KEYENCE

Digital Microscope
VHX-5000

Instantly Observe any Object Entirely in Focus

VHX
DIGITAL MICROSCOPE

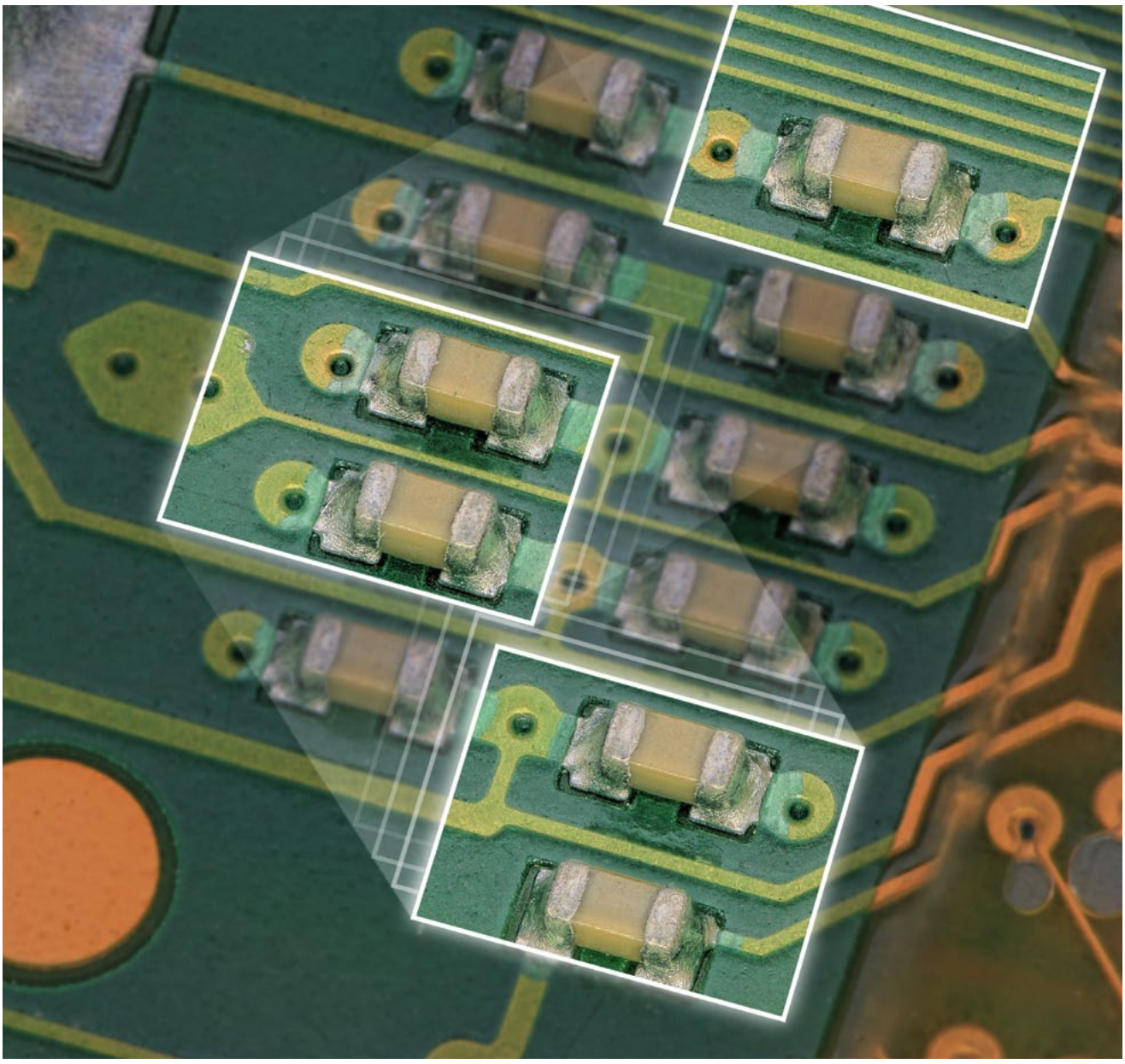
The New Standard for Microscopes

The VHX is an all-in-one microscope that incorporates observation, image capture, and measurement capabilities. Any user, regardless of their experience, can now obtain high-quality, fully-focused images in an instant.

VHX
DIGITAL MICROSCOPE

View any Area Completely in Focus in Less than a Second

Advanced functions eliminate the need for focus adjustment



Eliminate focus adjustment
Real-time depth composition P. 8

EVOLUTION OF KEYENCE DIGITAL MICROSCOPES

Quick and easy observation - KEYENCE continues to develop easy-to-use products that enable high-quality imaging by anyone. KEYENCE relies on customer feedback when developing future microscope products to ensure that each system meets and exceeds the needs of users.

FIRST GENERATION

Magnified observation without looking through eyepieces

For the first time, a group of people are able to observe a large depth-of-field image on a monitor quickly and easily. Based on this concept, the first-generation model, VH-6000, made its debut by using a 280,000 pixel CCD camera. Since then, development has continued to increase the camera resolution while simplifying the imaging process.

1990

FIRST GENERATION

2003

SECOND GENERATION

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

SECOND GENERATION

Marking the beginning of a digital era with 3D observation

A growing need to view objects entirely in focus, even at high magnification, led to the development of a depth composition function (an algorithm that combines several partially-focused images into a fully-focused image). This technology paved the way for 3D observation.

THIRD GENERATION

16-bit imaging with high-level gradation

Two difficult types of samples to image are shiny surfaces and low contrast surfaces - one produces too much glare while the other has few detectable features. These issues were resolved with the development of a technology that captures images at different brightness levels and then produces an image with a high level of colour gradation. This made it possible to thoroughly inspect even the most challenging materials.

2006

THIRD GENERATION

2014

FOURTH GENERATION

VHX-500 VHX-600 VHX-900 VHX-1000 VHX-2000 VHX-5000

FOURTH GENERATION

Fully-focused images in real-time

The ability for any user to be able to quickly see a fully-focused image at all times was an increasing demand. Every component of the hardware had to be reviewed to meet this request. The system will now automatically adjust focus as the user moves a part so that focused images are seen at all times. The speed and ease with which this is achieved mark the beginning of a new style of magnified observation.

Product Concept

Advanced usability

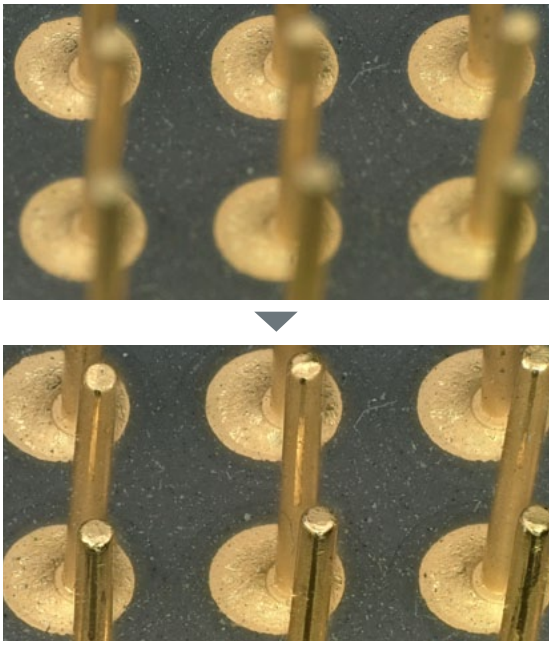
The VHX covers all basic analysis operations - observation, image capture, and measurement - in a single unit.
Achieves fast, easy, and accurate imaging that cannot be accomplished with traditional optical microscopes.

Even large samples can be observed non-destructively.

OBSERVATION

Depth-of-field 20 times greater than optical microscopes

This is one of the fundamental features of VHX Digital Microscopes that greatly increases ease-of-use.
The lenses, camera, and graphics engine are designed to optimise the relationship between depth-of-field, resolution, and brightness.



Pins (100x)

Multi-angle observation

View an object from any angle by tilting the lens up to 90 degrees and rotating the stage 360 degrees.
Because the stand and stage can be moved instead of the actual part, observing a target from various angles can be done without having to manipulate the part by hand.

Easy Mode provides everyone with quick access to advanced functions

Easy Mode contains frequently used functions to allow everyone to perform analysis under optimal conditions. Even novice users can effectively utilise advanced functions.

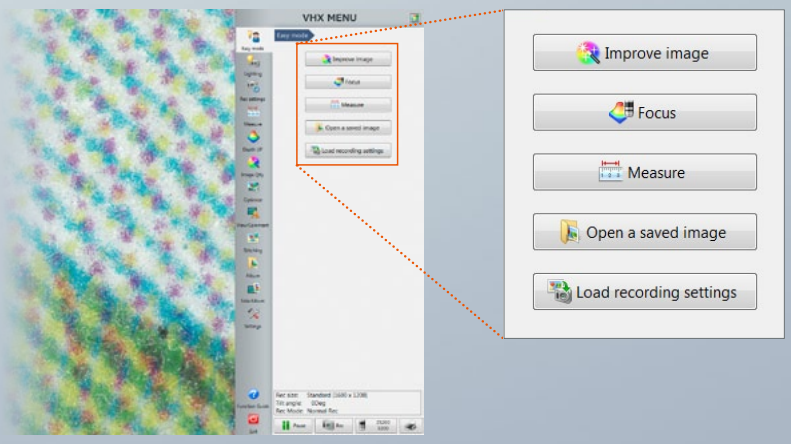
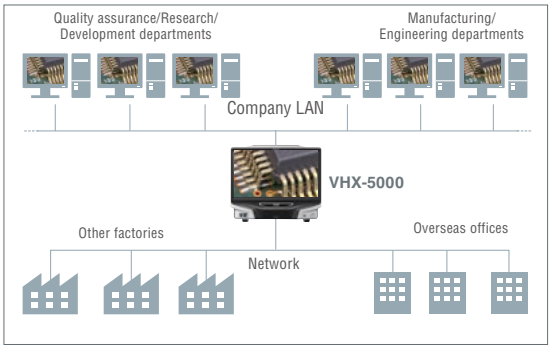


IMAGE CAPTURE

Rapidly save images and data

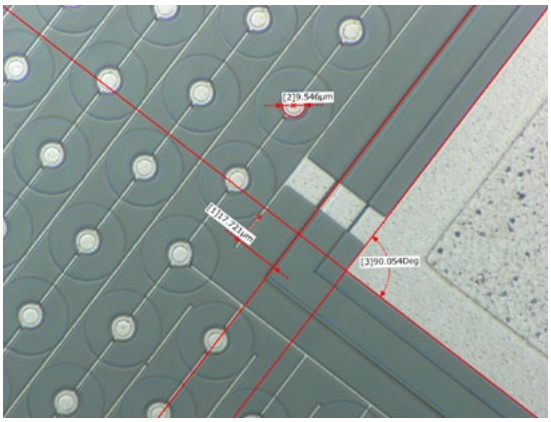
The built-in 500 GB HDD allows images, videos, and measurement data to be saved to the system. The saved files can be viewed on a PC or other devices easily via LAN or USB. Templates can also be created to generate reports automatically.

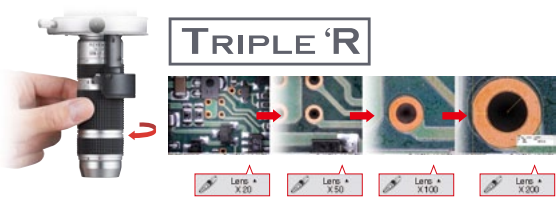


MEASUREMENT

Measure directly on the screen

Dimensional measurements can be made on the microscope by just clicking the area to be measured with the mouse. Measurement data is stored with the image file for easy information sharing, and results can even be exported as a CSV file.

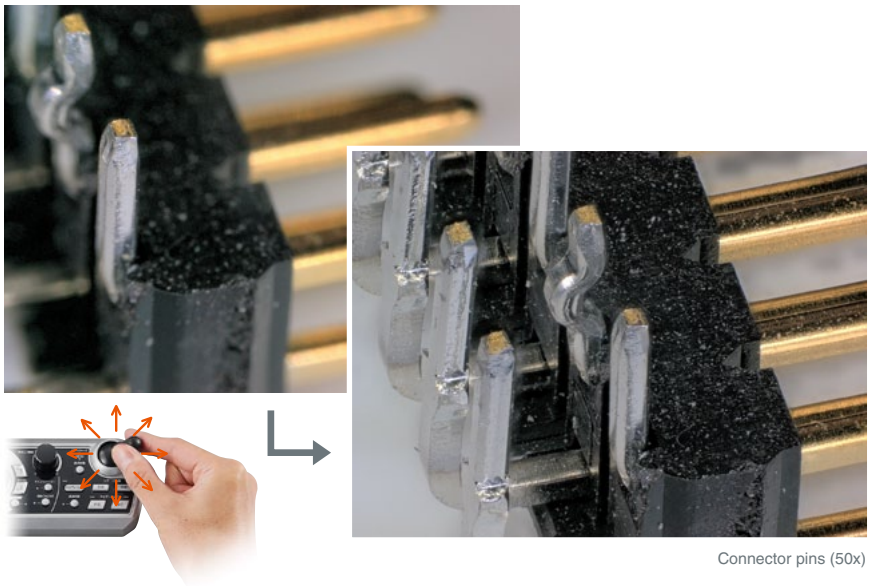




Advanced Functions

View any Area Completely in Focus with Real-time Depth Composition

Due to the high frame rate of its camera, the VHX can quickly scan through the focal range of a sample and recognise areas of focus to build a fully-focused image. This provides intuitive and instant focusing, and satisfies the universal need for focused magnified observation.



Connector pins (50x)

You can observe a fully-focused image instantly by just moving the motorised X-Y stage to a desired area.

Instant full focus
eliminates manual adjustments

Faster observation and more thorough analysis using increased sample data

No need for focus adjustment

No need for manual depth composition

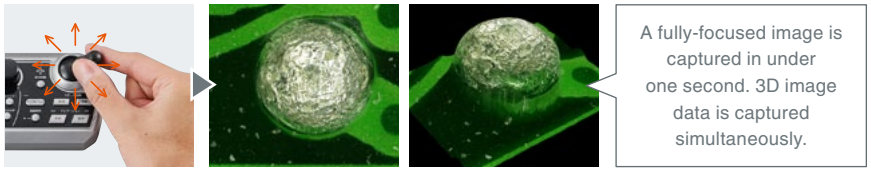
Fully-focused observation without any user adjustments

A fully-focused image can be captured in less than one second. To observe another area of interest, just move the stage and the system will automatically generate a fully-focused image of your target. The VHX has revolutionised observation by providing fully-focused images of objects without the need for focus adjustments or manual depth composition.

Conventional

Select the field-of-view... adjust the focus... move the lens through the z range for composition... finally obtain a fully-focused image

VHX-5000

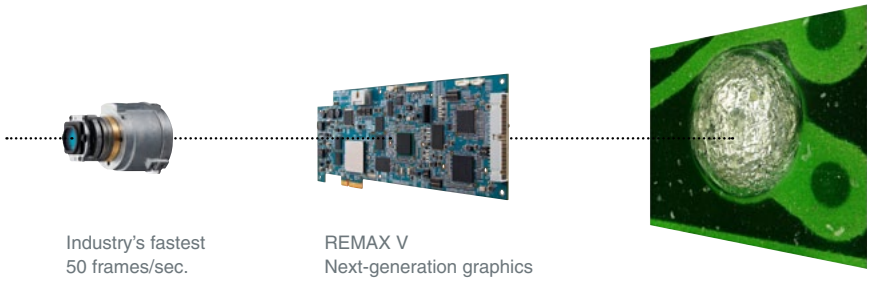


Just select the area to view... view a fully-focused image... view a 3D image

A fully-focused image is captured in under one second. 3D image data is captured simultaneously.

KEYENCE's original digital focusing technology

The industry's fastest, 50 frames per second camera, sends out a large amount of image data with every focus position, and the REMAX V next-generation graphics engine processes this data at a super-high speed. This technology identifies the data with the best focus for each pixel and generates a fully-focused, magnified image instantly on the screen.

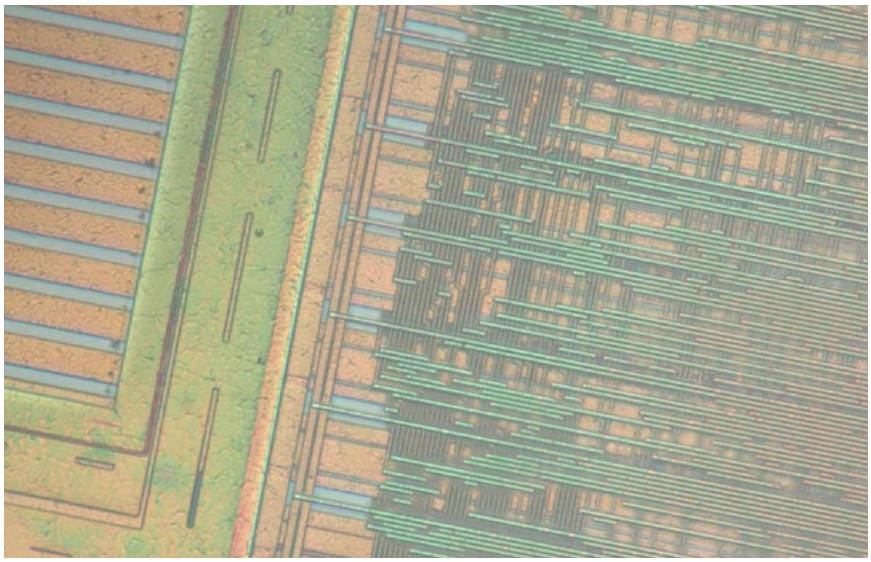


Industry's fastest 50 frames/sec. camera

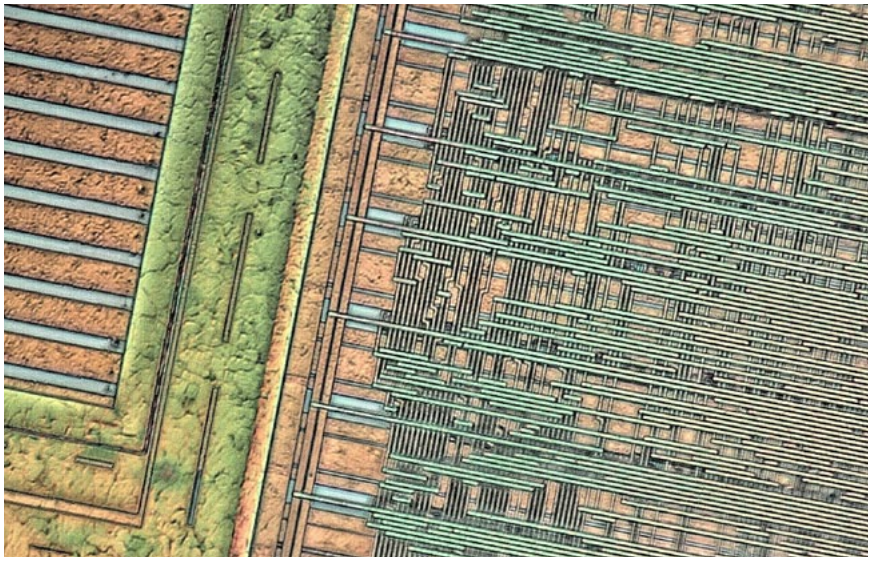
REMAX V Next-generation graphics engine

Improving Image Resolution: High-resolution HDR

A high-resolution image is obtained by using short-wavelength light and the HDR (High Dynamic Range) function to capture multiple images at varying shutter speeds. This produces a high colour gradation image with high resolution and sharp contrast that was previously impossible to obtain.



Normal observation of IC (1500x)



High resolution HDR observation of IC (1500x)

Pixel shift technology

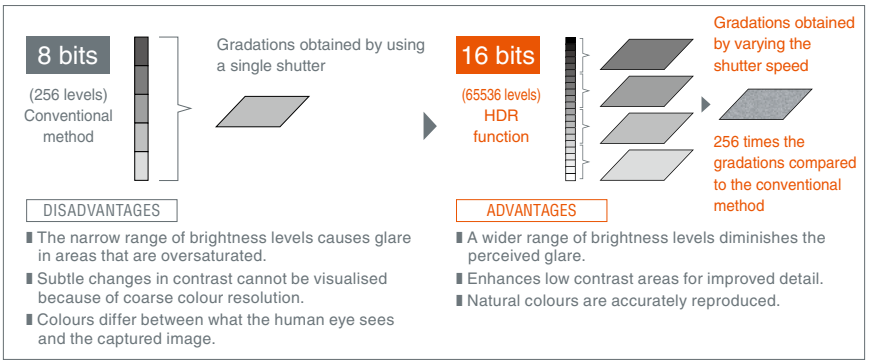
Short-wavelength filter achieves higher resolution

The optimal wavelength of light is selected based on the characteristics of the lens to capture sharp images with minimal chromatic aberration. By combining short wavelength light with KEYENCE's original pixel shift technology, image resolution can be increased by up to 25%.

Chart | High resolution observation | Normal observation

HDR+ function

The camera captures multiple images at different brightness levels by varying the shutter speed, and then produces an image with a high level of colour gradation data. This allows for clear observation of targets with glare or low contrast that would be impossible to image accurately with traditional microscopes. A new algorithm that accurately represents the colours of the target makes observation more similar to that with the naked eye.

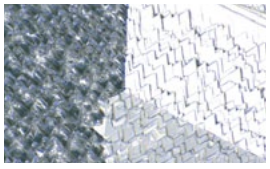
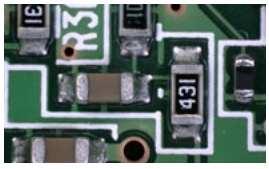
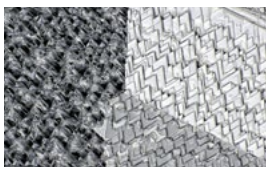
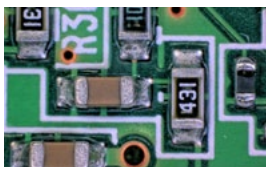


DISADVANTAGES

- The narrow range of brightness levels causes glare in areas that are oversaturated.
- Subtle changes in contrast cannot be visualised because of coarse colour resolution.
- Colours differ between what the human eye sees and the captured image.

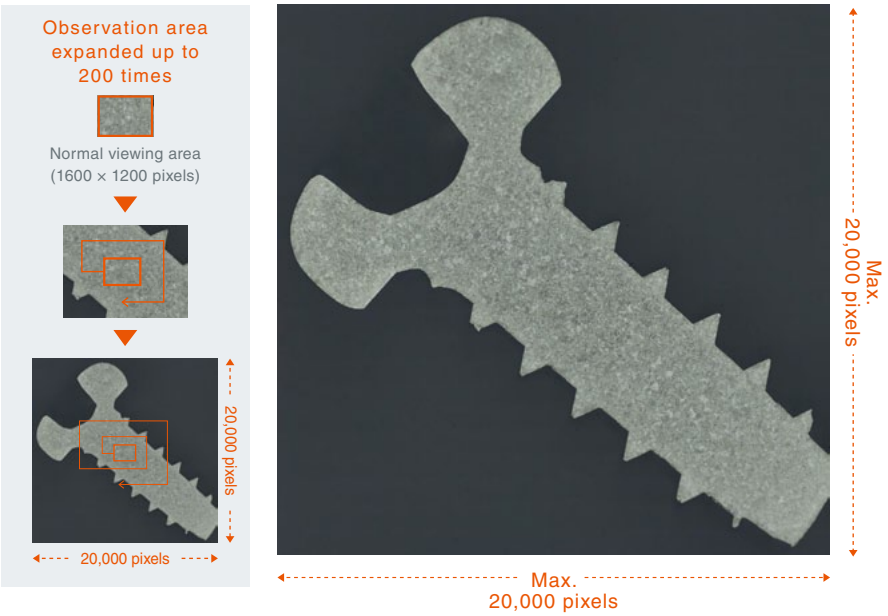
ADVANTAGES

- A wider range of brightness levels diminishes the perceived glare.
- Enhances low contrast areas for improved detail.
- Natural colours are accurately reproduced.

Contrast enhancement	Glare removal	Colour reproduction
		
Conventional [8 bits]	Conventional [8 bits]	Conventional [8 bits]
		
HDR [16 bits] Plastic cap (50x)	HDR [16 bits] Solar cell (50x)	HDR [16 bits] PC board (50x)

High-resolution, Wide Area Imaging: Ultra High-speed Image Stitching

With any optical system, as the magnification is increased the field-of-view decreases. The VHX incorporates an image stitching algorithm with a motorised XY stage to automatically move and stitch together adjacent images in real-time. This will provide users with a high-resolution (up to 20,000 x 20,000 pixels), overall view of the target, while preventing any misalignment typically associated with other stitching techniques.

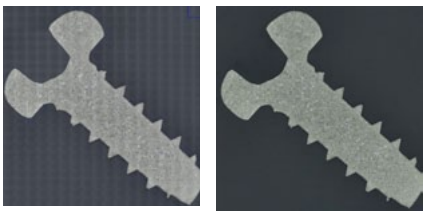


Navigation function

The stitched image can be utilised as a navigation screen. 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 yellow and the previously viewed field-of-view is outlined in red, making it easier to maneuver the stage. This function is also extremely useful for understanding which area of the target is being observed when imaging at a higher magnification.

Auto Correct function

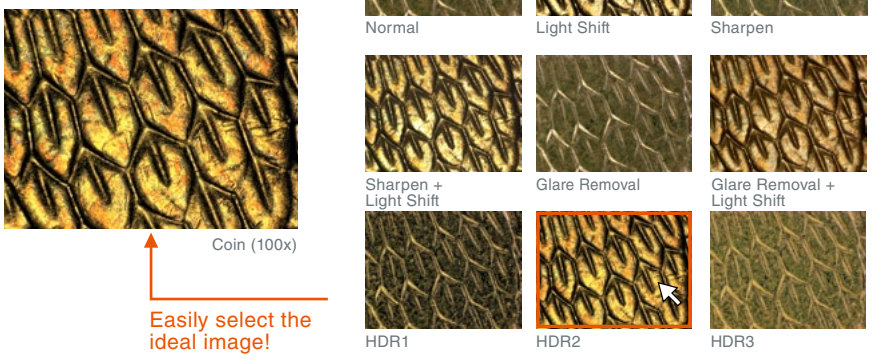
Produces a high-quality stitched image by automatically adjusting for brightness changes that can result from aberrations around the periphery of the lens.



Conventional | Auto Correct

Optimal image function

One click of the OPTIMISE button displays nine different lighting scenarios. From there, all the user needs to do is to click the image that is ideal for observation. The optimal observation conditions for any target can be found easily and repeatably.

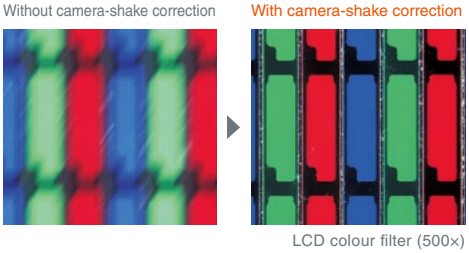


Light Shift function

Simply pushing the Light Shift button on the console instantly changes the lighting. The lighting can be switched from full illumination to partial illumination, which enhances the projections and depressions of the target.

Image stabilisation function

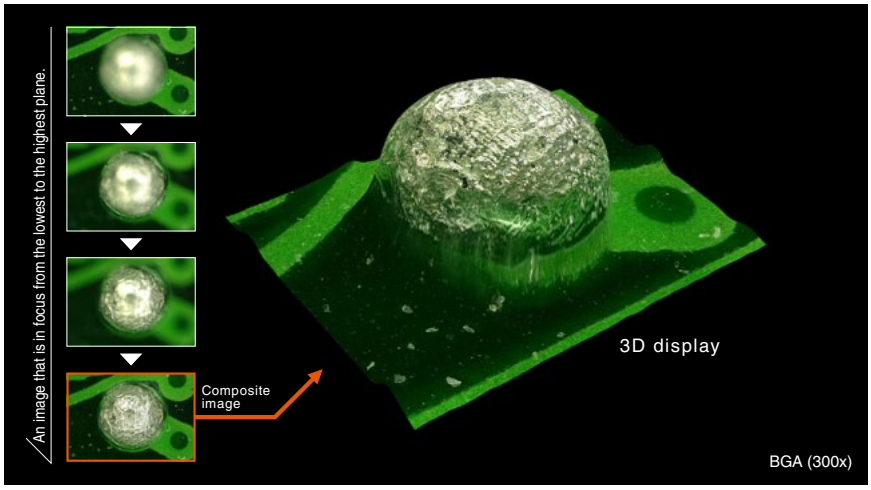
Through advanced image processing, the VHX-5000 is able to correct for position misalignments in an image at the sub-pixel level. This function makes it possible to perform high-magnification imaging without being affected by environmental vibrations.



3D Display Function

ONE TOUCH

Even when a target's surface has significant variation in height, a fully-focused image can be obtained instantly by compiling images at different focal planes. After creating the composite image, the focal position data can then be used to construct a 3D model. When the motorised stage is used, this 3D image can be displayed easily by just pushing a button on the console.

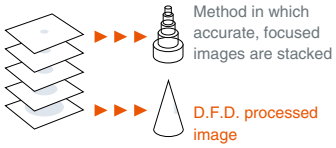


Accurate D.F.D. method

KEYENCE has developed a new algorithm that uses fine changes in texture to calculate height data. This means a 3D image can be constructed from fewer images.

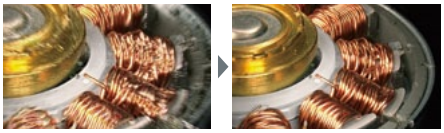
[D.F.D. (Depth from Defocus) method]

The Depth from Defocus method obtains 3D information by analysing the focus of a 2D image. Even if an image is not captured in complete focus, a calculation is made to determine height data. This allows accurate 3D image construction with fewer steps in the Z-axis.



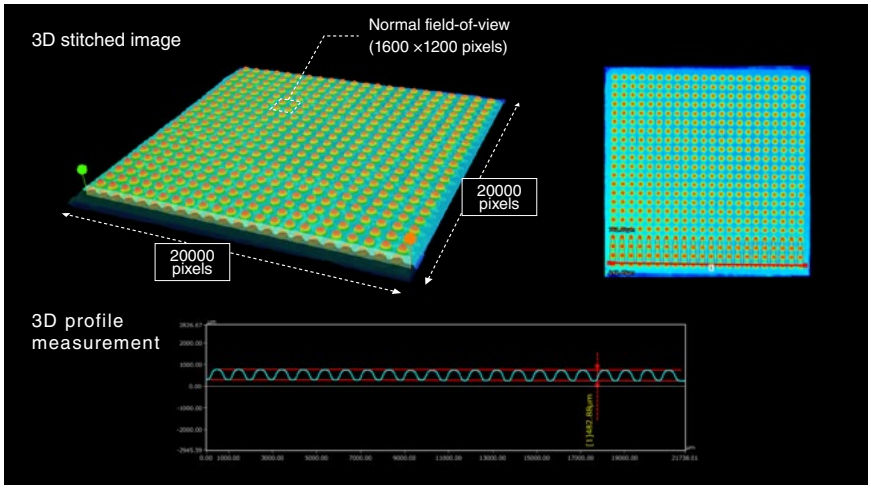
Auto Adjust function allows for depth composition even when imaging at an angle

Edge displacement and vibration caused during image capture are automatically corrected and a comprehensive, fully-focused image is constructed. The composition can use not only images captured perpendicular to the sample, but also those captured from an angle.



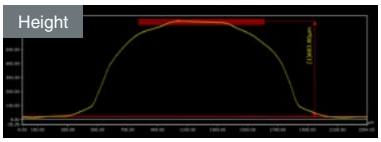
3D Image Stitching & Measurement Functions

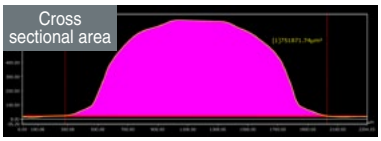
Once a 3D image has been created, data can be collected to calculate the profile, height, and volume for any area within the field-of-view. When used in conjunction with the image stitching function, a wide-field 3D image can be generated to allow users the ability to understand the topography over an entire target.

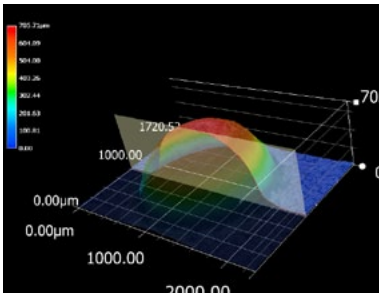


Height colour/Scale display

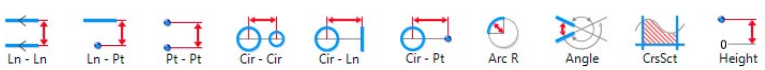
Colour bars that indicate height are displayed on a 3D image. The highest position is displayed in red and the lowest position is displayed in blue, allowing you to see height differences clearly at a glance. The height data can also be superimposed on a raw image.





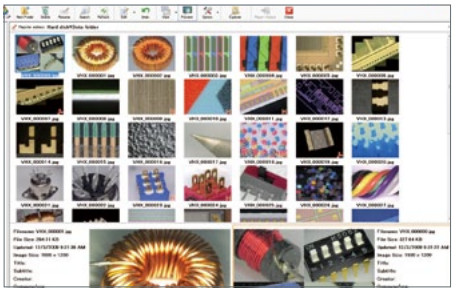


Advanced measurement tools



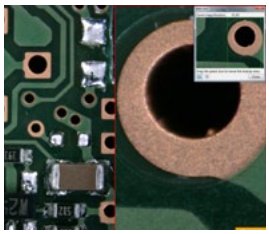
Easy Recording with Just the Press of a Button

The VHX has been equipped with a 500 GB hard disk drive, so images and video can be recorded during observation. Our original high-speed filing system ensures effortless handling of a high volume of images. File names, titles, organisation names, lenses, and comments can be registered with each image, providing for quick database searches.



Split screen/Comment entry function

The viewing area can be split horizontally, vertically, or in quadrants. This can be used to quickly perform side-by-side image comparison of good and bad parts or when viewing a low-magnification and high-magnification image. Comments and scale bars can also be inserted into the image. Measurements can be made independently in each separate window.



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

Images of different magnifications can be measured individually.

Video recording function

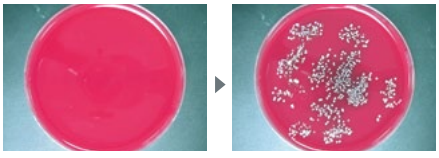
Accurately capture an object's motion by recording a video at up to 50 frames per second, with recording times of up to one hour. Users can fast forward, advance a single frame, and capture still images from the video file. Each video is saved as an AVI file that can be played on the VHX-5000 or a separate 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. Users can monitor a process over a given period of time by loading the saved images to a PC via LAN.



Bacterial growth

Observation settings are saved automatically

Parameters such as brightness level or camera settings will automatically be saved with each image. Users can apply the exact same settings when observing similar parts by simply loading the file.

Shutter Speed	Light Shift	White Balance
Gain	Edge Enhance	Light Intensity

PC mode/Anti-virus software

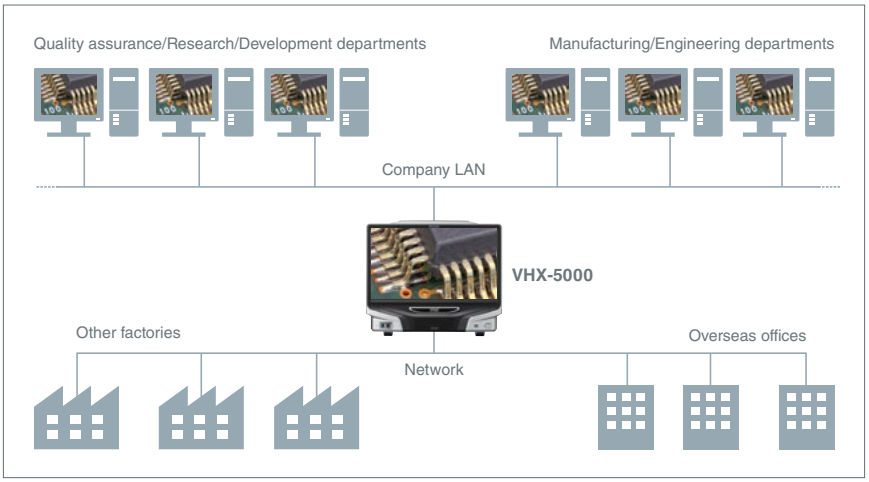
With the PC mode, various drivers for peripheral software or equipment can be installed on the microscope, including drivers for printers, Microsoft Office, and anti-virus software. This makes it possible to use the microscope in a way that best fits your operating environment.

Report function (report preparation)

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.

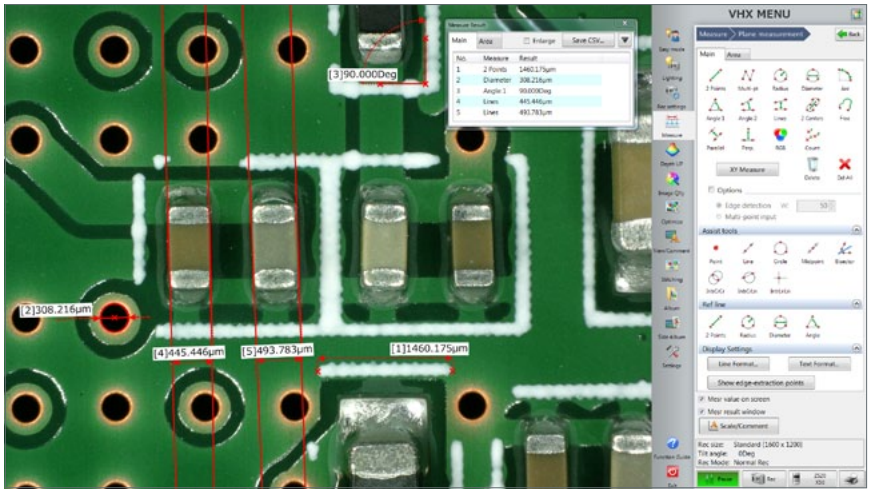
Network compatible

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



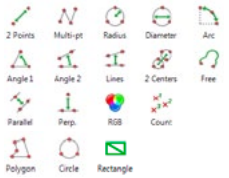
Real-time Measurement

Users can complete all measurements directly on the screen with just a few clicks of the mouse. This is significantly easier and faster than systems that require a user to capture images, import them to a PC, and then use external software to complete measurements on the sample.



Various measurement tools

With 21 measurement tools available, nearly any feature of interest can be inspected with the VHX.
Also, with the added ability to re-position a measurement point, it is easier to make quick changes to measurements to confirm accuracy.

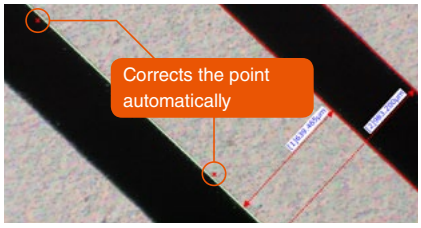


TRIPLE'R sensor automatically recognises lens/magnification

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 (no cable required), lens type, and magnification. The system will automatically adjust the stage movement speed and calibration data when the magnification is changed.

Edge detection function

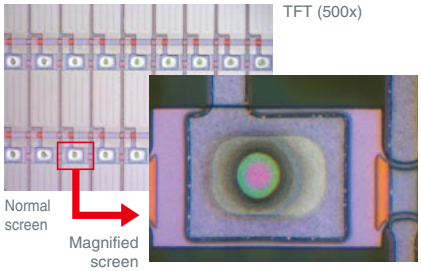
Even when the measurement point selected on the image is not perfectly on the edge of the target, this function will adjust the measurement point to the correct edge location. This reduces variation between operators and ensures high repeatability of dimensional measurements.



Print pattern (150x)

High-resolution measurements

By capturing a high-resolution image (4800 x 3600 pixels), measurements can be made on an image that is nine times larger than a standard image, increasing the accuracy and repeatability of the measurements.



FUSION OF A DIGITAL MICROSCOPE AND A MEASURING MICROSCOPE

Moving the stage allows you to measure a target of up to 100 mm x 100 mm. Measurements can even be completed over an area that exceeds the field-of-view of the lens being used, allowing you to perform both observation and measurement of a larger target with a single microscope.

X-Y measurement system VH-M100E

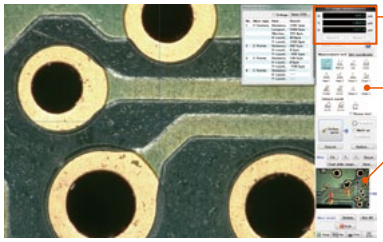
Display unit OP-84483
Digitally displays the distance traveled by the stage

Transmitted illumination unit OP-84484
Clearly projects edges of a target

Supports traceability

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

Measurement software for improved usability VHX-H2M2



Real-time screen display
The XYD measurement results are displayed on the monitor screen in real-time.

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

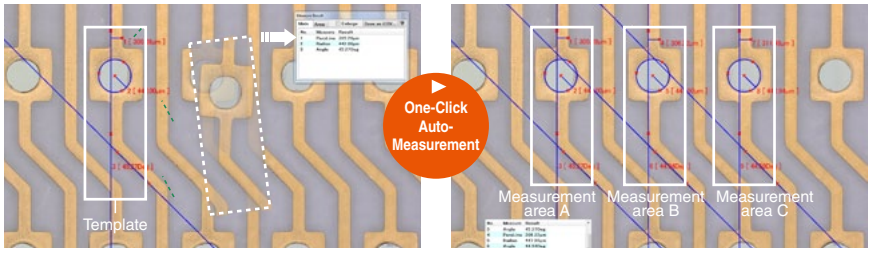
Wide image capture
Once a wide-field image captured under low magnification is registered, the current measurement point is always indicated even after the field-of-view is changed under higher magnification. The measurement point can be easily checked for an entire image.

One-click Auto-measurement

Until now, it was necessary to complete all measurements independently with the mouse. With the VHX-5000, multiple measurements are stored in a template (template data) and pattern matching technology is used to match the template to a part to enable batch measurement and data compilation.

Industry's first **Automatic Measurement**

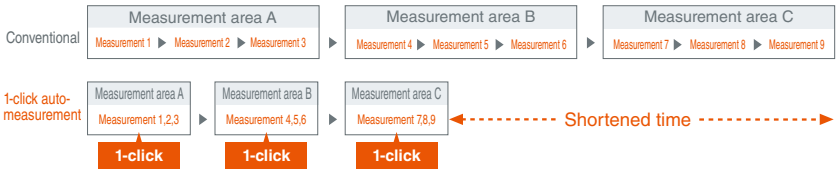
Automatic edge extraction | Save measurement templates



[Template saving]
Template searching for pattern match

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

With template saving and automatic edge extraction



Industry's first One-push calibration

ONE TOUCH

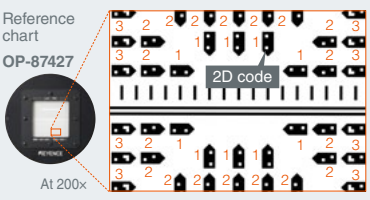
Conventionally, it was necessary to place the calibration scale in the correct position to then obtain proper focus for calibration. With the VHX-5000, anyone can easily perform proper calibration with the motorised XYZ stage.

Focus adjustment & position alignment are unnecessary

Calibration is possible just by placing the scale on the stage and pressing a button. There is absolutely no need to find the correct location and adjust the focus manually.

Reading 2D codes

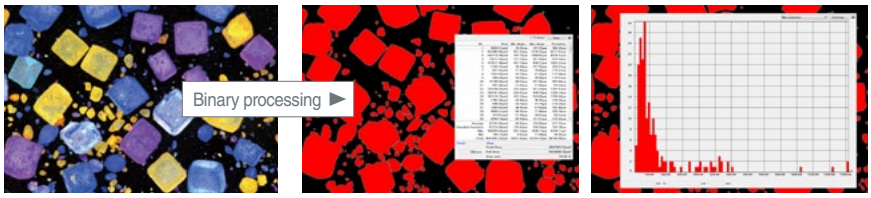
2D codes are embedded in a unique KEYENCE scale that when read, move the XY stage to the correct location based on the magnification of the lens being used. Since the code is automatically detected by the system, there are no calibration errors, making this an essential function for accurate measurements.



Automatic area measurement/count

Area Measurement | Binary conversion | Particle count

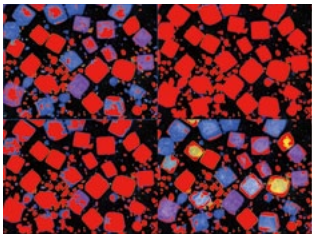
Easily extract target areas and quantify their area and other 2D parameters. Each specified location can be edited to remove unnecessary areas or separate overlapping targets.



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

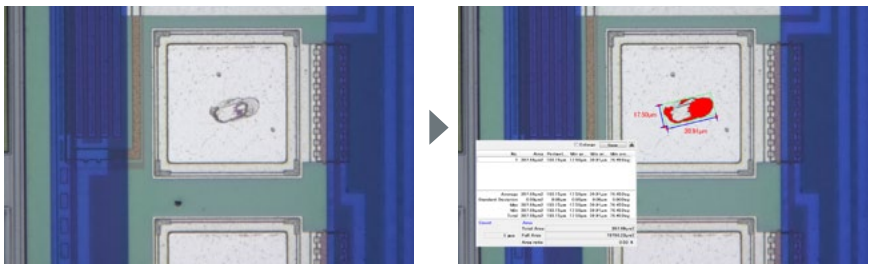
Measurement preview

Displays a preview of four binary conversion algorithms so that users can select the one that best extracts the areas that they are looking to measure. Even when measuring an object with uneven brightness, with the automatic shading correction function, it is possible to perform binary processing easily.



Maximum area measurement

Measures the largest target area within a user-specified field by simply selecting the area with the mouse. Measurements can be performed with ease even when measuring complicated shapes.



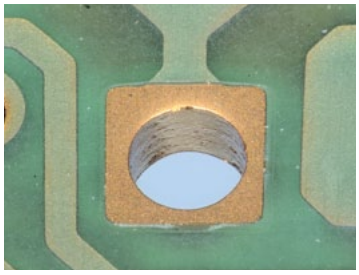
Probe dent (1000×)

Extraction condition reproduction function

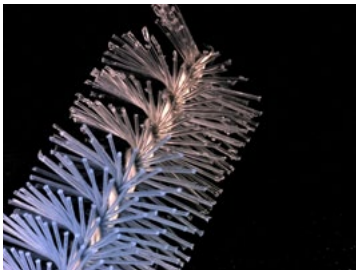
The system automatically saves the conditions that were used during extraction/ binarisation. When analysing different targets, it is possible to implement extraction with the same conditions. This also ensures that the same conditions are applied when multiple users measure the same object, eliminating user variation.

STEREOSCOPIC MICROSCOPE

Solder (100x)



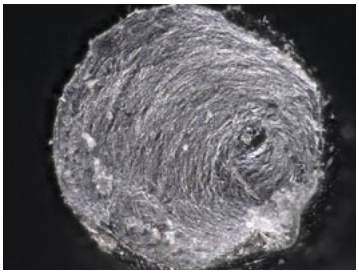
PCB through hole (100x)



Brush (50x)

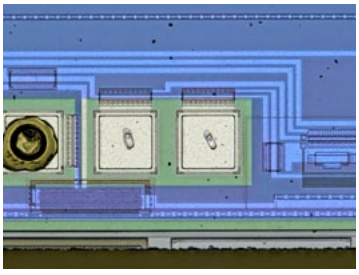
Gear (50x)

Fibre (50x)

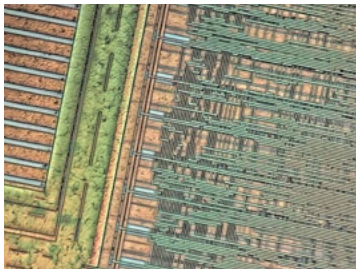


Fractured metal (200x)

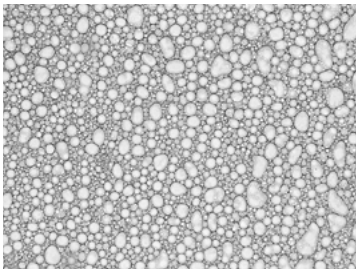
METALLURGICAL MICROSCOPE



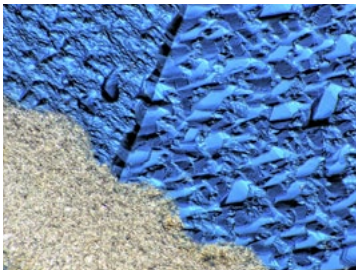
CCD (500x)



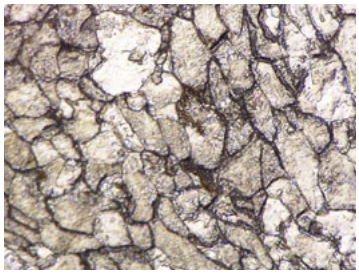
IC pattern (1500x)



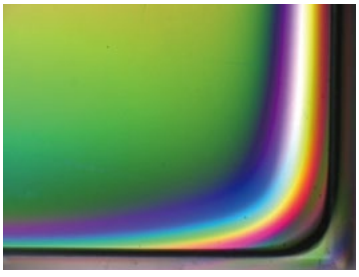
Emulsion (500x)



Solar cell (1000x)

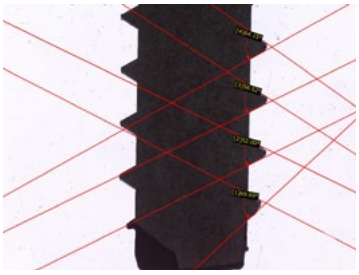


Metal structure (2000x)

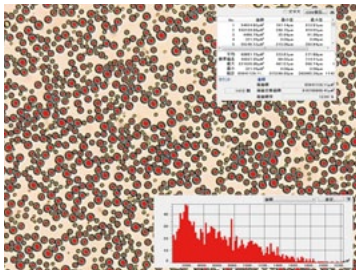


Residual stress (700x)

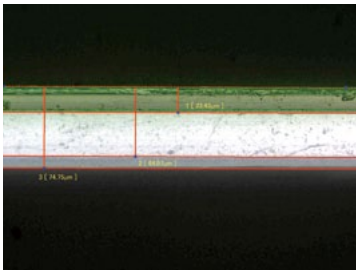
MEASURING MICROSCOPE



Screw measurement (50x)



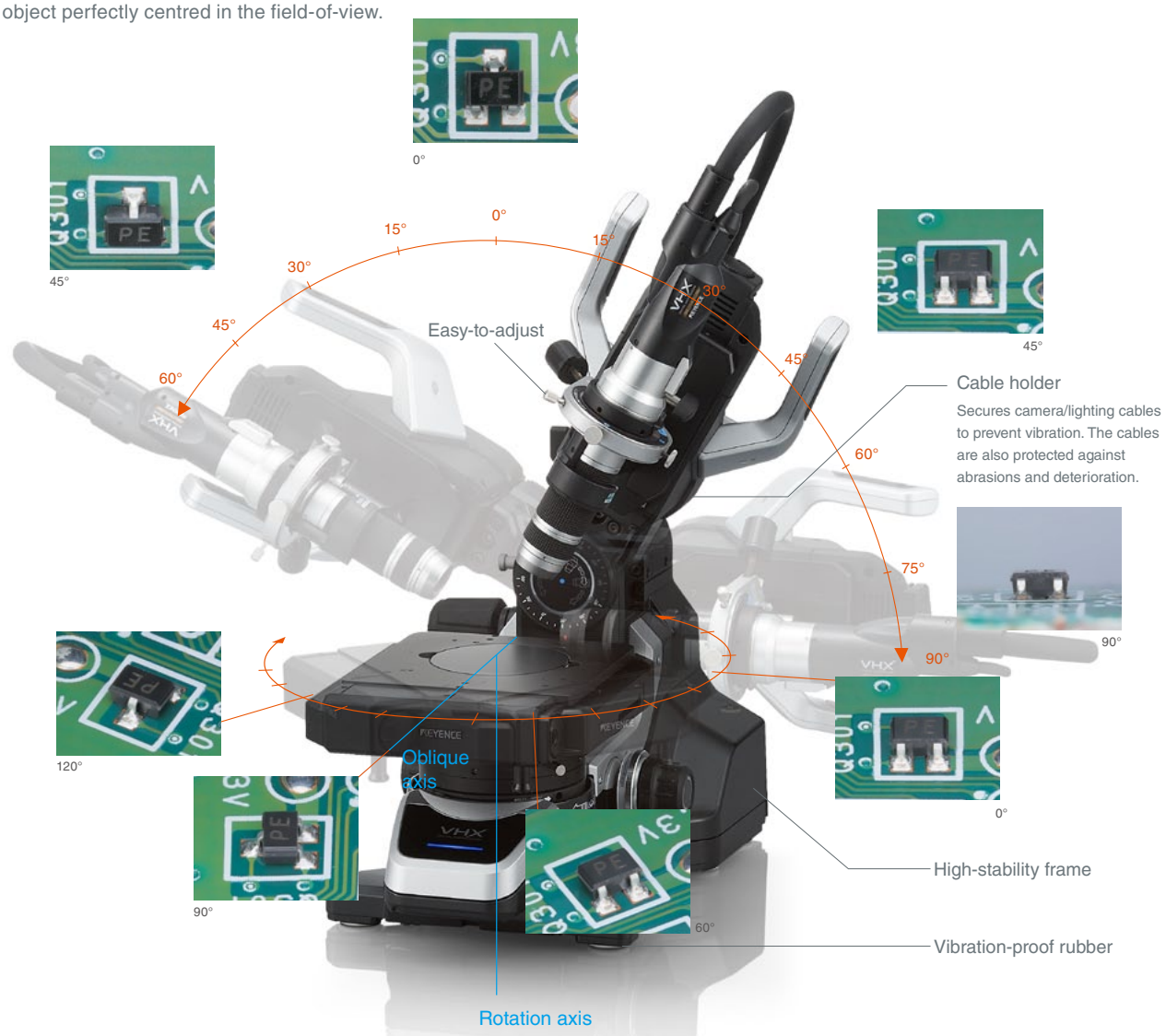
Area measurement of emulsion (1000x)



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

Free-angle observation system (XYZ motorised)

This versatile stand includes XY and Z axes controls for adjusting position and focus, and the stage can be rotated freely. A custom mechanism allows the camera and lens to be tilted around the object being viewed, while still keeping that object perfectly centred in the field-of-view.



Faster Z-axis movement

The maximum speed of the motorised Z-axis stage has increased to 17 mm/sec. This significantly improves the auto-focus and depth composition speeds.

Better viewing repeatability

A new locking mechanism has been incorporated into the stand to ensure that the lens is set to 0 degrees.

Improved seismic capacity

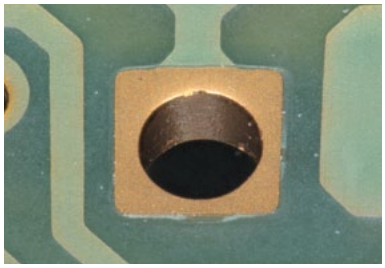
By using an aluminium die-cast frame for the stand, vibration-resistance has increased twofold over previous models.

Built-in tilt angle sensor

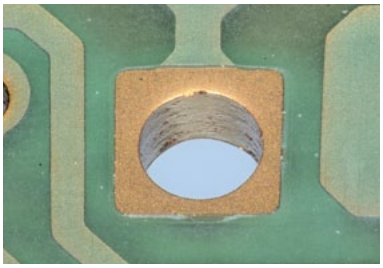
A built-in sensor detects the tilt angle of the stand. Now it is possible to display the angle on the observation screen or to save the condition during recording.

LED transmitted illumination

Transmitted lighting comes standard with the motorised XY stage, producing consistent brightness from low to high magnifications. It is also possible to use the LED transmitted lighting in conjunction with reflected illumination from the lens. The light from each source can be adjusted independently, making it possible to perform observation with an optimum balance of light intensity.



Reflected illumination

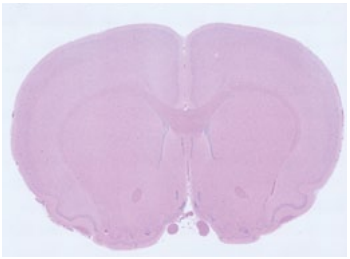


Reflected + transmitted illumination

PCB through-hole (100×)

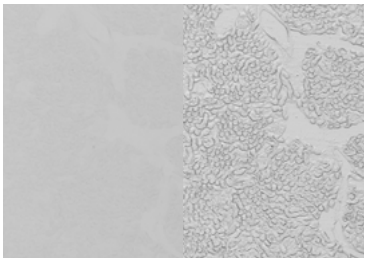
Transmitted light switching filter

When viewing a sample at low magnification, the light is applied uniformly to the entire target. As the magnification is increased, the light can be concentrated to improve the contrast of the image.



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

Diffuse illumination | Concentrated illumination

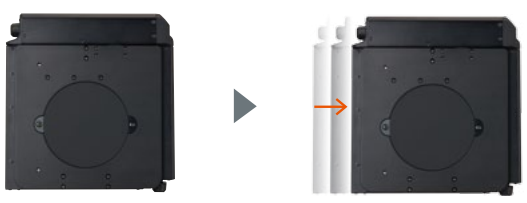


Mouse kidney section
(150x comparison image)

Rotation sensor for accurate stage movement

A sensor is built into the motorised XY stage that recognises the amount of rotation of the stage. Regardless of the angle of rotation, the stage will move in the correct direction.

Rotation angle: 0 degree



Regardless of the rotation angle

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

Ultra-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 also 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 aperture.

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 illumination adapter 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 to provide the highest resolution in its class. 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

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

A Single Lens that can Perform a Variety of Observations

RZ LENS Real Zoom Lens

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

20 ▸ 200

Optimal lighting with the touch of a button

This newly-designed 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	DIC

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. With the wide-area illumination attachment equipped.

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

100 ▸ 1000

Differential Interference Contrast (DIC) lens

Bright/dark field, polarised transmitted, 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 - typically difficult with conventional bright field lighting.

Bright-field	Dark-field
Polarisation	DIC

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 illumination adapter 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

Long-Working-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.

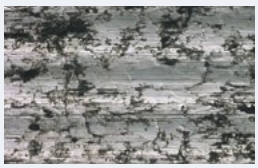
Model		VH-Z50L/Z50T					
Magnification [1]		50x	100x	200x	300x	400x	500x
Field-of-view (µm)	Horizontal	6.09	3.05	1.53	1.02	0.76	0.61
	Vertical	4.57	2.28	1.14	0.76	0.57	0.46
	Diagonal	7.62	3.81	1.90	1.27	0.95	0.76
Working distance (mm)		85					

1. Magnification on a 15-inch monitor.

Long distance lens - 85 mm working distance

With its cutting-edge 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 recessed features in the target clearly and offers ample working space for dramatically improved imaging efficiency.

Easy observation of deep, recessed features of the target



Aluminium surface (500x)

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

Frequently-used functions in an easy-to-use package

LARGE DEPTH-OF-FIELD

Achieve 20 times greater depth-of-field than a conventional optical microscope.

FREE-ANGLE OBSERVATION

Tilt the optics up to 90 degrees and rotate the stage completely for flexible operation.

OBSERVE, CAPTURE, AND MEASURE WITH JUST ONE DEVICE

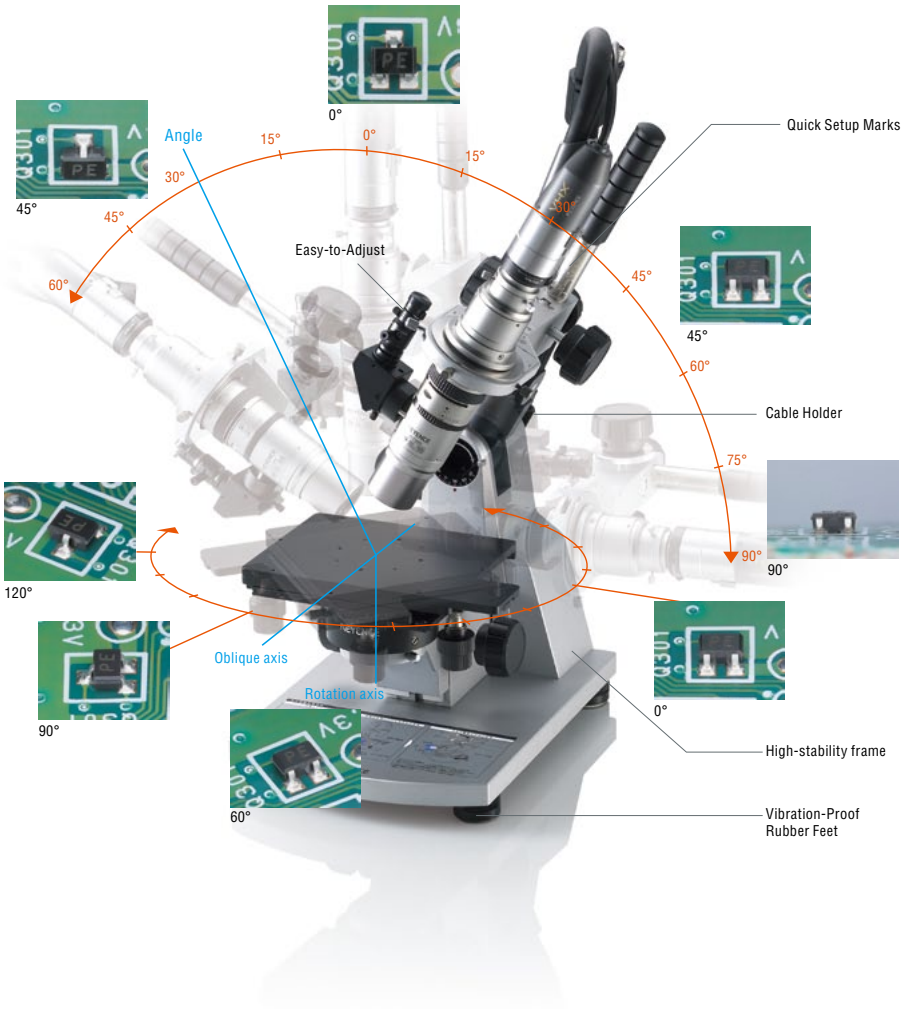
Built-in hard drive and network connectivity allows for quick and easy communication of data and pictures.

DEPTH COMPOSITION AND 3D DISPLAY FUNCTIONS

Capture fully-focused images even for targets with uneven surfaces.

Free-angle observation system
VH-S30F/S30B

Simple, versatile and intuitive operation - Motorised Free-Angle Stand



EASY-TO-ADJUST

Easy focus adjustment, X-Y stage movement, rotation and oblique axis motion. A custom mechanism allows the target to stay centred in the field of view, even when the lens unit is inclined or rotated.

QUICK SETUP MARKS

The ideal setting position for different lenses is indicated on the arm.

CABLE HOLDER

The cable is held in place to prevent vibrations and protect against abrasions and deterioration.

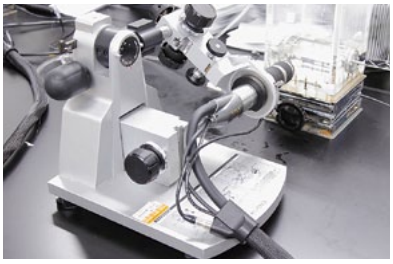
VIBRATION-PROOF RUBBER

Absorbs low to high frequency vibration, allowing for observation of specimens without interference from environmental vibration.

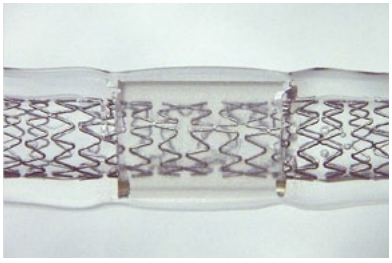
HIGH-STABILITY FRAME

The die-cast main body provides a highly rigid structure with a low centre of gravity that allows for more stable observations.

Objects that cannot fit onto the stage or that require a large working distance can still be imaged easily



Stent fatigue test setup



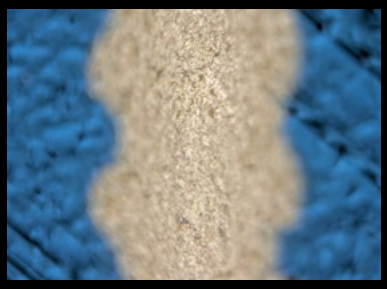
Stent (100×)

Quick depth composition & 3D display function

Objects with uneven surfaces could never be observed clearly and completely in focus at one time

Focus position: Lowest plane

Focus position: Middle plane

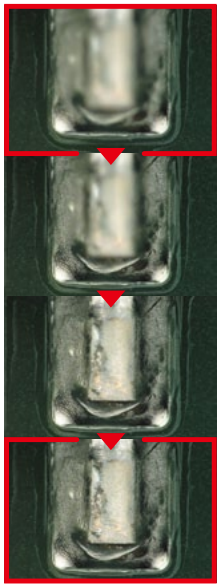


Focus position: Highest part

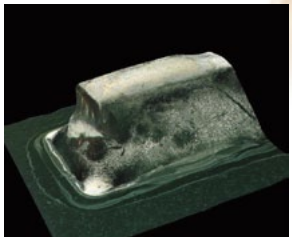
Just press
the console button.

Generate a 3D display of a sample simply by moving the lens from bottom to top

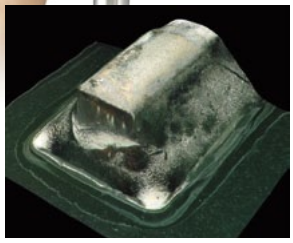
Focus first on the lowest plane and then move toward the highest plane...



"Depth composition" completed



Get a 3D display just by focusing

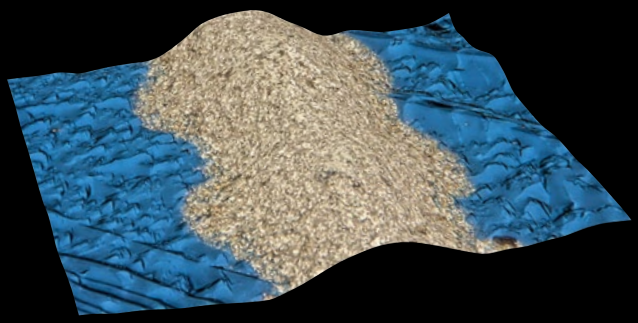


Rotate and zoom the display using a mouse

IMAGE AFTER DEPTH COMPOSITION

Observing the target completely in focus allows for quick and detailed analysis of the entire object.

3D DISPLAY



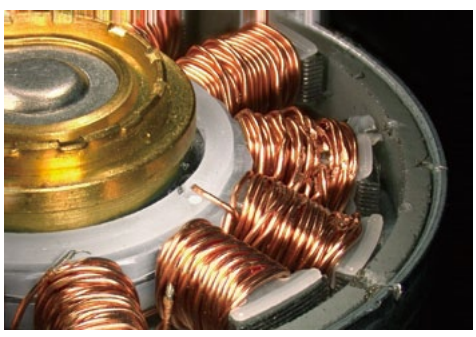
Observe detailed topographical features not visible in two dimensions.

Just press
the console button.

Auto Adjust function to prevent aberration during depth composition

Edge displacement and image blurring due to camera-shake while capturing an image with a non-telecentric lens are automatically corrected and a comprehensive, completely focused image is constructed. This method is at least five times faster and more accurate than conventional position correction methods and obtains accurate information even for easily distorted, low magnification areas.

Conventional image



Adjusted by the Auto Adjust Function

VHX Series System Line Up

RZ LENS [1]

High-resolution zoom lens
VH-Z500R/Z500T
500x to 5000x

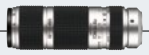
Dual-light
High-magnification
zoom lens
VH-Z250R/Z250T
250x to 2500x

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

Ultra-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

Middle-range zoom lens
VH-Z150
150x to 800x

BORESCOPE [4]

VH-BA

FIBRESCOPE [5]

Polarised
illumination adapter
OP-51649

Contact adapter
OP-81880

Polarised
illumination adapter
OP-72405 [2]

OP-72407

Coaxial polarisation adapter
OP-72406

Dark-field illumination adapter
OP-72402

Adjustable
illumination adapter
OP-72404

Wide area
illumination adapter
OP-87298 [3]

Diffuse illumination adapter
OP-87299

Ring illumination unit
for Z100/Z100U/Z20U
OP-87792

Polarisation observation set
OP-87821

Differential interference set
OP-86943

DIC prism and filter set
OP-87297

Non-reflective
illumination ring
OP-32009

Adjustable
illumination adapter
VH-K20

Super-diffuse
illumination adapter
OP-42305

Polarised illumination adapter
OP-87429

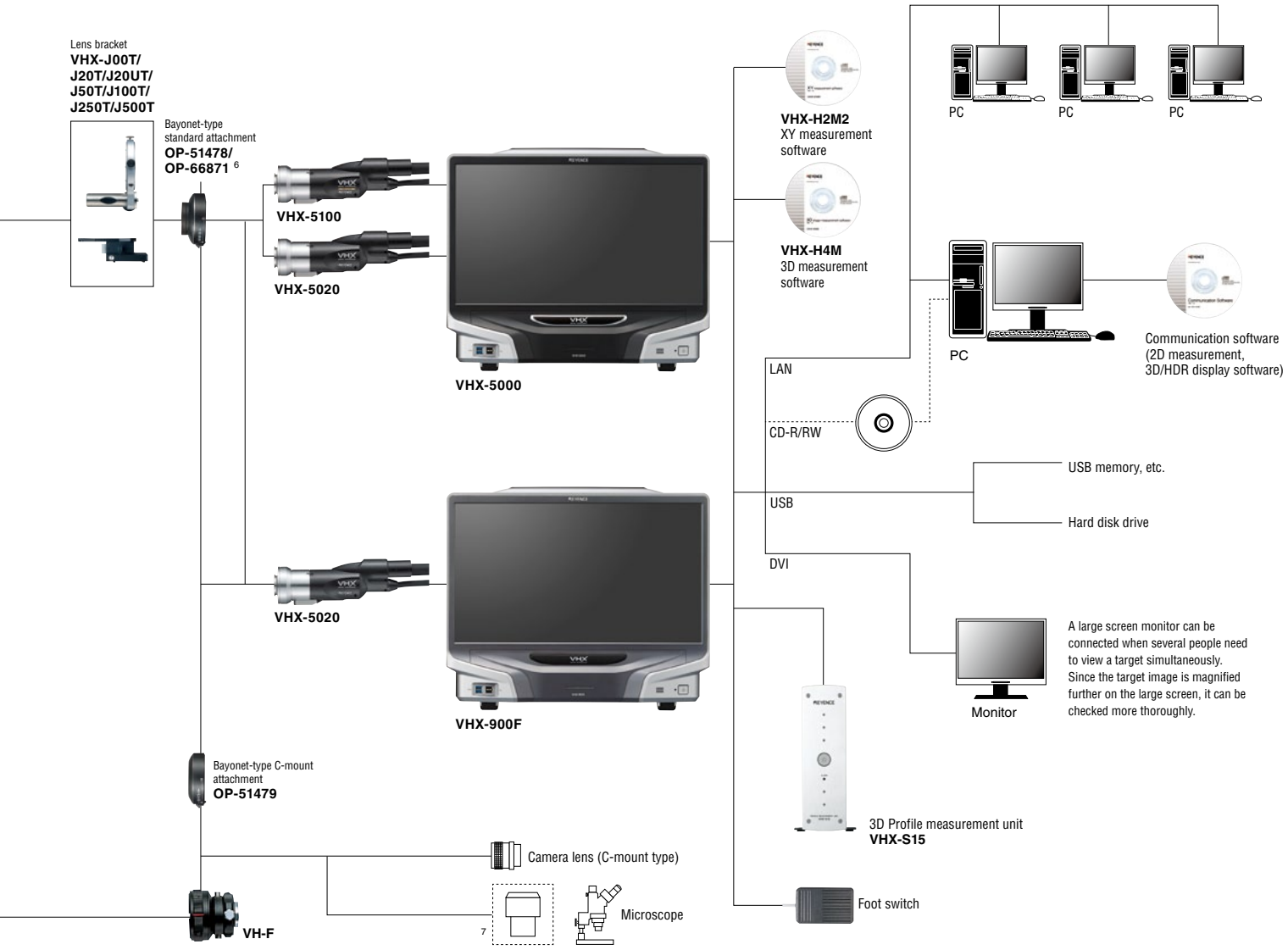
Diffuse illumination adapter
OP-35324

Non-contact diffusion
OP-35414

Multi-diffuse adapter
OP-35469

Coaxial
illumination adapter
OP-35416

Adjustable
illumination adapter
VH-K150



▮ OPTION

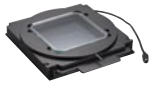
Free-angle observation system
VHX-S550E (XYZ motorised)
VHX-S500E (Z motorised)

Free-angle observation system
VH-S300 (Manual)

Free-angle observation system
VH-S30F/S30B

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 (OP-87790) is required.
6. OP-66871 is required when the VH-Z00R or Z20R is used.
7. A C-mount adapter suitable for the microscope is required.

Basic functions: Controller

Model			VHX-5000	VHX-900F
Camera	Image receiving element		1/1.8-inch, CMOS image sensor Virtual pixels: 1600 (H) x 1200 (V)	
	Scan method		Progressive	
	Frame rate		50 frames/sec. (max.)	
	Resolution	Normal	1600 (H) x 1200 (V) Approx. 1000 TV lines	
		3CMOS[1,3]	1600 (H) x 1200 (V) Approx. 1200 TV lines (2 million pixels x 3CMOS mode, Excellent colour reproducibility)	–
		High resolution[3]	3200 (H) x 2400 (V) Approx. 1600 TV lines	
		Super high resolution[3]	4800 (H) x 3600 (V) Approx. 2000 TV lines or more	
		Super high resolution x 3CMOS[2,3]	4800 (H) x 3600 (V) Approx. 2000 TV lines or more (18 million pixels x 3CMOS mode, Excellent colour reproducibility)	
	High Dynamic Range		16-bit resolution through RGB data from each pixel	–
	Gain		AUTO, MANUAL, PRESET	
	Electronic shutter		AUTO, MANUAL, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/9000, 1/19000	
	Supercharge shutter		0.02 sec. to 4 sec.	
	White balance		AUTO, MANUAL, ONE-PUSH SET, PRESET (2700K, 3200K, 5600K, 9000K)	
	Back-focus adjustment		Not required	
LCD monitor[5]	Size		Colour LCD (IPS) 23"	
	Panel size		509.184 (H) x 286.416 (V) mm	
	Pixel pitch		0.2652 mm (H) x 0.2652 mm (V)	
	Number of pixels		1920 (H) x 1080 (V) (FHD)	
	Display colour		Approx. 16,770,000 colours[4]	
	Brightness		300 cd/m^2 (Centre 1 Point, typical)	
	Contrast ratio		1000:1 (typical)	
	Viewing angle		±89° (typical, horizontal), ±89° (typical, vertical)	
CD-R/CD-RW/DVD drive unit	Unit		DVD-ROM super-multi drive unit	
	Applicable disk		CD-R/CD-RW/DVD±R/DVD±R DL/DVD±RW/DVD-RAM	
	Storage capacity		8.7 GB (when DVD±R DL is used)	
Hard disk drive unit	Storage capacity		500 GB (including 165 GB reserved 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)	
Image format			JPEG (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	
	Lamp life		40000 hours (reference)	
	Colour temperature		5700K (typical)	
Output	Video output		DVI-I (1920 x 1080 pixels)	
	Scanning frequency	Special LCD monitor	66 kHz (H), 60 Hz (V)	
		External monitor	66 kHz (H), 60 Hz (V)	
Input	Mouse input		USB mouse supported	
	Keyboard input		USB keyboard supported	
	External remote input		Pause/Recording, Non-voltage input (Contact/Noncontact)	
Interface	LAN		RJ-45 (10BASE-T/100BASE-TX/1000BASE-T)	
	USB 2.0 Series A		6 types	
	USB 3.0 Series A		2 types	
Power supply	Power supply voltage		100 to 240 VAC, 50/60 Hz	
	Power consumption		280 VA	
Environmental resistance	Ambient temperature		+5 to 40°C	
	Relative humidity		35 to 80% RH (No condensation)	
Weight	Controller		Approx. 12.5 kg	
	Camera unit		Approx. 1.10 kg (VHX-5100), Approx.1.00 kg (VHX-5020)	Approx. 1.00 kg (VHX-5020)
	Console		Approx. 0.4 kg	Approx. 0.3 kg
Dimensions (Excluding the projected areas)			550 (W) x 470 (H) x 200 (D) (when stored)	

Basic functions: Stage

		VHX-S550E	VHX-S500E	VH-S300	VH-S30F/S30B
XYθ stage	XY stage: Electric/Manual	Electric	Manual	Manual	Manual
	XY-motorised stage motor	2-phase stepping motor	–	–	–
	XY-motorised stage resolution	1 µm (typical)	–	–	–
	XY-motorised stage movement speed	10 mm/sec. (max.)	–	–	–
	XY stage moving range	±20 mm	±35 mm	±35 mm	X: ±37.5 mm, Y: ±25 mm
	θ rotation angle	±90°	360°	360°	360°
	XY*θ* 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	Top surface: 180 mm × 136 mm
	Transmitted light-compatible magnification	20x or higher	–	–	–
Z stage	Z stage: Electric/Manual	Electric	Electric	Manual	Manual
	Z-motorised stage motor	5-phase stepping motor	5-phase stepping motor	–	–
	Z-motorised stage resolution	0.1 µm (typical)	0.1 µm (typical)	–	–
	Z-motorised stage movement speed	17 mm/sec. (max.)	17 mm/sec. (max.)	–	–
	Z stage moving range	49 mm	49 mm	56 mm	28 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	12.0 kg
Load capacity		1 kg	1 kg	1 kg	1 kg

VHX-5000/900F (Software module details)

Software	Video recording software	Allows recording/playing back moving images.
	High 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.
	Time-lapse 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-900F	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+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 simulated illumination function	Provided		Provided	
	3D 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	
	Light Shift function (Height difference enhancement)	Provided (Full, partial, lateral, dark-field, bright-field, and combination illumination modes)	✓	Provided (Full, partial, lateral, dark-field, bright-field, and combination 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, and 9-part split and combination display	✓
	Video recording/playback function	50 frames/sec. max. (Image size: 1600 x 1200, 800 x 600, 640 x 480)		30 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.		Provided	
	Real-time 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.	✓	Showing a group of functions selected according to the purpose.	✓
Measuring functions	TRIPLE'R function	Provided (Automatic lens connection/lens type/magnification recognition function)		Provided (Automatic lens connection/lens type/magnification recognition function)	
	High-resolution dimensional measurement function	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)		–	
	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)	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	
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. Provides superior resolution and colour reproduction to the normal mode.
2. Provides superior colour reproduction to the high resolution mode.
3. Supported only when the multi-scan camera VHX-5100 is used.
4. Approximately 16,770,000 colours are realised with the FRC processing 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.

KEYENCE

Please visit: www.keyence.com

SAFETY INFORMATION
Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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WW1-1017

VHX5000V900F-WW-C-GB 1027-4 600H16