/Z20U
OP-87792 [3.]

OP-72407

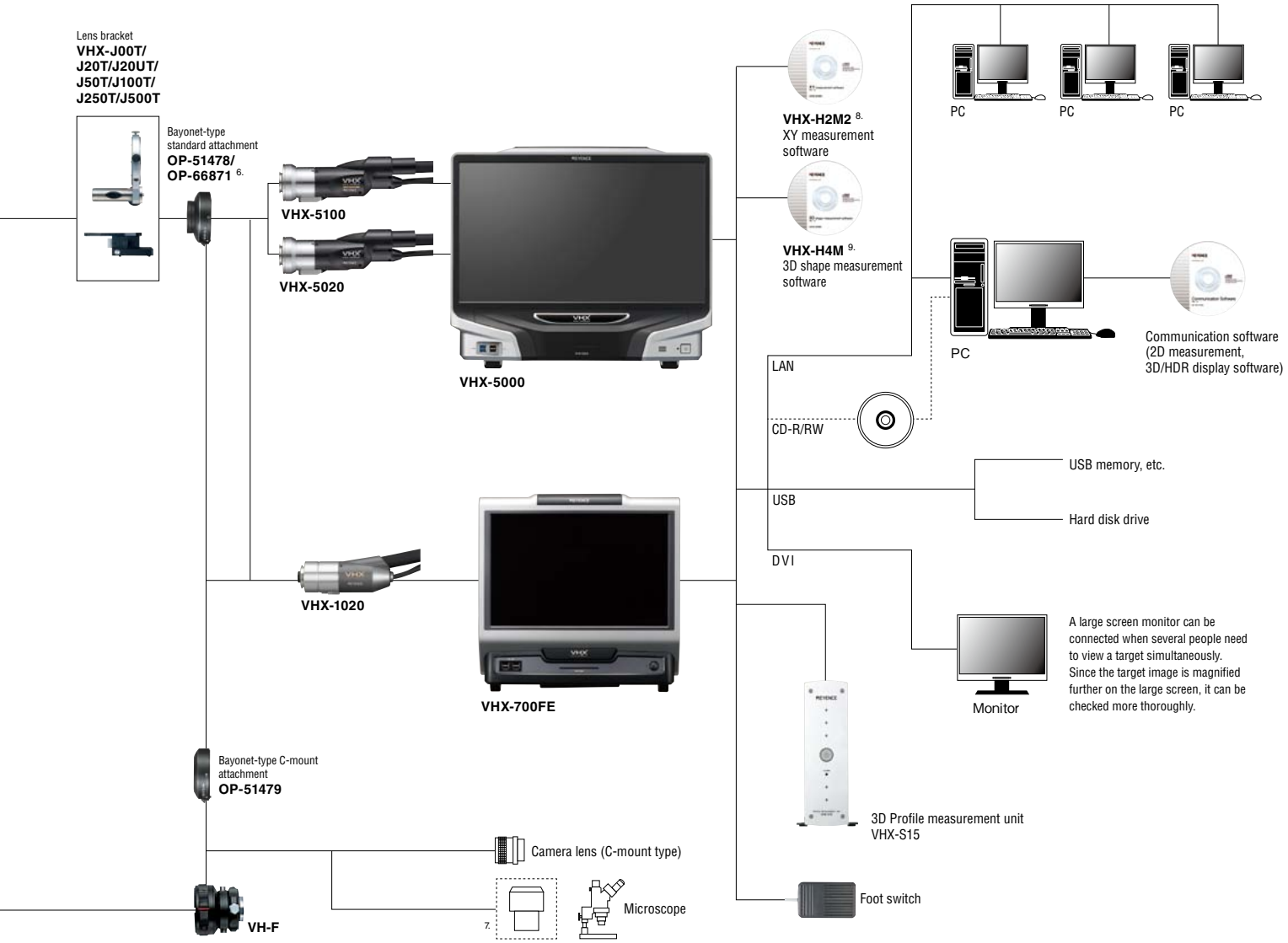
- Polarisation illumination adapter **OP-72405** [2.]
- Coaxial polarisation adapter **OP-72406**
- Dark-field illumination adapter **OP-72402**
- Adjustable illumination adapter **OP-72404**
- Wide area illumination adapter **OP-87298**
- Diffuse illumination adapter **OP-87299**

DIC prism and filter set
OP-87297

Non-reflective illumination ring
OP-32009

- Contact adapter **OP-81880**
- Polarisation illumination adapter **OP-87298**
- Adjustable illumination adapter **VH-K20**
- Super-diffuse illumination adapter **OP-42305**
- Polarised illumination adapter **OP-87429**
- Diffuse illumination adapter **OP-35324**
- Non-contact diffusion **OP-35414**
- Multi-diffuse adapter **OP-35469**
- Coaxial vertical illumination adapter **OP-35416**
- Adjustable illumination adapter **VH-K150**

Free head contact adapter
OP-32348



▮ OPTION

Free-angle
observation system
VHX-S500E

Free-angle observation
system (XYZ-axis automatic)
VHX-S550E

High-precision
VH mounting stand
(with X-Y stage and
transmitted illumination)
VH-S5

VH lens mounting stand
(with XY stage)
OP-25539
OP-22124

X-Y measurement system
VH-M100E

Transmitted
illumination unit
OP-84484

Display unit
OP-84483

1. TRIPLE'R compliant lenses VH-Z00T/Z20T/Z20UT/Z50T/Z100UT/Z100T/Z250T/Z500T are fitted with Automatic Lens/Zoom Recognition units and connection recognition mount, respectively.
2. OP-72407 and OP-72406 are required when coaxial illumination is used.
3. Included with the VH-Z20UR/Z20UT.
4. The optional bore fibre cable (OP-87201) is required.
5. The optional light guide attachment (either of OP-51482 or OP-87796) dedicated to the VHX Series is required.
6. OP-66871 is required when the VH-Z00R, Z20R, or Z25 is used.
7. A C-mount adapter suitable for the microscope is required.
8. VHX-H1M1 is required for the VHX-700FE.
9. VHX-H3M is required for the VHX-700FE.

Basic functions: Controller

Model			VHX-5000	VHX-700FE
Camera	Image receiving element		1/1.8-inch, CMOS image sensor Virtual pixels: 1600 (H) x 1200 (V)	1/1.8-inch, CCD image sensor Virtual pixels: 1600 (H) x 1200 (V)
	Scan method		Progressive	Progressive
	Frame rate		50 frames/sec. (max.)	15 frames/sec. and 28 frames/sec. selectable
	Resolution	2 million pixels	1600 (H) x 1200 (V) Approx. 1000 TV lines	1600 (H) x 1200 (V) Approx. 1000 TV lines
		2 million pixels[1.3.]	1600 (H) x 1200 (V) Approx. 1200 TV lines (2 million pixels x 3CMOS mode, Excellent colour reproducibility)	–
		8 million pixels[3.]	3200 (H) x 2400 (V) Approx. 1600 TV lines	
		18 million pixels[3.]	4800 (H) x 3600 (V) Approx. 2000 TV lines or more	
		18 million pixels[2.3.]	4800 (H) x 3600 (V) Approx. 2000 TV lines or more (18 million pixels x 3 CMOS mode, Excellent colour reproducibility)	
	High Dynamic Range		16-bit resolution through RGB data from each pixel	–
	Gain		AUTO, MANUAL, PRESET	AUTO, MANUAL, PRESET
	Electronic shutter		AUTO, MANU, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/9000, 1/19000	AUTO, MANU, 1/15, 1/30, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/9000, 1/19000
	Supercharge shutter		0.2 sec. to 4 sec. Can be set in increments of 0.1 sec.	0.2 sec. to 17 sec. Can be set in increments of 0.1 sec.
	White balance		Auto, Manual, One-push set, Preset (2700K, 3200K, 5600K, 9000K)	Auto, Manual, One-push set, Preset (2700K, 3200K, 5600K, 9000K)
	Back-focus adjustment		Not required	Not required
LCD monitor[5.]	Size		Colour LCD (IPS) 23"	Colour LCD (TFT) 17"
	Panel size		509.184 (H) x 286.416 (V) mm	365.76 (H) x 228.60 (V) mm
	Pixel pitch		0.2652 mm (H) x 0.2652 mm (V)	0.1905 mm (H) x 0.1905 mm (V)
	Number of pixels		1920 (H) x 1080 (V) (FHD)	1920 (H) x 1200 (V) (WUXGA)
	Display colour		Approx. 16770000 colours[4.]	Approx. 16770000 colours[4.]
	Brightness		300 cd/m^2 (Centre 1 Point, typical)	270 cd/m^2 (typical)
	Contrast ratio		1000:1 (typical)	450:1 (typical)
	Viewing angle		±89° (typical, horizontal), ±89° (typical, vertical)	±80° (typical, horizontal), ±70° (typical, vertical)
CD-R/CD-RW/DVD drive unit	Unit		DVD-ROM super-multi drive unit	DVD-ROM super-multi drive unit
	Applicable disk		CD-R/CD-RW/DVD±R/DVD±R DL/DVD±RW/DVD-RAM	CD-R/CD-RW/DVD±R/DVD±R DL/DVD±RW/DVD-RAM
	Storage capacity		8.7 GB (when DVD±R DL is used)	8.7 GB (when DVD±R DL is used)
Hard disk drive unit	Storage capacity		500 GB (including 165 GB reservation area) Approx. 1680000 images (When a 2 million-pixel image is compressed) to approx. 55000 images (When a 2 million-pixel image is not compressed)	500 GB (including 80 GB reservation area) Approx. 2100000 images (When a 2 million-pixel image is compressed) to approx. 70000 images (When a 2 million-pixel image is not compressed)
Image format			JPEG (With compression), TIFF (No compression)	JPEG/HD Photo (With compression), TIFF (No compression)
Observable image size			20000 (H) pixels x 20000 (V) pixels (when stitched)	1600 (H) pixels x 1200 (V) pixels
Light source	Lamp		High brightness LED	12 V, 100 W, Halogen lamp
	Lamp life		40000 hours (reference)	1000 hours (average)
	Colour temperature		5700K (typical)	3100K (at maximum light intensity)
Output	Video output		DVI-I (1920 x 1080 pixels)	DVI-I (1920 x 1200 pixels)
	Scanning frequency	Special LCD monitor	66 kHz (H), 60 Hz (V)	75 kHz (H), 60 Hz (V)
		External monitor	66 kHz (H), 60 Hz (V)	75 kHz (H), 60 Hz (V)
Input	Mouse input		USB mouse supported	USB mouse supported
	Keyboard input		USB keyboard supported	USB keyboard supported
	External remote input		Pause/Recording, Non-voltage input (Contact/Noncontact)	Pause/Recording, Non-voltage input (Contact/Noncontact)
Interface	LAN		RJ-45 (10BASE-T / 100BASE-TX / 1000BASE-T)	RJ-45 (10BASE-T / 1000BASE-T)
	USB 2.0 Series A		6 types	8 types
	USB 3.0 Series A		2 types	–
Power supply	Power supply voltage		100 to 240 VAC, 50/60 Hz	100 to 240 VAC, 50/60 Hz
	Power consumption		280 VA	340 VA
Environmental resistance	Ambient temperature		+5 to 40°C	+5 to 40°C
	Relative humidity		35 to 80%RH (No condensation)	35 to 80%RH (No condensation)
Weight	Controller		Approx. 12.5 kg	Approx. 11.6 kg
	Camera unit		Approx. 1.10 kg (VHX-5100), Approx.1.00 kg (VHX-5020)	Approx. 0.90 kg (VHX-1020)
	Console		Approx. 0.40 kg	Approx. 0.40 kg
Dimensions (Excluding the projected areas)			550 (W) x 470 (H) x 200 (D) (when stored)	420 mm (W) x 416 mm (H) x 181 mm (D) (when stored)

Basic functions: Stage

		VHX-S550E	VHX-S500E	VH-S300
XYθ stage	XY stage: Electric/Manual	Electric	Manual	Manual
	XY automatic stage motor	2-phase stepping motor	–	–
	XY automatic stage resolution	1 µm (typical)	–	–
	XY automatic stage movement speed	10 mm/sec. (max.)	–	–
	XY stage moving range	±20 mm	±35 mm	±35 mm
	θ rotation angle	±90°	360°	360°
	XYθ stage size	Top surface: 171 mm x 168 mm (Centre disc: ø100)	Top surface: 190 mm x 150 mm	Top surface: 190 mm x 150 mm
	Transmitted light-compatible magnification	20x or more	–	–
Z stage	Z stage: Electric/Manual	Electric	Electric	Manual
	Z automatic stage motor	5-phase stepping motor	5-phase stepping motor	–
	Z automatic stage resolution	0.1 µm (typical)	0.1 µm (typical)	–
	Z automatic stage movement speed	17 mm/sec. (max.)	17 mm/sec. (max.)	–
	Z stage moving range	49 mm	49 mm	56 mm
Ratings	Power supply voltage	100 to 240 VAC, 50/60 Hz	100 to 240 VAC, 50/60 Hz	–
	Power consumption	60 VA	50 VA	–
Environmental resistance	Ambient temperature	+5 to 40°C	+5 to 40°C	–
	Relative humidity	35 to 80%RH (No condensation)	35 to 80%RH (No condensation)	–
Weight		17.5 kg	17.0 kg	17.4 kg
Load capacity		1 kg	1 kg	1 kg

VHX-5000 (Module details)

Software	Moving image recording software	Allows recording/playing back moving images.
	High image quality depth composition software	Captures multiple images focused on different heights and composes a single image from them.
	Area measurement software	Measures an area of a 2D image.
	Timer capture software	Captures images automatically at specified time intervals.
	Screen splitting software	Displays vertical, horizontal, or 4-part split screens.
	Comment input software	Allows inputting and displaying comments such as characters and markers on the observation image.
	Image improvement software	Provides image processing functions for modifying images to make observation easier.

▮ Other functions

Model		VHX-5000	Console compatible	VHX-700FE	Console compatible
Various controller functions	Auto focus function	Provided	✓	Provided	✓
	Image stitching	Provided	✓	-	
	3D image stitching	Provided	✓	-	
	High resolution image capture	Provided		-	
	Z-axis automatic stage control function	Provided	✓	Provided	✓
	One-push quick 3D function	Provided	✓	Provided	✓
	HDR Plus function	Provided	✓	-	
	Side album function	Provided		Provided	
	Capture condition reproduction function	Provided		Provided	
	High quality depth composition	Provided		Provided	
	Accurate D.F.D. method 3D display function	Provided (Quick method)		Provided (Quick method)	
	3D illumination simulation function	Provided		Provided	
	3D two-screen simultaneous comparison function	Provided (Combination/Comparison/Difference display mode)		Provided (Combination/Comparison/Difference display mode)	
	Real-time digital zoom	1.0x to 10.0x		1.0x to 10.0x	
	Lighting shift function (Height difference enhancement)	Provided (Full, partial, lateral, dark-field, bright-field, and combination illumination modes)	✓	Provided (Full, partial,and lateral illumination modes)	✓
	e-Preview mode (9 types)	Provided (Automatically lists 9 types of image modes, allowing selection of the optimal image)	✓	Provided (Automatically lists 9 types of image modes, allowing selection of the optimal image)	✓
	Glare removal function	Provided	✓	Provided	✓
	Vivid & sharp image mode	Provided		Provided	
	Supercharge shutter function	Provided	✓	Provided	✓
	Edge enhancement function	Provided (200 steps), moving images supported		Provided (200 steps), moving images supported	
	Gamma correcting function	Provided		Provided	
	Camera-shake correcting function	Provided (Moving images supported)	✓	Provided (Moving images supported)	✓
	Split function	Vertical, horizontal, 4-part, and 9-part split and combination display		Vertical, horizontal, 4-part	
	Moving image recording/playback function	50 frames/sec. max. (Image size: 1600 x 1200, 800 x 600, 640 x 480)		28 frames/sec. max. (Image size: 1600 x 1200, 800 x 600, 640 x 480)	
	Timer capture function	Provided		Provided	
	Automatic unit S15 control function	Provided		Provided	
	Eucentric setting function	Provides a guide for eucentric position observation.		–	
	Live depth composition function	Ensures constantly focused, high depth-of-field image.	✓	–	
	High resolution HDR function	Displays a high resolution and high gradation image.	✓	–	
	High resolution observation function	Displays a high resolution image based on pixel shift technology.		–	
	Simple mode	Showing a group of functions selected according to the purpose.	✓	–	
Measuring functions	TRIPLE'R function	Provided (Automatic lens connection/lens type/magnification recognition function)		Not provided. A cable is required for lens connection.	
	High-resolution dimensional measurement function	Provided		Not provided	
	Distance, angle, radius, area, and other measurement functions	Various functions provided		Various functions provided	
	Automatic count and area measurement function	Provided (Enables distance/area measurement through brightness/colour extraction)		Provided (Enables distance/area measurement through brightness/colour extraction)	
	Scale display	Various scales provided	✓	Various scales provided	✓
	Automatic edge detection	Provided		Provided	
	Auto calibration	Full-auto (Numerical input is not required)		Full-auto (Numerical input is not required)	
	One push calibration function	Provided	✓	–	
	Measurement point replacement function	Provided		Provided	
	Measurement free display function	Provided		Provided	
	Specified dimension display function	Provided		Provided	
	Measurement auxiliary function	Provided (Automatic edge extraction, multi-point input)		Provided (Automatic edge extraction, multi-point input)	
	CSV storage	Provided		Provided	
	3D height colour/scale display function	Provided (Enables X/Y/Z-axis height scale display and colour bar display related to height)		Provided (Enables X/Y/Z-axis height scale display and colour bar display related to height)	
	Height between two points measurement function	Provided		Provided	
Manual XY measurement system	XY stage measurement	Provided		Provided	
	Wide image display function	Provided		Provided	
Measuring functions (Optional functions of VHX-H4M/ VHX-S15)[6]	3D profile measurement	Provided (Displays height profile on a specified line on the 3D screen.)		Provided (Displays height profile on a specified line on the 3D screen.)	
	3D cross section profile measurement	Provided		Provided	
	3D volume measurement	Provided		Provided	
	3D plane distance measurement	Provided		Provided	
	3D plane angle measurement	Provided		Provided	
Utility	Complete style covering Observation, Recording and Measurement	All-in-one system that enables all operations for Observation, Recording and Measurement without using a PC		All-in-one system that enables all operations for Observation, Recording and Measurement without using a PC	
	Filing system	Provided		Provided	
	Bayonet-type attachment	Provided		Provided	
	Keyboard entry	Enabled		Enabled	
	Compatible with a foot switch	Enabled		Enabled	
	User settings	Provided		Provided	
	PC mode	Provided (System protection setting available)		Provided (System protection setting available)	
	Function guide	Provided		Provided	
Accompanying software (Free of charge, no copy restriction) (PC software)	PC communication software	Image data transfer between the VHX and PC can be performed easily. (LAN)		Image data transfer between the VHX and PC can be performed easily. (LAN)	
	3D reproduction software for the PC (Available free of charge)	The PC can reproduce a 3D image saved in the VHX.		The PC can reproduce a 3D image saved in the VHX.	
	3D HDR playback/measurement/stitched image playback software (Available free of charge)	Allows adjustment of HDR parameters and display/ measurement of stitched images.		Allows measurement on the PC.	
	One-click measurement compilation software (Available free of charge)	Compiles the result of one-click measurement and transfers it to Excel.		–	

1. 2 million pixels ×3 CMOS mode
2. 18 million pixels ×3 CMOS mode
3. Supported only when the multi-scan camera VHX-5100 is used.
4. Approximately 16770000 colours are realised with the FRC processing (dithering processing for the VHX-700FE) of the display controller.
5. The LCD monitor provided in the VHX Series is based on extremely advanced technology.
   Rarely, an unlit pixel (black spot) or lit pixel (bright spot) may exist on the monitor screen. However, this is not an indication of the LCD monitor being defective.
6. The VHX-H3M is required for the VHX-700FE.

Providing non-contact profile and roughness measurements on nearly any material

3D LASER SCANNING MICROSCOPE
VK-X100/X200

- 200× - 24000× magnification
- High-resolution, large depth-of-field observation
- Profile and roughness measurements with only a few sample preparation
- Measures thickness and uniformity of clear layers
- Acquires data on angles approaching 90 degrees
- Perform measurements with just a single click of the mouse

For measuring shapes or curvature in wider area: One-shot 3D Measuring Macroscope

ONE-SHOT 3D MEASURING MACROSCOPE
VR-3000

- 3D measurement of wide areas in 4 seconds at the fastest
- User-independent “Place and push 3D measurement”
- Triple telecentric lenses for enabling accurate measurement of curvature, flatness, angle, and radii
- Can also be used for an everyday observation
- Various measurement/analysis functions including proper baseline setting based on a surface area

All-in-one high-speed imaging solution

HIGH-SPEED MICROSCOPE
VW-9000

- Record at up to 230000 frames per second
- Fully-integrated system with built-in light source and LCD
- Setup and record in minutes
- Error Monitoring Function automatically detects changes in motion
- Quantify and analyse moving objects
- Provides on-site, magnified observation with microscope functionality

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KEYENCE DEUTSCHLAND GmbH
Zentrale für Deutschland Siemensstraße 1, 63263 Neu-Isenburg, Germany Tel: +49 (0) 61 02 36 89-0 Fax: +49 (0) 61 02 36 89-100

Regionalbüros: Berlin, Essen, Frankfurt, Hamburg, Hannover, Jena, Karlsruhe, Köln, Leipzig, Mannheim, Montabaur, München, Nürnberg, Stuttgart

KEYENCE INTERNATIONAL (BELGIUM) NV/SA / KEYENCE MICROSCOPE EUROPE
Hauptbüro Bedrijvenlaan 5, 2800 Mechelen, Belgien Tel: +32 (0) 1-528-1222 Fax: +32 (0) 1-520-1623 www.keyence.eu E-mail: info@keyence.eu

Regionalbüros: Belgien/Luxemburg, Niederlande, Österreich, Polen, Rumänien, Slowakei, Slowenien, Schweiz, Tschechien, Ungarn

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