

Observing targets (Basic operations)

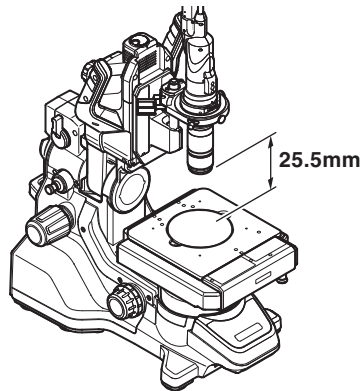
This section describes the basic steps to observe targets using the Zoom Lens VH-Z20T and the Free-angle Observation System VHX-S550E.

Adjusting white balance

Make adjustments to display color accurately.

1 Place a white object on the stage.

Rotate the zoom ring on the VH-Z20T zoom lens to the magnification that you would like to observe the target. To observe a white target, place it approximately 25.5 mm from the tip of the lens.

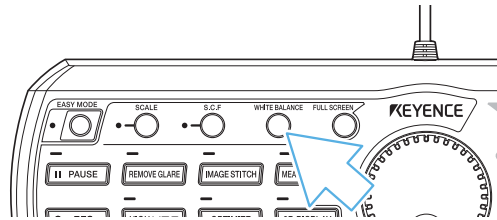


The working distance changes depending on the lens being used.

Lens name	Lens magnification	Observation distance
VH-Z00T (R/W)	0 - 50 times	95 mm
VH-Z20T (R/W)	20 - 200 times	25.5 mm
VH-Z20UT (UR/UW)	20 - 200 times	20.8 mm
VH-Z100T (R/W)	100 - 1000 times	25 mm
VH-Z100UT (UR/UW)	100 - 1000 times	25 mm
VH-Z250T (R/W)	250 - 2500 times	6.5 mm
VH-Z500T (R/W)	500 - 5000 times	4.4 mm
VH-Z50T (L/W)	50 - 500 times	85 mm
VH-ZST	20 - 2000 times	15 mm

2 Adjust white balance.

Press the WHITE BALANCE button on the console.



Adjusting the brightness and focus

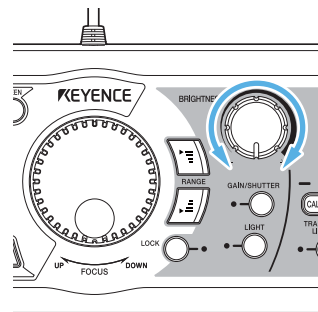
Make adjustments to display the image clearly.

1 Place the object for observation.

Place the target for observation on the XY stage.

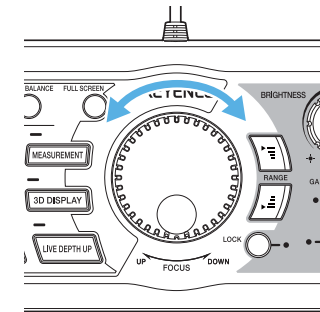
2 Adjust the brightness.

Adjust the brightness by turning the BRIGHTNESS dial on the console.



3 Adjust the focus.

Adjust the focus by turning the FOCUS dial on the console.

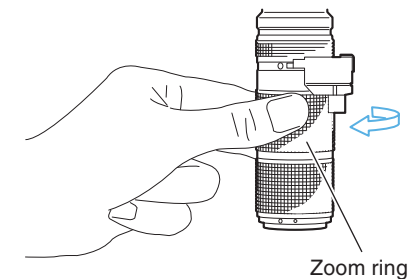


If the target does not come into focus within the range of adjustment, turn the height adjustment handle on the underside of the XY stage and adjust the focus.

It is also possible to focus on the target using the auto focus function.

4 Adjust the magnification.

Adjust the magnification by rotating the zoom ring to the left on the ultra-small high performance VH-Z20T zoom lens.



Zoom ring

Easy mode

You can easily access convenient functions for observation.

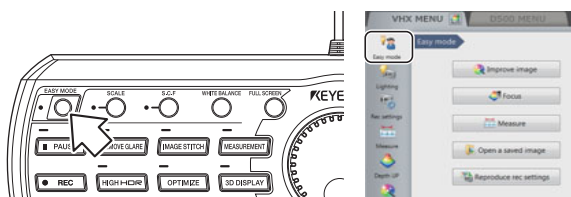
Detailed settings are done automatically, you can fully utilize convenient functions without difficult operations.

Operating procedures

Select the function to use from five types of menus.

1 Follow the screen display to launch the function.

Press the [EASY MODE] button on the console or click [Easy mode] on the VHX MENU.



2 Select the function to use from the five menus. Each function is as follows.

Available functions

Menu		Effect	
Improve image	Functions for improving images are grouped together.	Remove glare	You can remove glare of target object. Function's effect can be adjusted as "Weak/Normal/Strong".
		Increase resolution	High Resolution HDR observation allows high-resolution observation. Function's effect can be adjusted as "Weak/Normal/Strong".
		Increase contrast	HDR observation allows observation with image whose contrast has been optimized. Function's effect can be adjusted as "Weak/Normal/Strong".
		Select best image from preview	You can select the best image for observation from among nine image types displayed on the screen.
Focus	Functions adjusting focus are grouped together.	See entire viewing area in focus and obtain a 3D	Displays image, for targets with different heights, which the entire parts are in focus. Then, 3D image can be displayed.
		AUTO FOCUS	Executes auto focus to focus the image.
Measure	Functions measuring target object as plane surface and 3D are grouped together.	Plane measurement	Measures area and length of target object.
		3D measurement	Displays the 3D from depth composition image of target object and measures the profile height and volume.
Open a saved image		You can call the album and confirm images saved on the microscope.	
Reproduce rec settings		By displaying the side album and reading recording settings from images saved in the microscope, recording can be done with the same settings.	

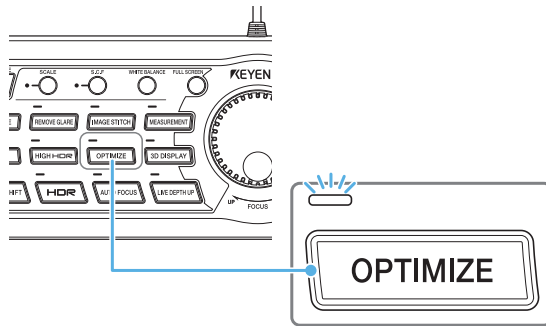
Selecting the optimal image

The Optimize function allows you to select the optimal image from nine different images employing different lighting scenarios. Even if you are using the VHX-5000 for the first time, you will be able to observe an image effectively by pressing the [OPTIMIZE] button.

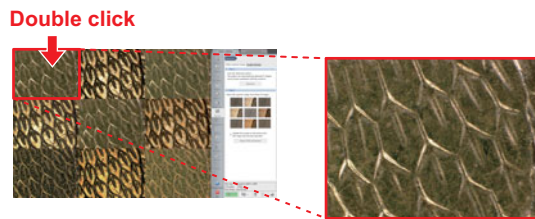
Operating procedures

Select an image mode from nine image modes.

- Adjust the brightness, magnification and focus in advance.
- Press the [OPTIMIZE] button on the console.
 - The LED light above the [OPTIMIZE] button will light up.

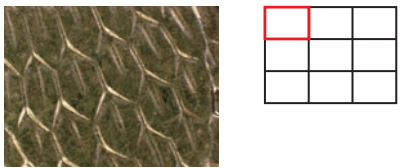
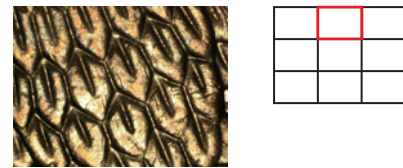
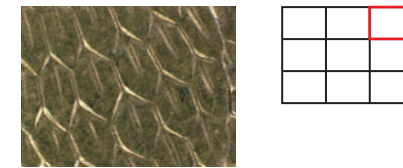
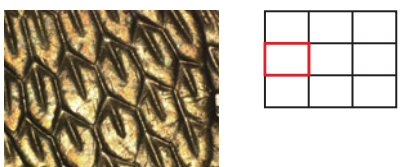

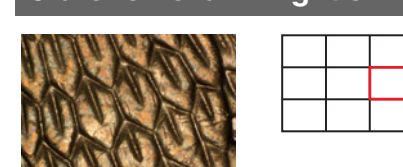
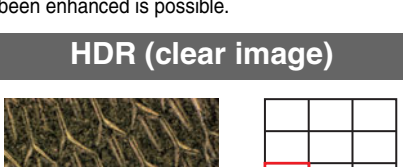
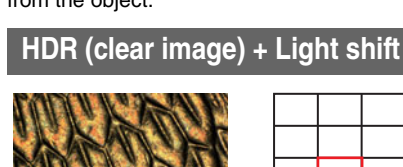



- Double click the optimal image from the nine images.
 - The selected image will be displayed in full screen and observation can begin.
 - The LED light above the [OPTIMIZE] button will turn off.



Select optimal image function

When executing the Optimize function, images are captured based on nine lighting scenarios and displayed on the screen. The following nine lighting scenarios are available:

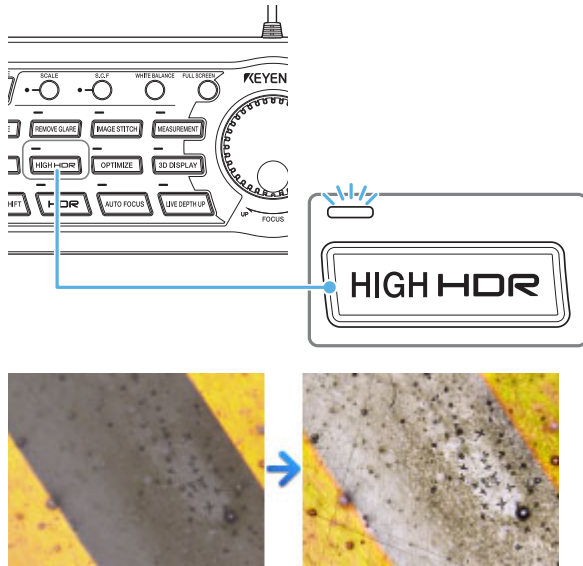
Normal mode	Normal mode + Light shift	Sharpening Image mode
		
<p>Observation with standard settings.</p>	<p>Observation with illumination from one direction. This enhances the minute irregularities of the object.</p>	<p>Observation with a vivid image whose profile has been enhanced.</p>
Sharpening Image mode + Light shift	Glare removal	Glare removal + Light shift
		
<p>Observation with illumination from one direction. Minute irregularities can be observed easily and observation on a vivid image whose profile has been enhanced is possible.</p>	<p>Removes glare caused by reflected light from the object.</p>	<p>Observation of an image whose glare caused by reflected light from the object has been removed, with illumination from one direction.</p>
HDR (clear image)	HDR (clear image) + Light shift	High Resolution HDR
		
<p>Image with the HDR function activated to emphasize the texture.</p>	<p>For observing with high dynamic range with illumination from one direction. The illumination increases the gradation levels, making it easier to observe minute height differences.</p>	<p>Observation of surface detail by using HDR observation and high resolution observation in combination.</p>

Observation in high resolution and high gradation level

Minute surface condition and color that cannot be seen under normal circumstance can be observed from short-wavelength light or image data of different brightness.

High Resolution HDR

1 Press the [HIGH HDR] button on the console.



2 Adjust each criterion by moving the slider left and right.

- Brightness : Adjusts the image brightness.
- Texture : Adjusts the image design strength and weakness levels.
- Contrast : Adjusts the image contrast strength and weakness levels.
- Color : Adjusts the image color strength and weakness levels.

Image quality UP

High Resolution HDR HDR (clear image)

It is possible to acquire high-gradation images with high resolution through pixel shift and HDR technology.

High Resolution HDR

Details

Brightness: 52

Texture: 12

Contrast: 67

Color: 52

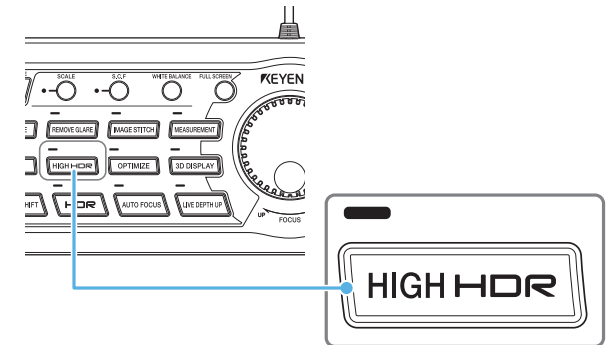
Depth Comp Default

Apply High Resolution HDR Settings

High Resolution Observation

Releasing High Resolution HDR

1 Press the [HIGH HDR] button on the console once more. The high resolution HDR function is turned off and you are returned to natural observation.



Tips

High-resolution observation and HDR observation can be used separately.

Image quality UP

High Resolution HDR HDR (clear image)

This will display a high-gradation clear image from multiple images of differing brightness.

High Resolution HDR

Details

Brightness: 53

Texture: 12

Contrast: 59

Color: 52

Depth Comp Default

Apply High Resolution HDR Settings

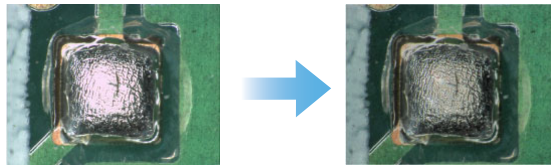
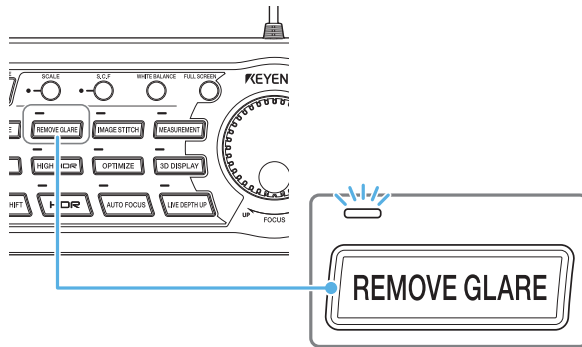
High Resolution Observation

Glare Removal

The Glare removal function removes glare from highly-reflective objects.

Setting the Remove Glare function

- 1 Press the **REMOVE GLARE** button on the console. The LED above the REMOVE GLARE button will light up. The glare caused by the reflected light from the image will be removed.

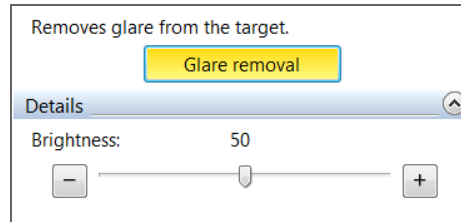


Tips

You can do the same operation by clicking [Image Qlty] on the VHX MENU, selecting [HDR (clear image)] and clicking [Glare removal].

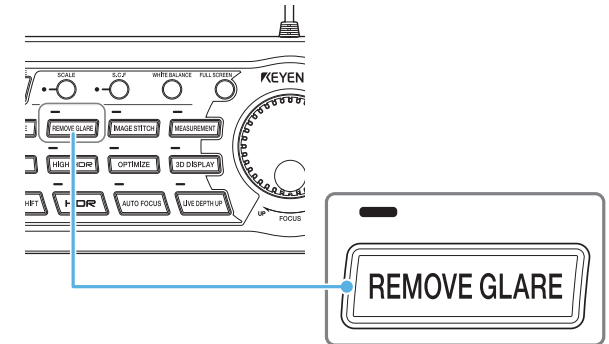
- 2 Make subtle adjustments for optimal brightness by moving the slider left and right.

If you press the [3D DISPLAY] button, you can use the Quick composition and 3D function with the Remove Glare function.



Turning the Remove Glare function off

- 1 To turn the Remove Glare function off, press the **REMOVE GLARE** button once more.



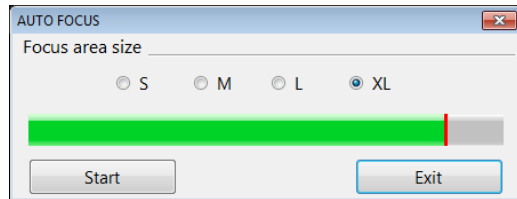
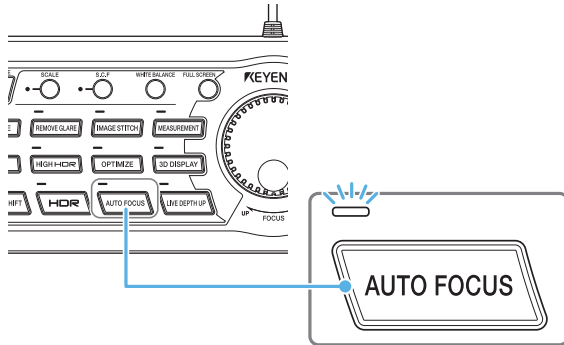
Tips

You can do the same operation by clicking [Glare removal] on the VHX MENU to clear the selected state (yellow).

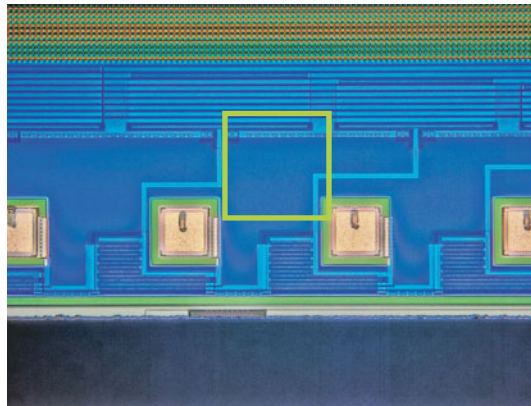
Using the auto focus function

The Auto Focus function allows for quick focus on the area of the target you want to observe.

- 1 Press the AUTO FOCUS button on the console.**
The LED above the AUTO FOCUS button will light up and the [AUTO FOCUS] dialog box will be displayed.

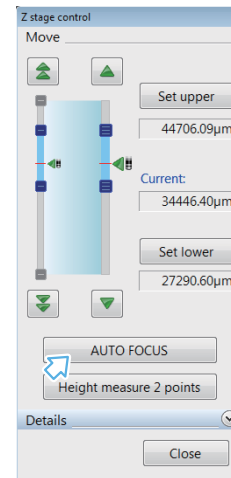
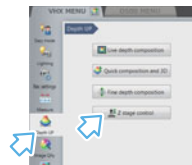


The green square showing the focus area on the screen is displayed and the focus is automatically adjusted.

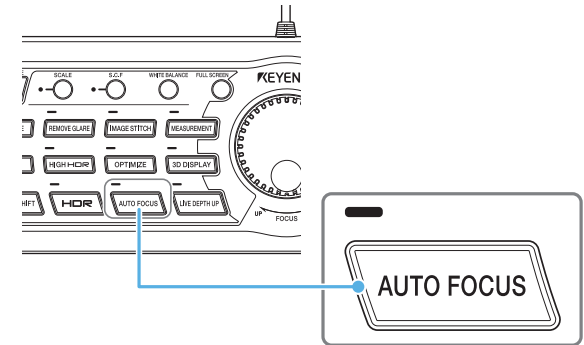


Tips

The same operation can also be performed by clicking [AUTO FOCUS] after selecting [Z stage control] from the [Depth Up] on the VHX MENU.



- 2 To close the [AUTO FOCUS] dialog box, click the AUTO FOCUS button on the console again.**



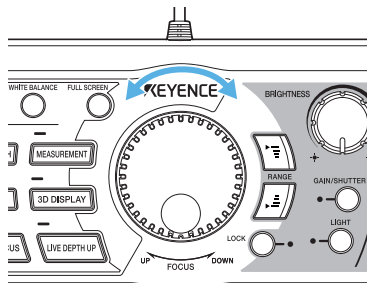
Tips

You can do the same operation by clicking the [Exit] button on the [AUTO FOCUS] dialog box.

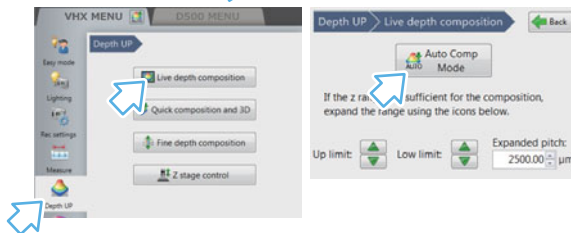
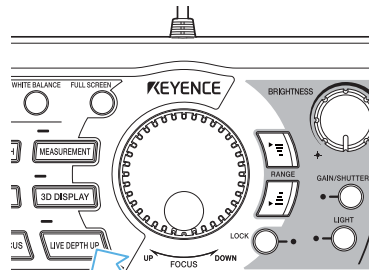
Live depth composition

The live depth composition is a function executing quick depth composition and displaying 3D images.

- 1 Adjust the focus to the lowest part of the object using the FOCUS dial on the console.

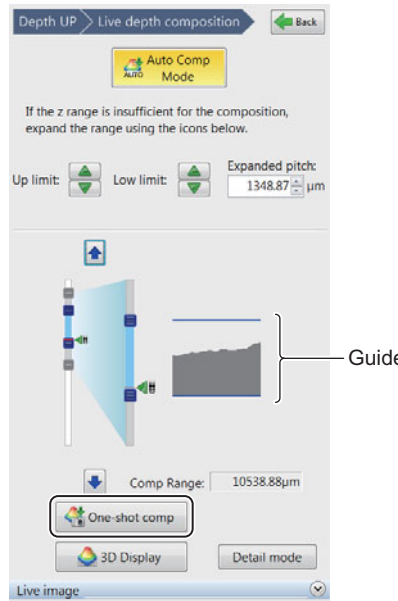


- 2 Press the [LIVE DEPTH UP] button on the console, or click [Depth UP] on the VHX MENU followed by [Live depth composition] - [Auto Comp mode].



The Z axis stage moves and the depth composition image appears on the observation window.

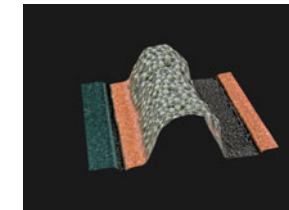
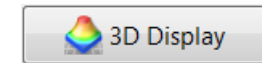
- 3 If the composition height is not enough, adjust the area upper/lower limits, extended pitch and composition area, and click [One-shot comp].



Tips

- When the depth composition completes, the guide indicating the object silhouette appears on the right side of lens' moving range. If the upper limit laps over the silhouette, you may broaden the composition range by moving lens slider.
- If the auto composition mode is ON, depth composition will be executed automatically when you move the XY stage. To cancel the auto composition mode, click the [Auto Comp mode] button again.

- 4 When clicking 3D Display, the 3D can be displayed.

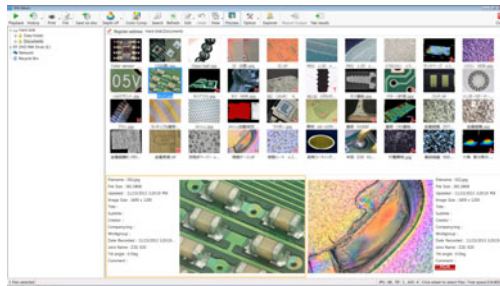


Display operations for 3D images

Using the mouse wheel button, the 3D image can be rotated, enlarged, reduced and moved.

1 Select [Album] on the VHX MENU.

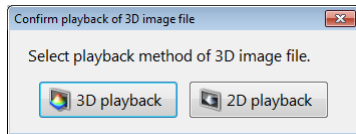
The album screen will be displayed.



2 Select any 3D image from the images saved in the album and click [Playback].

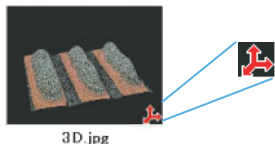
The [Confirm playback of 3D image file] dialog box will be displayed.

Click [3D playback].

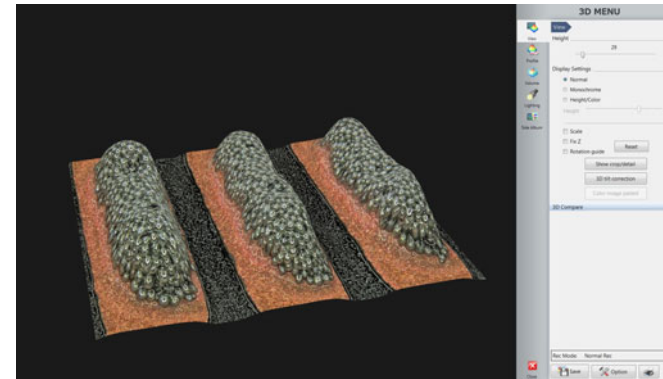


Reference

- For 3D images, a 3D mark is displayed in the thumbnail display. The 3D mark is also displayed in the preview information window.



- When [2D playback] is selected, the frontal view of the captured image is displayed. Also, images saved in 3D that are rotated, enlarged, or reduced can be opened in the same state that they were saved in.

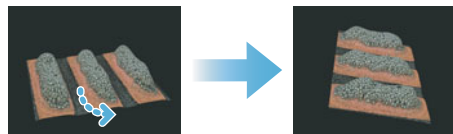


Rotation

To rotate the image, hold down the left mouse button and drag the image in the desired direction of rotation.

If you release the button while dragging, the object will rotate continuously.

- To stop the continuous rotation, click the left mouse button.

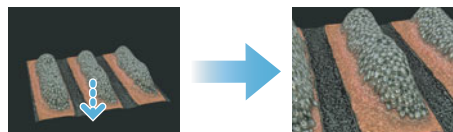


Zoom in

While holding down the mouse wheel button, drag the image in a downward direction.

If you release the button while dragging, the object will continue to enlarge.

- To stop the continuous expansion, click the left mouse button.

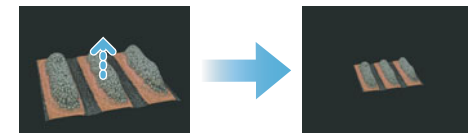


Zoom out

While holding down the mouse wheel button, drag the image in an upward direction.

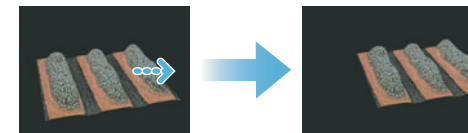
If you release the button while dragging, the object will continue to reduce.

- To stop the continuous reduction in size, click the left mouse button.



Movement

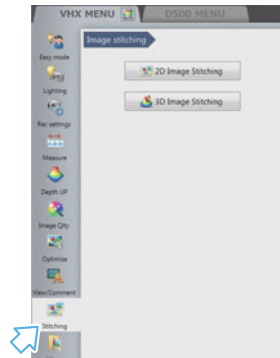
To move the image, hold down the right mouse button and drag the image in the desired direction of movement.



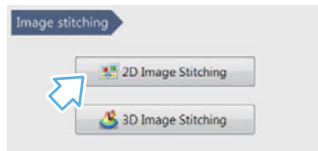
Stitching 2D images

Stitching images taken by moving the target in the XY directions allows you to observe the object in a wide field-of-view up to 20,000 x 20,000 pixels.

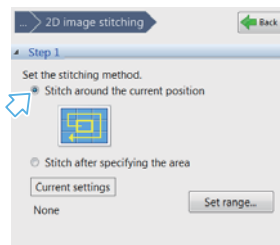
- 1** Click [Stitching] on the VHX MENU.
The [Image stitching] menu will be displayed.



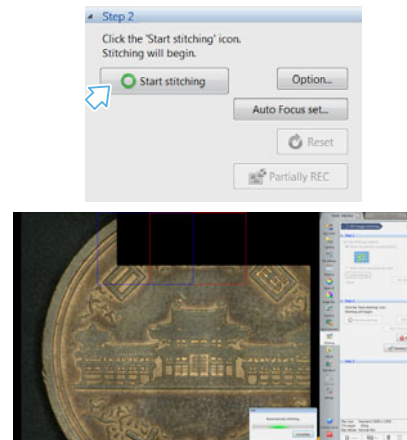
- 2** Click [2D Image Stitching].
The [2D image stitching] menu will be displayed.



- 3** Set the image stitching method. Here, select [Stitch around the current position].



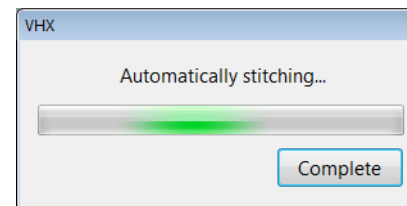
- 4** Click [Start stitching].
The XYθ stage starts moving. The images are captured one by one and stitched together.



Tips

Using [Auto Focus set], the auto focus processing can be automatically performed and the image stitching by depth composition image can be executed.

- 5** To finish the stitching on the way, click [Complete] on the Automatically stitching dialog box.



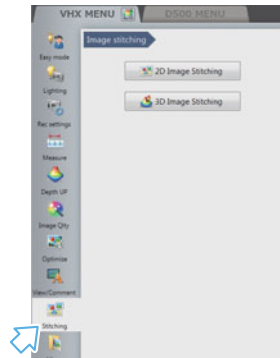
- 6** Click [Complete (Show stitched image)].
The stitched image appears.



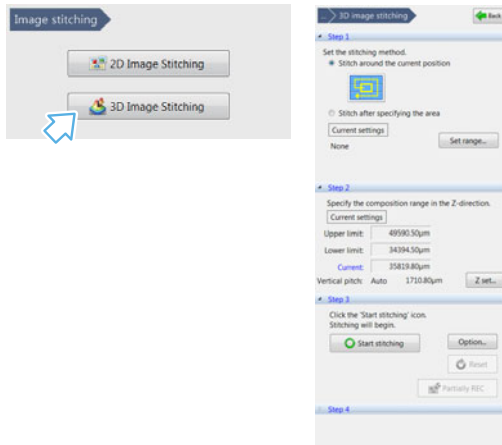
Stitching 3D images

Stitching images captured in 3D allows you to observe the object in 3D over a wider field-of-view.

- 1 Click [Stitching] on the VHX MENU.
The [Image stitching] menu will be displayed.

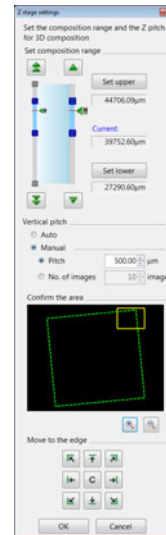


- 2 Click [3D Image Stitching].
The [3D image stitching] menu will be displayed.

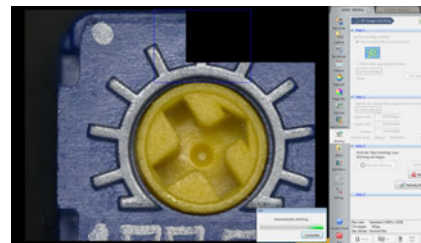


- 3 Set the image stitching method. Here, select [Stitch around the current position].

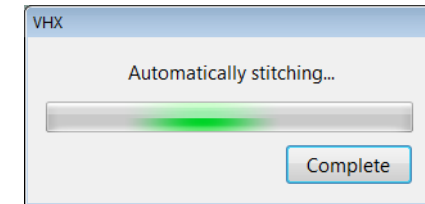
- 4 Click [Z set...] for the movement range of Z stage.
[Z stage settings] appears. After setting the Z-axis stage movement area and movement pitch, click [OK].



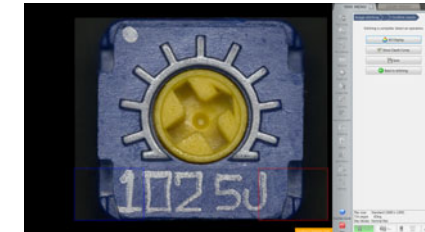
- 5 After clicking [Start stitching], the depth composition begins.
The XYθ stage starts moving. The images are captured one by one and stitched together.



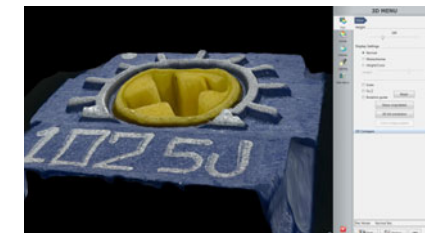
- 6 To finish the stitching, click [Complete] on the Automatically stitching dialog box.



- 7 Click [3D Display] or [Show Depth Comp].



- 8 The composite screen will be displayed.

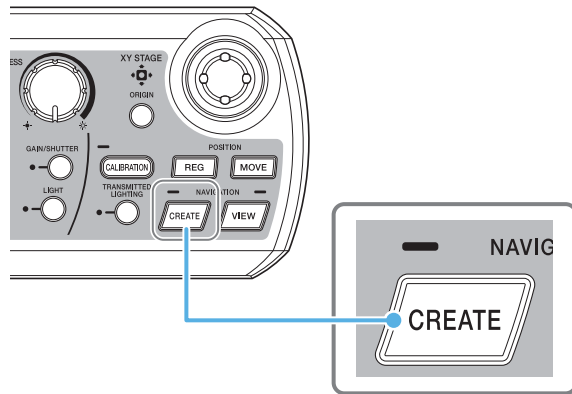


Observation Position Navigation (1)

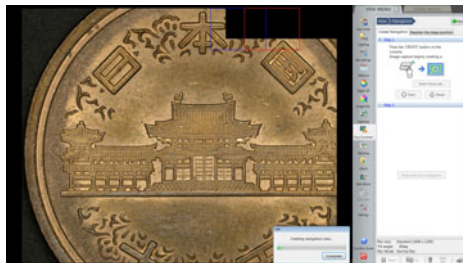
You can perform observation of a selected position while viewing a large field-of-view by using stitched images.

Creating Navigation

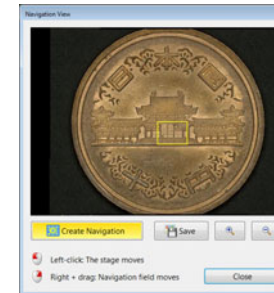
- 1 Press the CREATE navigation button on the console.**
The navigation menu is displayed.



- 2 Press the CREATE navigation button on the console once again.**
The XY stage moves with the current position at its center and creates a stitched image.



- 3 Once stitching the observation region is complete, press the CREATE navigation button on the console again.**
The image acquisition finishes and the navigation image is displayed.

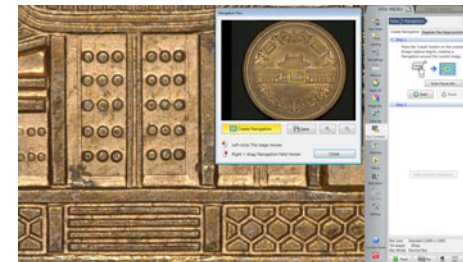


Tips

The navigation image is automatically displayed under the following conditions.

- If the entire movable region of the stage is stitched
- If the stitched image reaches 20,000 x 20,000 pixels

- 4 Click the position you want to observe on the navigation image.**
The XY stages moves to the specified position as indicated by the red frame.



Tips

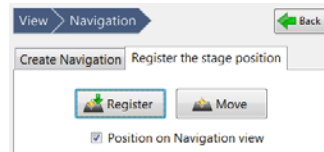
You can move the field-of-view of the navigation image by dragging using the right mouse button.

Observation Position Navigation (2)

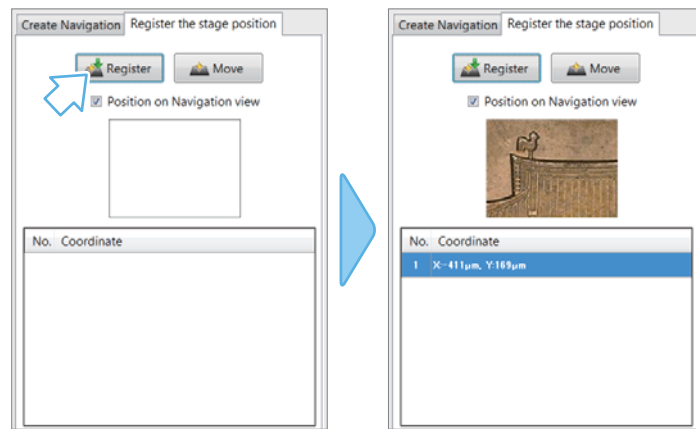
You can register any arbitrary XY coordinates and then move to that location again.

Registering a Position

- 1 Select the [Register the stage position] tab and click [Register].
The stage position menu is displayed.



- 2 Click [Register] at the location where you want to register the stage position.
The image, number, and XY coordinates are registered.



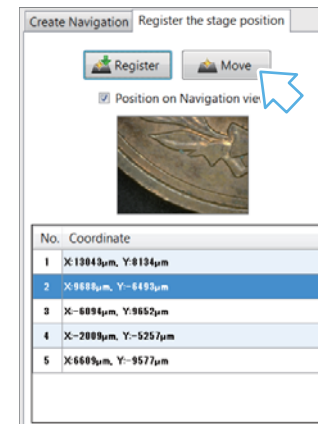
You can also register the position by pressing the REG navigation button on the console.

Tips

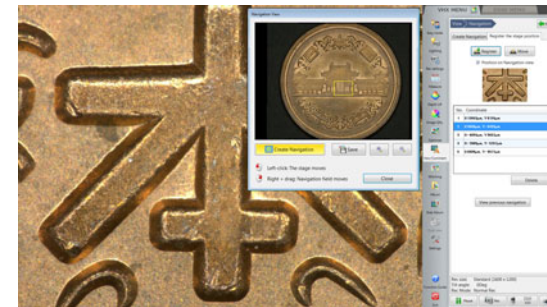
You can register multiple positions one after another (the number gets smaller for more newly registered positions).

The maximum number that can be registered is 10.

- 3 Select the position that you want to move to from the registered list in the menu and then click [Move].



The XY stage moves to the specified registered position.



Tips

Pressing the MOVE navigation button on the console moves in order from the smallest to largest number.

XY Stage Measurement (1)

By moving the target under observation in the XY directions, measurements can be carried out across a wide (100 x 100 mm) area.



* For the XY stage measurement, the XY Measurement System VH-M100E and XY Measurement Software VHX-H2M2 options are required.



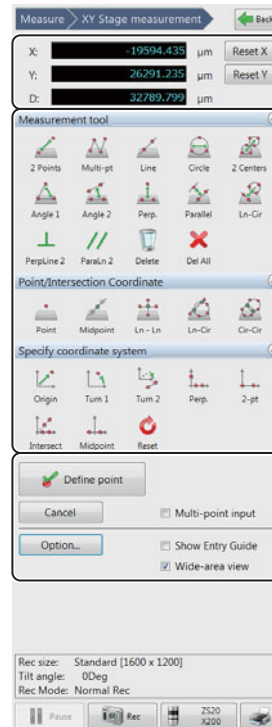
XY Measurement System
VH-M100E



XY Measurement Software
VHX-H2M2

XY Stage Measurement Menu

After installing the XY Measurement Software VHX-H2M2 onto the VHX-5000, connect the XY Measurement System VH-M100E to the VHX-5000. By clicking [XY stage measurement] under [Measure] on the VHX MENU, the [XY stage measurement menu] will be displayed.



Coordinate display area

The coordinates and distance of the intersection point in the middle of the screen are displayed in relation to the set origin point.

Tool area

The measurement tools, intersection coordinate, and coordinate system setting menus are displayed. Select the items applicable to your application.

Settings area

Input and set the measurement point, display color, measurement unit value and decimal point placement etc.

Coordinate System Setting and Measurement Tool

Outline of coordinate system setting

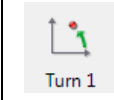
Set the XY axis based on the image of the target. Even if the camera and target are tilted, the correct XY coordinates can be set by correcting the tilt on the XY plane. Before carrying out measurements with the measurement tools, select the tools applicable to the shape and measurement points of the target from the options below and set the origin point and XY axis.



Origin

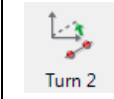
Move the origin.

By fixing the origin in the desired area, the XY coordinates move in parallel.



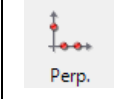
Turn 1

Rotate the XY coordinates with the origin fixed. By selecting one point, the line passing between the origin and the selected point is set as the X axis.



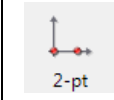
Turn 2

Rotate the XY coordinates around the origin at its center, making the X axis parallel to the line passing through the two selected points.



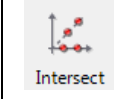
Perp.

By selecting two points for the X axis and a third point for the Y axis, the XY axis are determined.



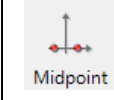
2-pt

By selecting the origin and a point on the X axis, the XY axis are determined.



Intersect

By selecting two points for the X axis, the Y axis is determined on the middle point.



Midpoint

By selecting two points on the X coordinate and two points on a line passing through the origin, the Y axis is determined.

XY Stage Measurement (2)

By moving the target under observation in the XY directions, measurements can be carried out across a wide (100 x 100 mm) area.

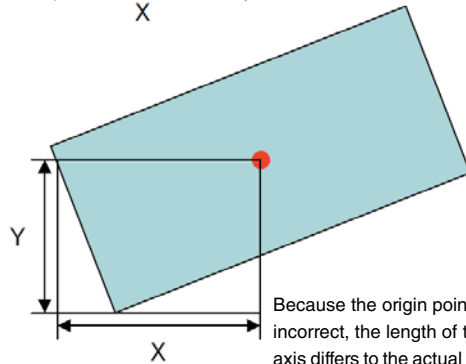
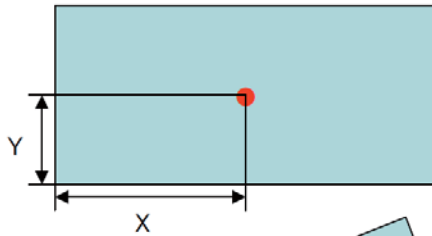


Important

Measurements requiring coordinate system setting

The coordinate system setting are required for measurements carried out based on the relationship of the origin point, X axis and Y axis. Some measurement tools do not require the coordinate system setting (if the origin point, X axis and Y axis are not related to the measurement values).

Example: As shown in the illustrations below, when measuring the selected point ● on the target from the origin in the XY axis directions, an accurate value cannot be calculated unless the XY axis are set. The coordinates should be set corresponding to the tilt of the target.



Outline of Measurement Tools

Select the tools applicable to the measurement before carrying out dimension measurements. The red items in the measurement criteria below require the coordinate system setting. An accurate measurement can not be carried out unless the origin, X and Y axis are set.

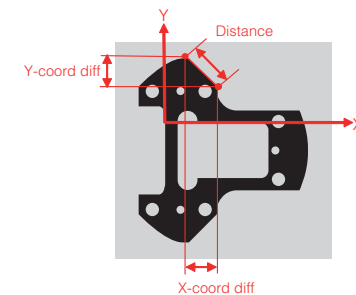
Measurement Tools	Measurement Criteria					
2 Points	Distance	X-coord diff	Y-coord diff			
Multi-pt	Distance	X-coord diff	Y-coord diff	Angle	Cumulative distance	Cumulative angle
Line	Angle	Degree of straightness				
Circle	X-coord	Y-coord	Distance	Radius	Diameter	Degree of circularity
2 Centers	Distance	Longest distance	Shortest distance	X-coord diff	Y-coord diff	
Angle 1	Angle					
Angle 2	Angle					
Perp.	Distance					
Perp.	Distance					
Ln-Cir	Distance	Longest distance	Shortest distance			
PerpLine 2	Angle	Length				
ParaLn 2	Angle	Length				

Measurement Tools	Measurement Criteria					
Point	X-coord	Y-coord	Distance			
Midpoint	X-coord	Y-coord	Distance			
Ln - Ln	X-coord	Y-coord	Distance			
Ln-Cir	X1-coord	Y1-coord	Distance1	X2-coord	Y2-coord	Distance2
Cir-Cir	X1-coord	Y1-coord	Distance1	X2-coord	Y2-coord	Distance2

Example: The specific measurement details for the [2 Points] measurement tool are shown in the picture below. The distance from the first to the second selected point, and the differences in the X and Y coordinates for the two points (coordinate system setting required) are measured.

Criteria measured using [2 Points]

- Distance
- X-coord diff
- Y-coord diff



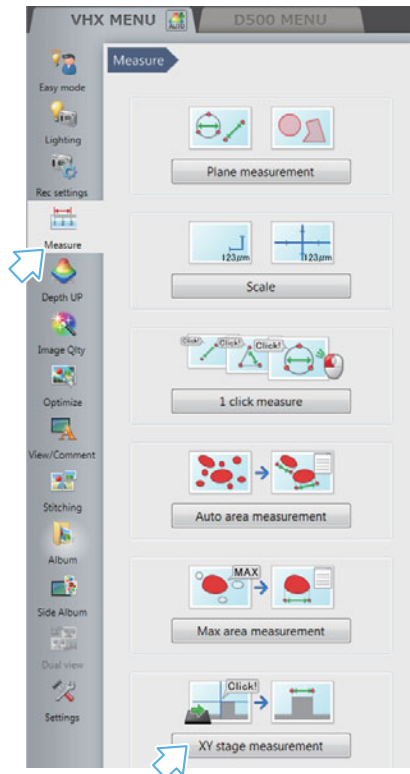
XY Stage Measurement (3)

By moving the target under observation in the XY directions, measurements can be carried out across a wide (100 x 100 mm) area.

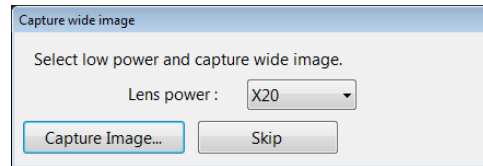
XY Stage Measurement Procedures

Wide image capture / Lens magnification rate settings

- 1 Click [Measure] on the VHX MENU and click [XY stage measurement].
The XY stage measurement screen and the [Capture wide image] dialog box will be displayed.



- 2 Click [Capture wide image] in the [Wide-area view].
The [Capture wide image] dialog box appears.
- 3 Set the lens power to low power, select the current lens power from the [Lens power] drop down box, and click [Capture Image].

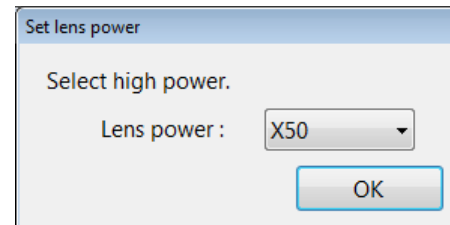


The [Set lens power] dialog box appears.

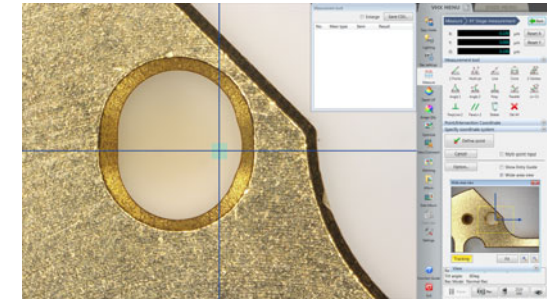
- 4 With the lens magnification high, select the current lens magnification rate from the [Lens power] drop down box.

Reference

It is not necessary to select the lens power for a lens with the automatic lens/zoom recognition function as the lens power is detected automatically.



- 5 Click [OK].
The [Set lens power] dialog box closes.
The system moves to the measurement mode.

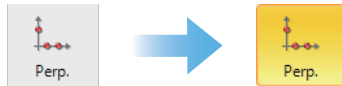
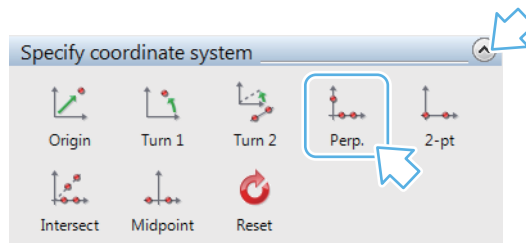


XY Stage Measurement (4)

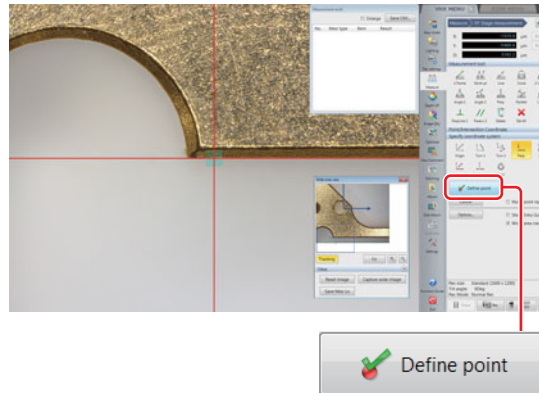
By moving the target under observation in the XY directions, measurements can be carried out across a wide (100 x 100 mm) area.

Coordinate system setting

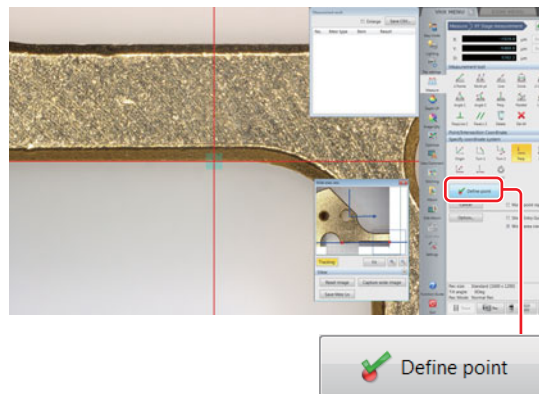
- 6** **Select a coordinate system setting tool.**
Click the [Set coordinate] tab in the tool area to display the coordinate system setting tools.
Select the coordinate system setting tool applicable to the shape and measurement points of the target.
As an example, click [Perp]. The icon will change to blue.



- 7** **Move the XY stage, set the first point on the X line to the intersection of the crossed lines, and click [Define point].**

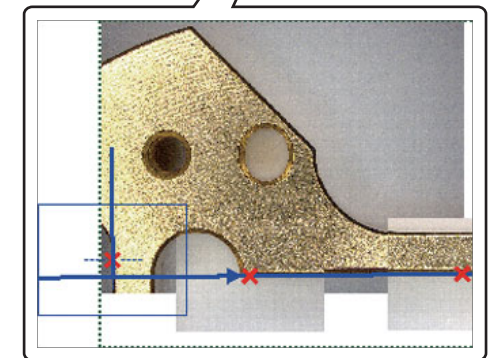
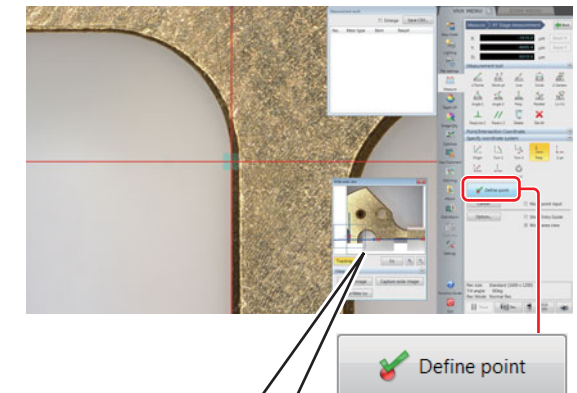


- 8** **Move the XY stage, set the second point on the X line to the intersection of the crossed lines, and click [Define point].**



- 9** **Move the XY stage, set a point on the Y line to the intersection of the crossed lines, and click [Define point].**

The origin point and XY axis will be set.



XY Stage Measurement (5)

By moving the target under observation in the XY directions, measurements can be carried out across a wide (100 x 100 mm) area.

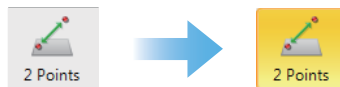
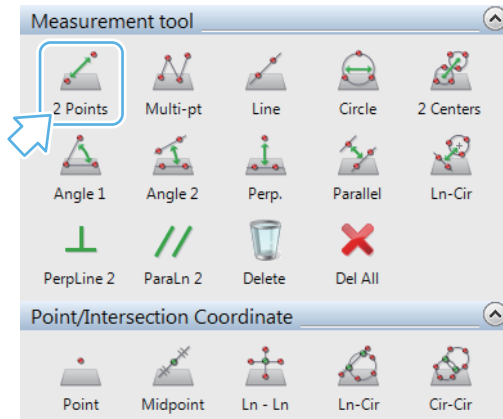
Dimension measurements

10 Select a measurement tool.

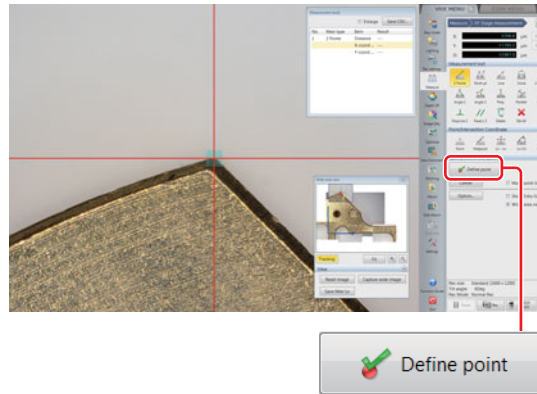
Click the [Measurement tool] tab in the tool area to display the measurement tools.

Select the measurement tool applicable to the measurement including the measurement points.

As an example, click [2 Points]. The icon will change to blue.

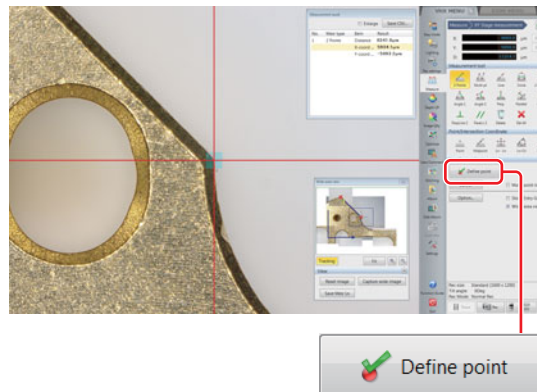


11 Move the XY stage, set the first point to the intersection of the crossed lines, and click [Define point].



12 Move the XY stage, set the second point to the intersection of the crossed lines, and click [Define point].

The measurement position is set and the results will be displayed in the measurement results window.



No.	Mesr type	Item	Result
1	2 Points	Distance	8341.9μm
		X-coord ...	5904.1μm
		Y-coord ...	-5893.2μm

Reference

The measurement points are as shown below.

