



Digital Microscope

HRX-01

Users Manual

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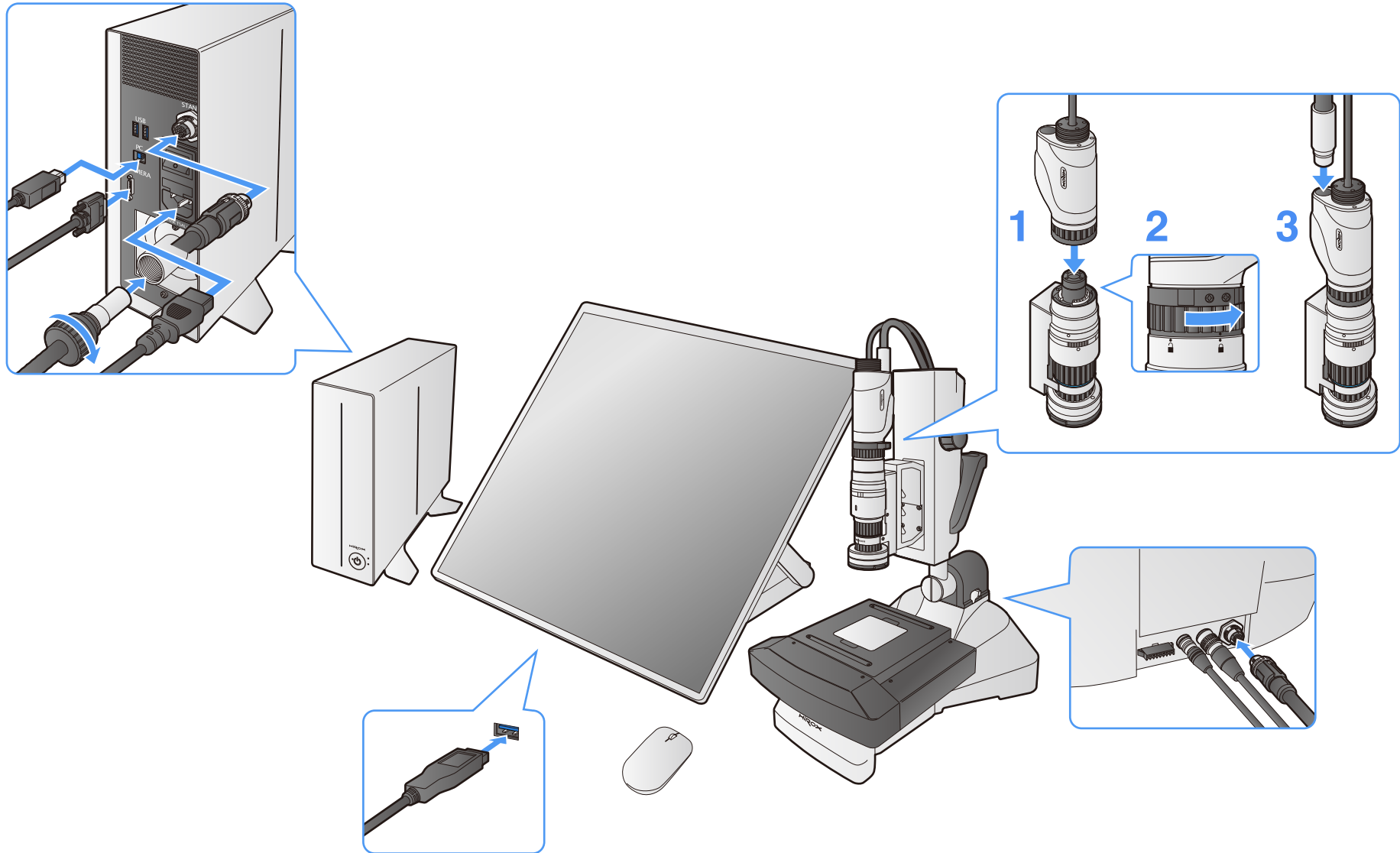
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Tiling

Chapter 1. Setup

Setup

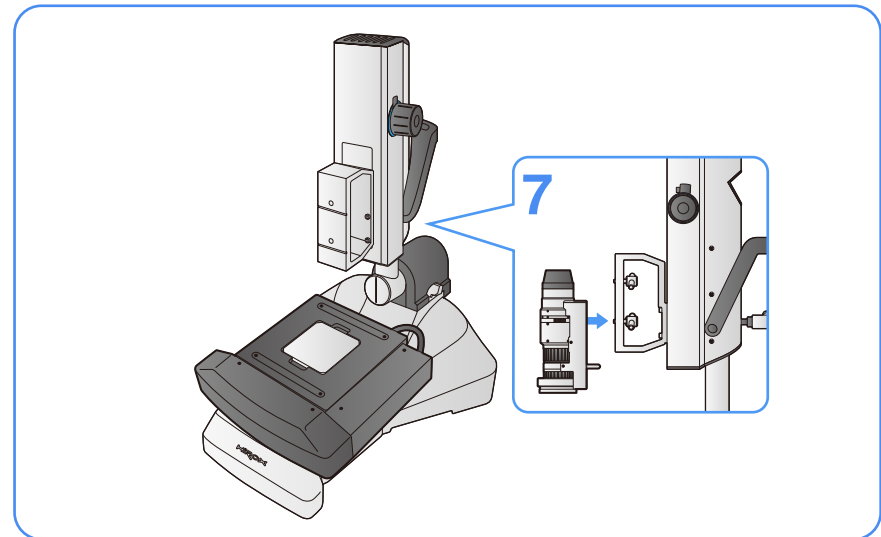
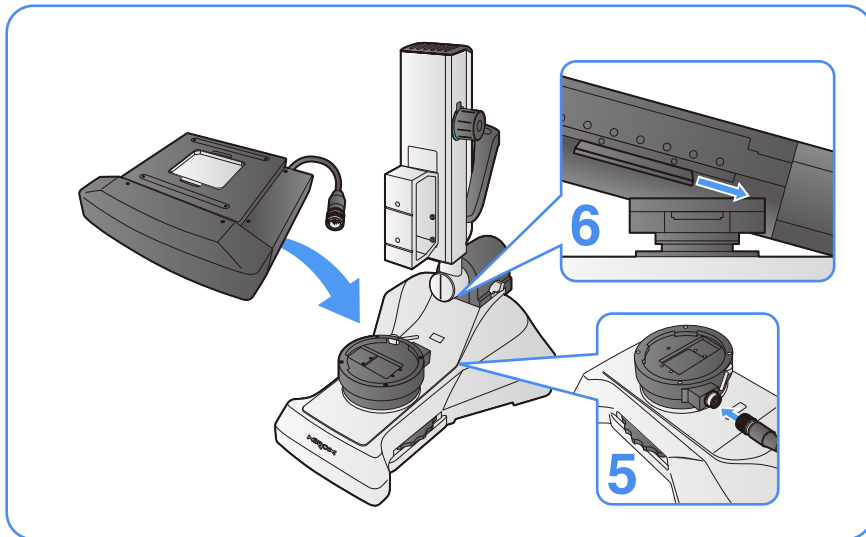
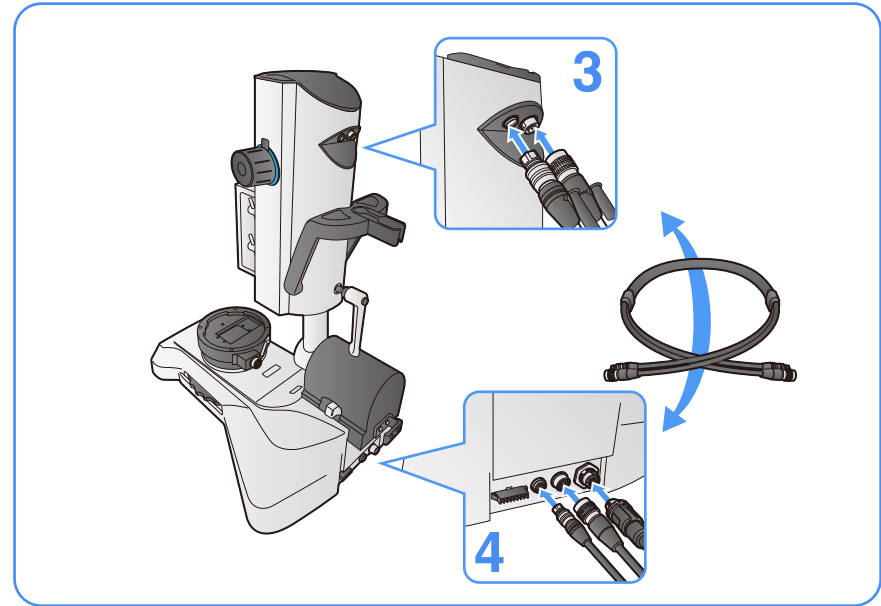
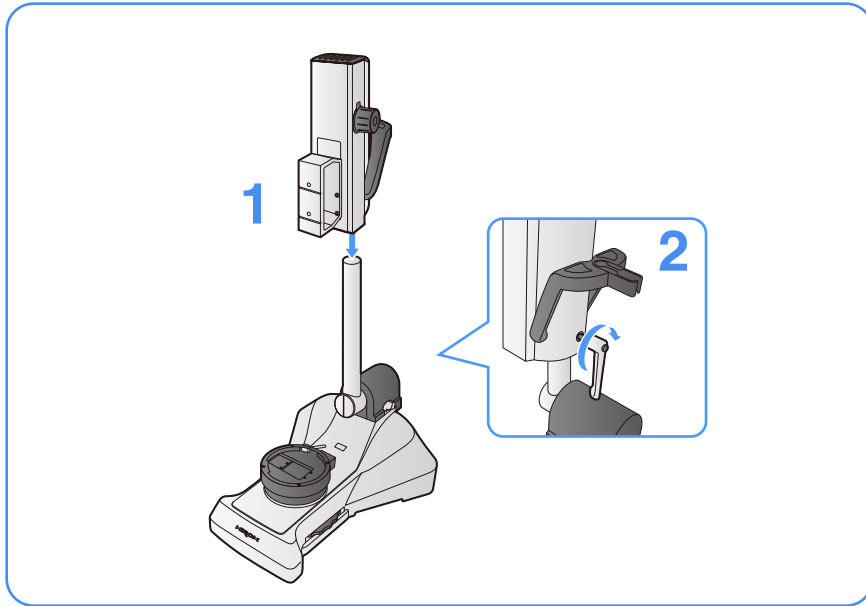
HRX-01, the stand set, and computer connection diagrams are shown below.



HRX-01, the stand set, and computer connection diagrams are shown below.

Setup - Stand

The stand largely consists of the base, Z-axis stage, and XY stage. They need to be connected before connection to HRX-01.



Chapter 2. Basic operation

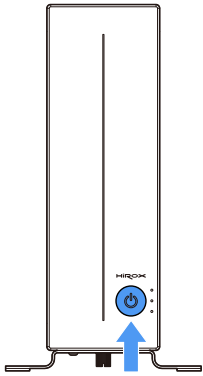
Start-up and Shutdown

The special software needs to be started to operate HRX-01.

Start-up

For start-up, turn on the HRX-01 main unit first, then start the software.

1. Press the power button of the HRX-01 main unit.



2. Start the software by choosing HRX-01 shortcut icon.



Shutdown

1. Click [End] of the Main Menu.

It will terminate the software and turn off the power of the HRX-01 main unit at the same time.

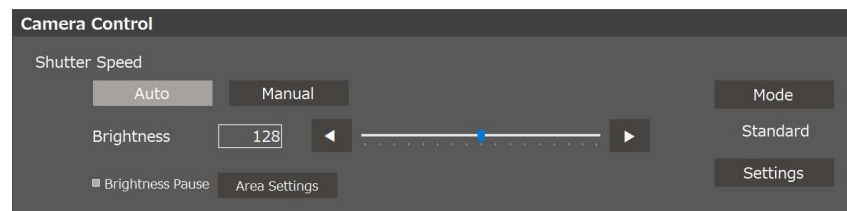


Camera Operation

Detailed setting can be performed manually, such as changing only brightness of the camera setting and changing shutter speed.

Camera Control

Camera setting can be performed from [Camera Control] of the menu.



Auto

Automatically perform camera setting according to the object.

Manual

Set the shutter speed to an arbitrary speed according to the object.

Shutter speed can be set to the following speeds in the menu.
Preset : 1/15 1/30 1/50 1/60 1/100 1/120 1/250 1/500 1/1000
1/2000 1/5000 1/10000 1/20000
Variable : 1 ~ 1/25000

Brightness

Set shutter speed to an arbitrary speed according to the object.

Move the slider to the right to increase brightness; brightness increases as the number becomes larger.

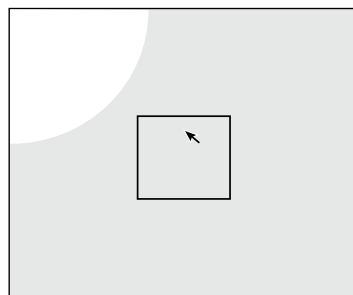
Brightness Pause

Temporarily fix shutter speed when shutter speed is [AUTO], such as auto level adjustment.

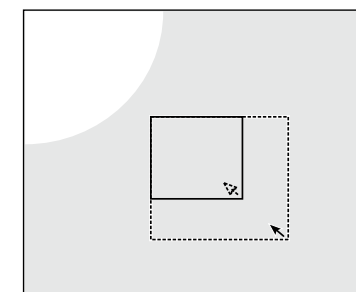
Select Area

While [Auto] is selected, choose the area (brightness area) to be used as reference brightness in the live image displayed.

1. Click [Select Area].
 - The mode changes to the brightness setting mode.
 - The rectangle shows the currently set brightness area.



2. Adjust the brightness area.
 - Movement of the area :
When the mouse is dragged, the brightness area is moved.
 - Change of the rectangle :
You can change the rectangle area when you click the mouse on the rectangle, move it to the point on the rectangle and drag it in the active state.



- When you want to change the color of rectangle, right click the mouse or double click the mouse on the rectangle.
- The [display setting] menu appears on the screen.

Lens Operation

For lenses compatible with electric control, functions such as magnification ratio can be operated from the software.

Lens Operation

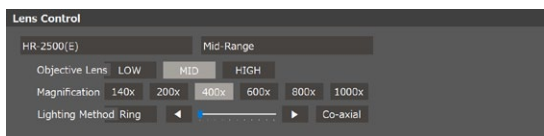
Connected lens will be automatically recognized and shown on the software.

1. Information such as the connected lens and magnification ratio will be displayed on the software.
2. For lenses compatible with electric control, functions such as magnification ratio can be operated using the software.

Lenses compatible with electric control:
AC-1020E, AC-2016E, AC-5040E, AC-2500E, AC-5000E, AC-10CE

Magnification ratios that can be selected are different for each lens.

AC-2500E



Lens	Magnification ratios and lighting
HR-1020E	10x, 20x, 30x, 50x, 90x, 100x, 120x, 150x, 200x
HR-2016E	20x, 30x, 40x, 50x, 80x, 100x, 130x, 160x (Fluctuates when HI / LOW adapter is installed)
HR-5040E	50x, 100x, 150x, 200x, 250x, 300x, 350x, 400x (Fluctuates when HI / LOW adapter is installed)
HR-2500E	Wide :20x, 30x, 50x, 80x, 120x, 140x Mid :140x, 200x, 400x, 600x, 800x, 1000x High :350x, 500x, 1000x, 1500x, 2000x, 2500x Lighting :Ring, Co-axis
HR-5000E	Wide :20x, 30x, 50x, 80x, 120x, 140x Mid :140x, 200x, 400x, 600x, 800x, 1000x High :700x, 1000x, 2000x, 3000x, 4000x, 5000x Lighting :Ring, Co-axis
HR-10CE	OL-35 :35x, 50x, 75x, 100x, 125x, 150x, 200x, 250x, 350x OL-70 II :70x, 100x, 150x, 200x, 250x, 300x, 400x, 500x, 700x OL-140 :140x, 200x, 300x, 400x, 500x, 600x, 800x, 1000x, 1400x OL-140 II :140x, 200x, 300x, 400x, 500x, 600x, 800x, 1000x, 1400x, OL-350 II :350x, 500x, 750x, 1000x, 1250x, 1500x, 2000x, 2500x, 3500x OL-700 II :700x, 1000x, 1500x, 2000x, 2500x, 3000x, 4000x, 5000x, 7000x

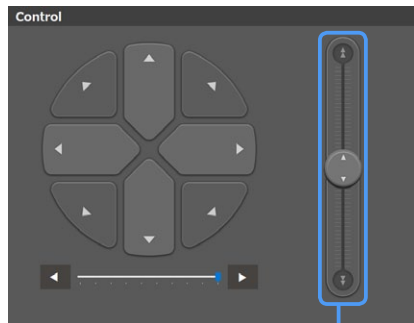
Operation of Electric Z-axis

Two types of operations are available for Z-axis, operation using the software and operation of the dial of Z-axis stage.

Operation using software

Z-axis can be moved from [Control].

1. The position of Z-axis can be adjusted from the Control Menu.



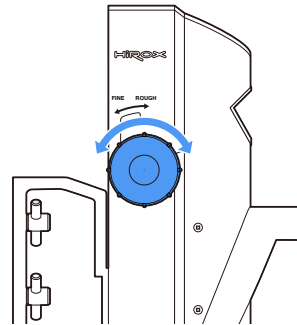
Z-axis Control Bar

2. The lens position moves up and down by moving up and down the Z-axis Control Bar icon. The movement speed becomes faster as the icon moves away from the center.

Operation using Z-axis stage

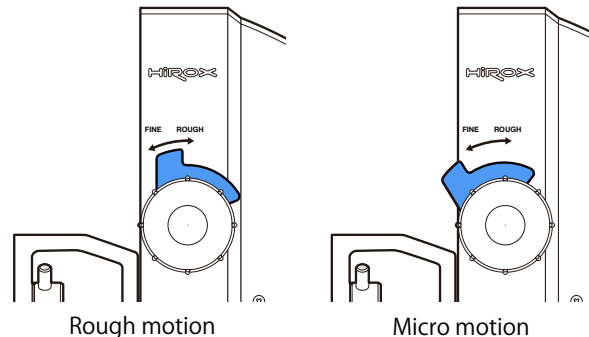
Z-axis can be moved with the dial of Z-axis stage.

1. The lens can be moved up and down by operating the dial of Z-axis stage.



2. Movement has two modes, rough motion and micro motion, which can be switched by operating the lever.

Rough motion: Large movement
Micro motion: Small movement

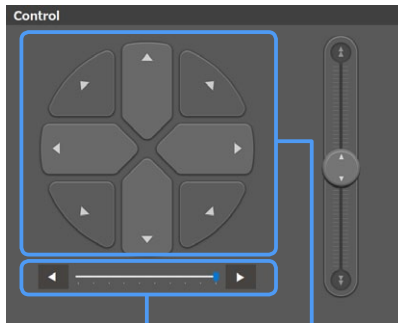


Operation of Electric XY Stage

X-axis and Y-axis can be moved by software operation.

Operation using Control

1. XY axis can be operated from the Control Menu.



Speed Control

Movement Icon

2. Movement Icon enables movement to the corresponding arrowhead direction, and Speed Control enables adjustment of movement speed.

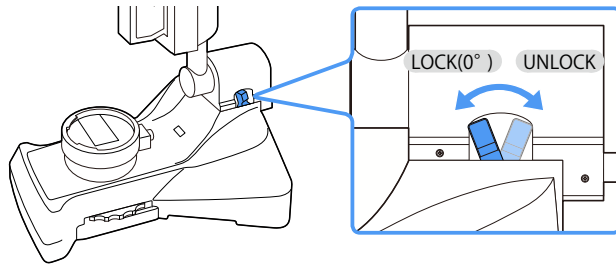
Stand Operation

The stand can be inclined.

Inclination method

Before inclining the stand, 0° Switch and Pole Fixing Lever need to be operated.

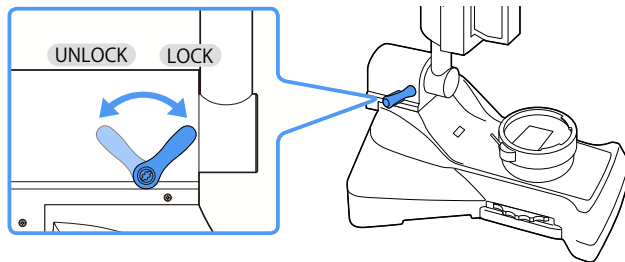
1. Unlock 0° Switch.



2. Unlock Pole Fixing Lever.



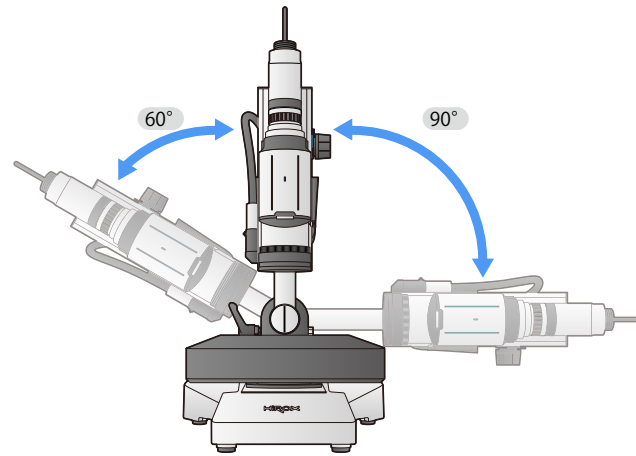
- When operating Pole Fixing Lever, fix it by holding the operation handle.



3. Hold the operation handle, incline the stand, and fix the position with Pole Fixing Lever.

Inclination angle

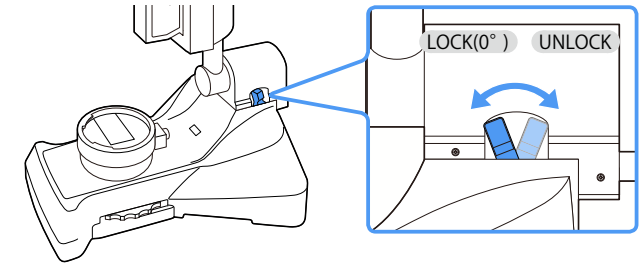
It can be inclined to 60° to the left and 90° to the right, when facing it from the front.



- When inclining the stand, check that the lens does not contact XY stage in a fixed state.
- If the lens may contact, incline the stand by moving Z stage upward.

Vertical (0°) fixation

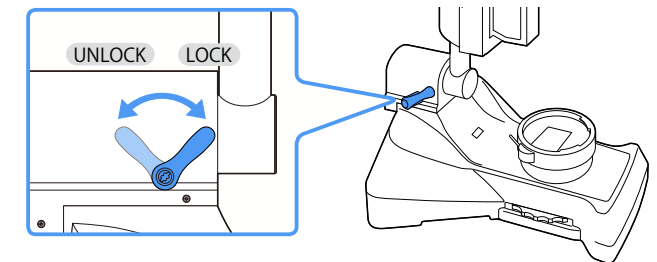
1. Unlock Pole Fixation Lever and make the pole close to vertical position.



2. Fix the position with Pole Fixing Lever while 0° Switch is in the LOCK (0°) position.



- When fixing, 0° Switch must be in the LOCK (0°) position.
- When 0° Switch is in the LOCK (0°) position, the pole is at 0° (vertical).



Recording - Still Image

Record images as still images.

Recording still image



Save images with serial numbers according to recording/save setting.

1. Click the icon to save images according to the setting.

File name will be base file name + serial number. Base file name and file format can be set from the Main Menu [Auto Numbering Capture].



Naming and recording still image



Save each image with a name.

1. Click the icon to start up the window to set a file name and image format.

Timer recording

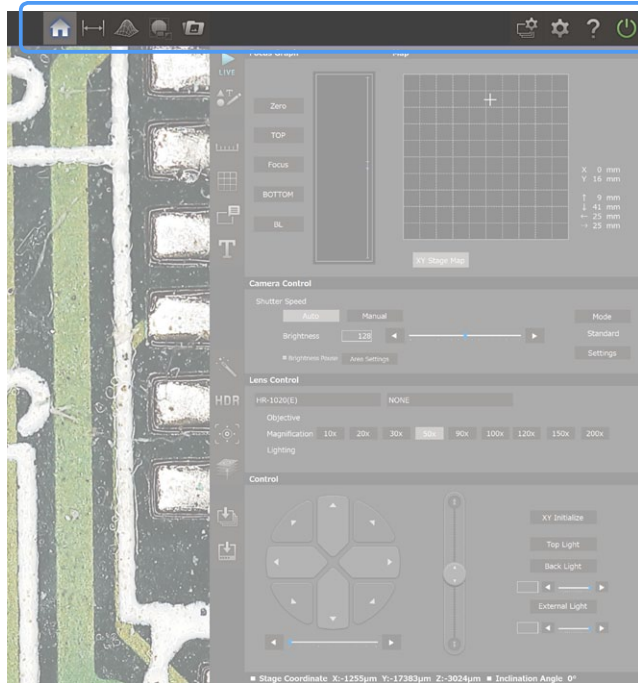


Save images according to the specified time.







1. Click the icon to start up the window to set time for the timer and image format.




Home screen - Main Menu

This page explains the icons on the Main Menu at the top of the screen.



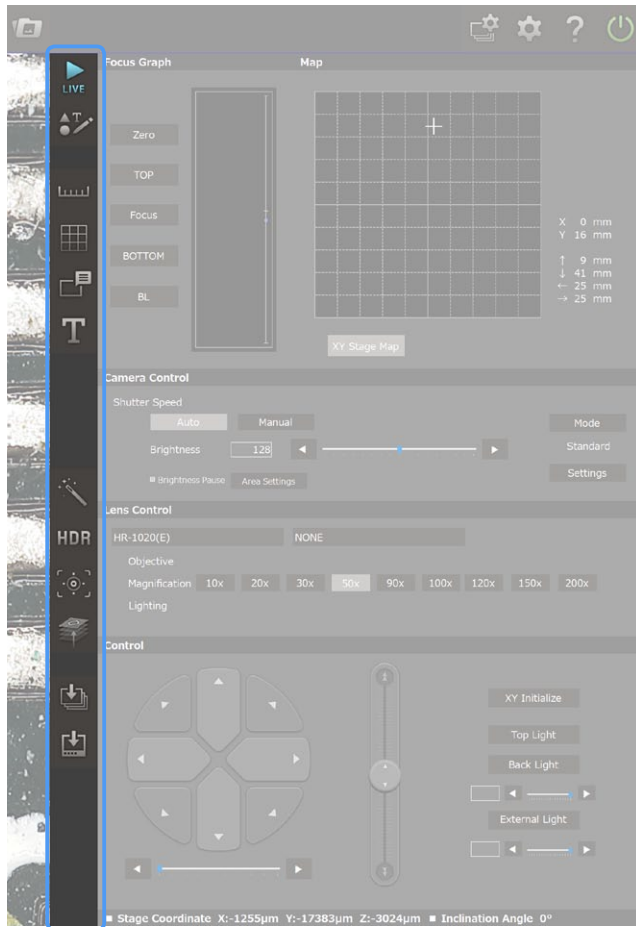
Description

Icon	Description
	The Menu after the start-up of HRX-01.
	Perform measurement.
	Construct 3D data.
	Perform tiling (linking images).
	See/play saved images, 3D data, etc.
	Perform setting of saving images with serial numbers, and saving format, etc.

Icon	Description
	Perform setting such as language setting, controller setting, and lens calibration setting.
	Start up Instruction Manual (this manual).
	Shutdown HRX-01.

Home screen - Sub Menu

This page explains the icons arranged vertically.



Description

Icon	Description
	Switch through image display/fixed display.
	Perform setting such as scale display, grid display, comment display.
	Display/not display scale information.
	Display/not display grid.
	Display/not display image information (e.g., observation setting values).
	Input text and figure.
	Automatically adjust optimal image setting suitable for image conditions.

Icon	Description
	Display HDR-processed image. Antihalation processing/setting can be also performed.
	Perform auto focus.
	Instantaneously create a focus stacking image
	Save images with serial numbers according to record/save setting.
	Save each image with a name.
	Save images according to the specified time.

Chapter 3. 2D Measurement

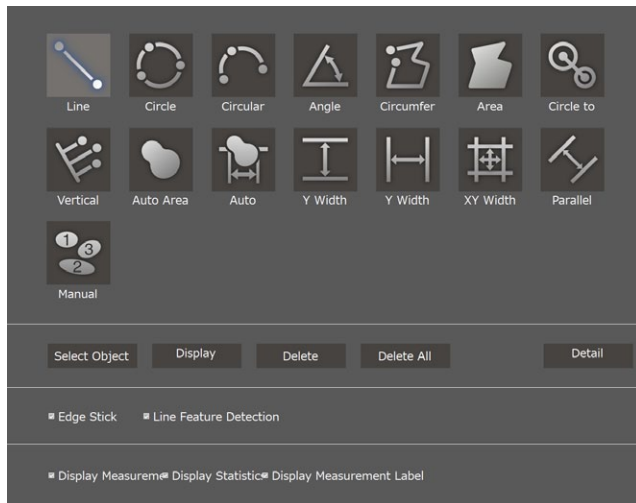
Measure 2D

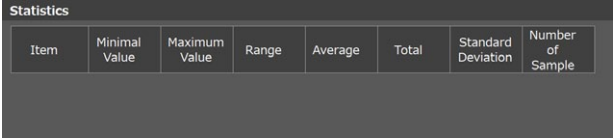
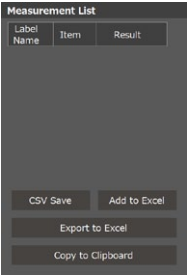
The length and area of 2D image can be measured.

Basic function of 2D measurement



Click [2D Measurement] icon on the Top Menu, then the Main Menu will switch to items for 2D measurement.



Item	Description
Select	It selects the measurement drawing located on the screen.
Delete	It deletes one measurement drawing by clicking it with the selection tool.
Delete All	It deletes all measurement drawings on the screen.
Edge Adsorption	Automatic detection of an edge is done. It reflects on mouse/cursor operation for 2D measurement. * 2D measurement: Right-clicking and
Line Feature Detection	Measurement points will be attached to the points of the measurement figure such as the start point, end point, middle point of the straight line tool, and the center of the circle tool.
Measurement list	Displays a measurement list that displays the measured length and area. 
Statistical values	The statistical table is created by using the maximum value, minimum value, range, average, total or standard deviation as the statistical values depending on the number of samples. It is recommended to use the statistical values after the selecting the same figure. 
Measurement result label	When clicking the label to be moved on the image data, the corner of the label is emphasized. When moving the mouse while left-clicking it, the label can be moved. When moving the destination, release the left-click.

Measure 2D

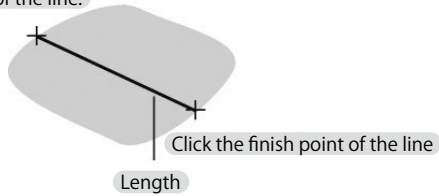
The length and area of 2D image can be measured.

Straight line



Use the Line tool to measure the length of the straight line.

Click the start point of the line.
the start point of the line.



Click the finish point of the line

Length

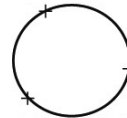
Circle



Use the Circle tool to measure the size of the circle.

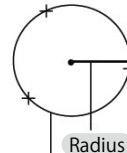
Measuring the size of the circle passing 3 points

Click the first point on the circumference.



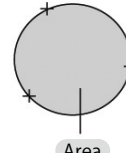
Click the second point on
the circumference.

Click the third point on the circumference.



Diameter

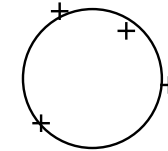
Radius



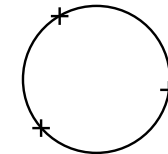
Area

Click multiple points, and measure the circle of best fit.

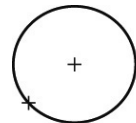
Select "Best Fit Circle" from "Measurement method."
If 3 points are clicked, a circle composed of those 3 points is drawn.



If the 4th point or after is clicked, the circle of best fit is measured.
Double-click, and the measurement will be set.

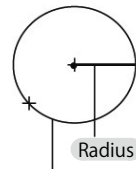


Center of the circle and one point



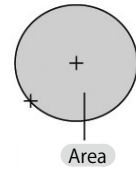
Click the center.

Click one point on the circumference.



Diameter

Radius



Area

Measure 2D

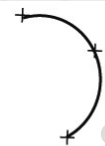
The length and area of 2D image can be measured.

Length of the arc



Use the Arc tool to measure the length, radius, and area of the arc passing 3 points.

Click the first point on the arc.



Click the second point on the arc.



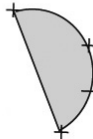
Click the third point on the arc.



Radius (BAx)



Arc length



Area

x = integral number

Measuring the angle



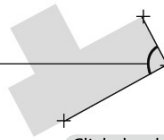
Use the Angle tool to measure the angle of the object.

Making measurement by specifying 3 points

Draw the angle connecting 3 points and measure the angle. Select 3 Points button of the angle item in Measurement method.

Click the first point.

Angle (AN)



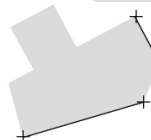
Click the second point.

Click the third point.

Making measurement by specifying two sides

Select 2 Sides button of the angle item in Measurement method. Draw the angle composed by two sides and measure the angle. If two sides are separated, the lines are extended automatically until they cross.

Click the start point of the first side.

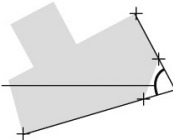


Click the finish point of the first side.

Click the start point of the second side.

Click the finish point of the second side.

Angle (AN)



If two sides are separated, the rubber bands are extended automatically until they cross.

Perimeter length and area



Use the Perimeter length tool to measure the length of the line drawn by Freehand tool or Polyline tool.

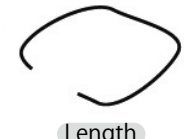
Click at the start point.

Click at the point where the angle changes.

At every click, the rubber band of the Polyline is displayed.



Length



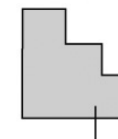
Length

Drawing figure by Freehand

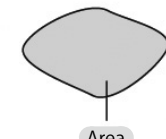
- (1) Place the mouse cursor at the start point and drag it along the shape.
- (2) When releasing the mouse button, the rubber band is displayed on the shape on which the cursor has passed. After releasing the mouse, a figure can be drawn continuously. Use the Perimeter length tool to measure the area of the specified range.

Specification of [Close] connects the start and finish points.

Specification of [Close] connects the start and finish points.



Area



Area

- Combination of Freehand and Polyline allows a figure to be drawn.
- Double-clicking the last point makes the same effect as [Apply] button.

Measure 2D

The length and area of 2D image can be measured.

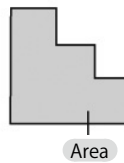
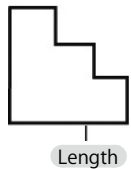
Area



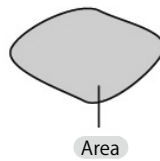
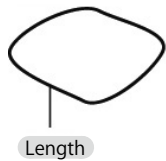
Use the Area tool to measure the area and perimeter length of the figure drawn by Freehand or Polyline.

Drawing the figure by Polyline

Click the start point.
Click the point where the angle is changes.
Every clicking allows the polyline rubber band to be displayed.



Drawing the figure by Freehand



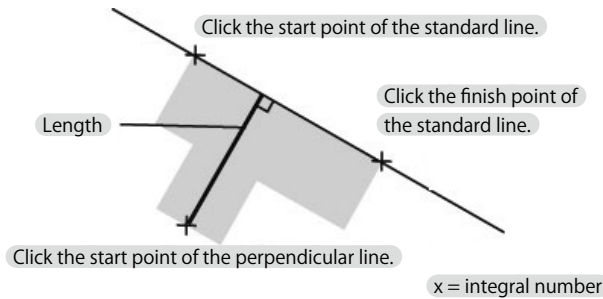
- Combination of Freehand and Polyline allows a figure to be drawn.
- Double-clicking the last point makes the same effect as [Apply] button.

Perpendicular line



Use the Perpendicular length tool to measure the shortest distance from the arbitrary point to the standard line.

First, decide the standard line by specifying two points. And then by specifying the point, the perpendicular line for the standard line is automatically drawn and the perpendicular line is measured.



- Double-clicking the last point makes the same effect as [Apply] button.
- After completion, the other standard line can be drawn and the perpendicular line for it can be drawn similarly.

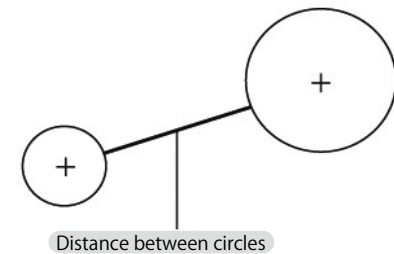
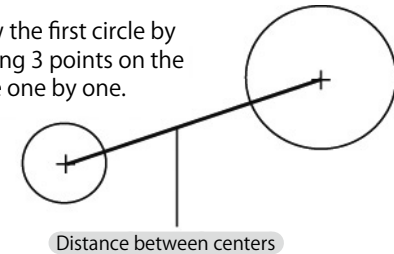
Distance between two circles



Use the Circle-to-circle tool to measure the distance between centers of two circles and distance between two circles. The circle is drawn by specifying three points.

2. Draw the second circle in the same manner.

1. Draw the first circle by clicking 3 points on the circle one by one.



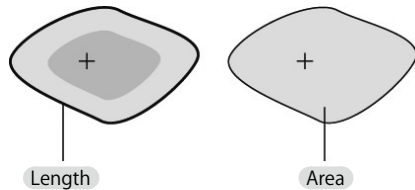
Measure 2D

The length and area of 2D image can be measured.

Automatically measuring the perimeter length and area



The outline of the object is recognized automatically and the perimeter length and area are measured. When clicking only one point inside the object in the image, the figure is drawn along the outline of the object and the perimeter length and area are measured.



- Value of the density range and smoothing cannot be adjusted before clicking the object.
- If the error message is displayed and a figure cannot be drawn or if the unintended range is included, values of the density range and smoothing should be adjusted. If adjusted, the outline is changed in real time.
- If there is not clear difference between brightness of the object and its background or if the objects are connected, automatic measurement cannot be done.
- Therefore, use Circle or Perimeter length tool to manually draw the figure.

Item	Description
Measurement item	Perimeter length : It acquires the length of the drawn line. Area : It acquires the area of the figure.
Density range	<p>It sets the density range used for recognition as one object. The outline is drawn by recognizing the density of clicked part \pm the density area of setting range as the object. Specification uses dragging the slider or clicking [▲] [▼] buttons. It sets the smoothing level of the image; i.e. 0 to 9. (0 ~ 9)</p> <p>Ex. When setting width is small Ex. When setting width is large</p>
Smoothing	<p>As the value increases, the smoother outline is drawn and as the value decreases, the rougher outline is drawn.</p>

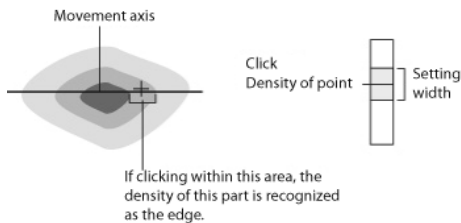
Measure 2D

The length and area of 2D image can be measured.

Executing automatic measurement



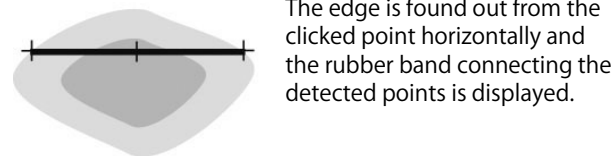
Use the Auto width tool to automatically measure the length between the edges of the object. Specify any of the X axis, Y axis, and arbitrary tilt and recognize the edge on the axis.

Item	Description
Measurement item	<p>X axis : It makes measurement by finding out the edge in the horizontal direction from the arbitrary point.</p> <p>Y axis : It makes measurement by finding out the edge in the vertical direction from the arbitrary point.</p> <p>Select axis : It specified the axis at the arbitrary tilt and makes measurement by finding out the edge along the axis from the Arbitrary point.</p>
Density range	<p>It sets the density range of the edge.</p> <p>It recognizes the density of clicked part \pm the density area of setting range as the object and detects the part where the other density change occurred as the edge.</p> <p>Specification uses dragging the slider or clicking [▲][▼] buttons.</p> 

- The density range cannot be adjusted before clicking the object.
- If the edge cannot be detected successfully, adjust the density range.
- If adjusted, the edge is detected in real time and the drawn line is changed.

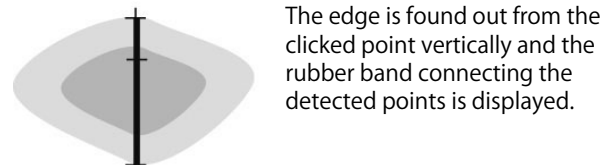
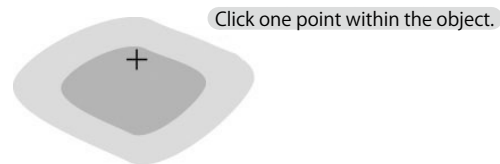
Making measurement by use of X axis

Click the X axis button.



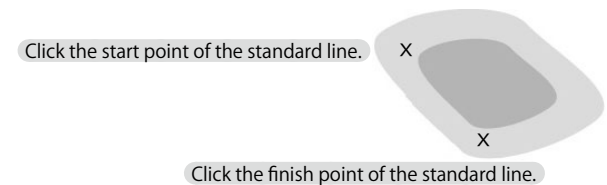
Making measurement by use of Y axis

Click the Y axis button.

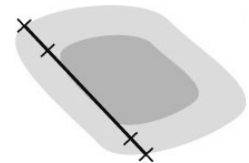


Making measurement by use of arbitrary axis

Click the Select axis button.



The edge is found out along the direction of the standard line and the rubber band connecting the detected points is displayed.



Measure 2D

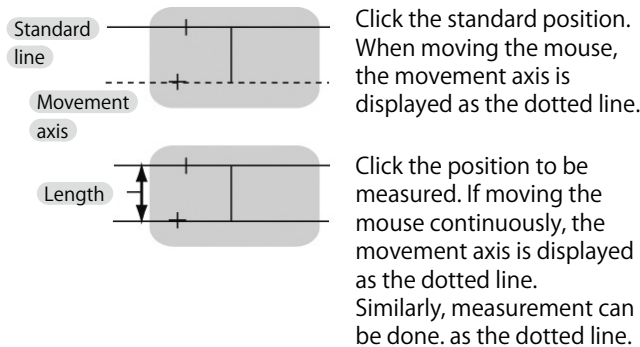
The length and area of 2D image can be measured.

X width



Measuring X width

Use the X width tool to measure the vertical distance. The perpendicular rubber band is automatically drawn from the movement axis for the standard line and its distance is displayed. If "Distance from Origin Line" is checked, the distance from the Origin Line to the moving lines is measured. If it is not checked, the distance between moving lines is measured.



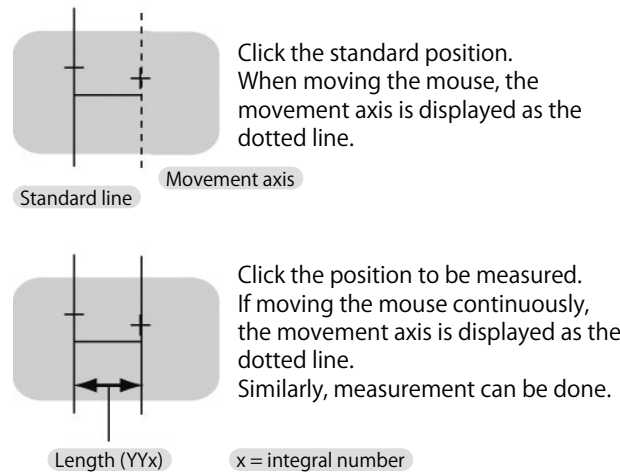
- Double-clicking the last movement axis makes the same effect as [Apply] button.
- The standard line can be moved after applying.
- After completion, the other standard line can be specified and the movement axis for it can be specified similarly.

Y width



Measuring XY width

Use the Y width tool to measure the horizontal distance. The perpendicular rubber band is automatically drawn from the movement axis for the standard line and its distance is displayed. If "Distance from Origin Line" is checked, the distance from the Origin Line to the moving lines is measured. If it is not checked, the distance between moving lines is measured.



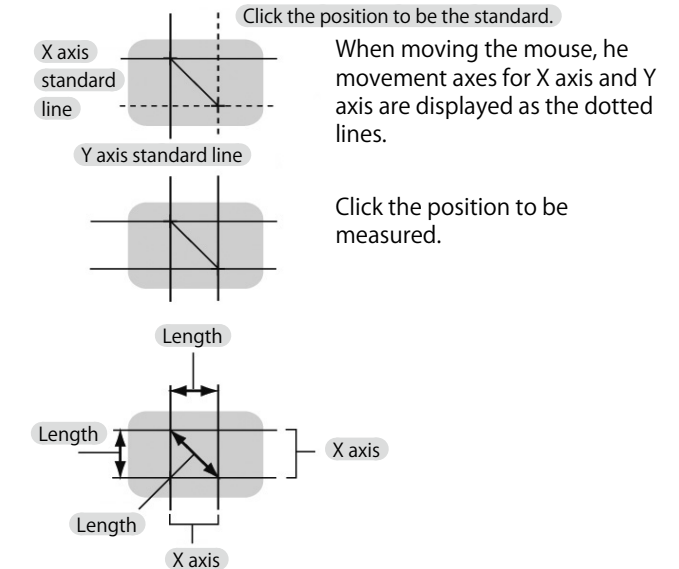
- Double-clicking the last movement axis makes the same effect as [Apply] button.
- The standard line can be moved after applying.
- After completion, the other standard line can be specified and the movement axis for it can be specified similarly.

XY width



Measuring XY width

Use the XY width tool to measure the horizontal distance. The perpendicular rubber band is automatically drawn from the movement axis for the standard line and its distance is displayed. If "Distance from Origin Line" is checked, the distance from the Origin Line to the moving lines is measured. If it is not checked, the distance between moving lines is measured.



- The standard line can also be moved after applying.
- When moving the mouse after completion, the other standard line is displayed as the dotted line. The other standard line can be specified and the movement axis can be specified for it similarly.

Measure 2D

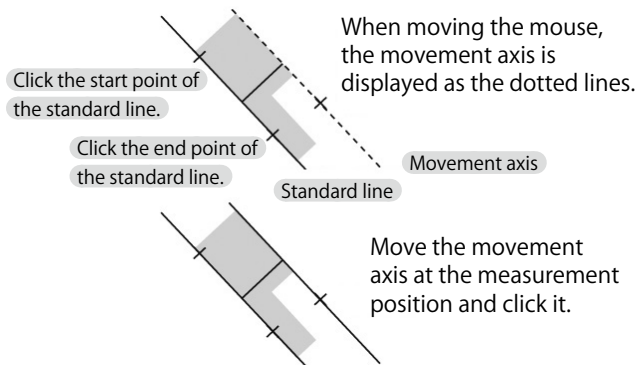
The length and area of 2D image can be measured.

Parallel lines

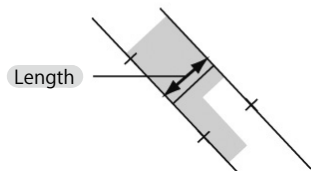


Use Parallel line tool to draw two parallel lines at the arbitrary angle in the image and measure the distance between them.

The rubber band of the perpendicular line and parallel line is drawn automatically for the standard line. If "Distance from Origin Line" is checked, the distance from the Origin Line to the moving lines is measured. If it is not checked, the distance between moving lines is measured.



If moving the mouse continuously, the movement axis is displayed as the dotted line. Similarly, measurement can be done.



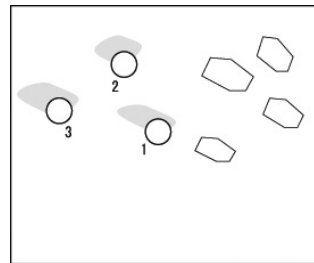
- Double-clicking the last movement axis makes the same effect as [Apply] button.
- The standard line can be moved after applying.
- After completion, the other standard line can be specified and the movement axis for it can be specified.

Manual counting



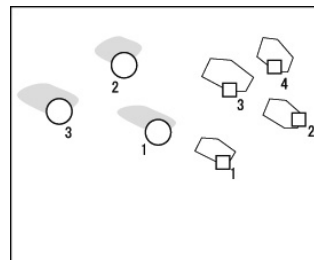
Use the Manual count tool to manually count the number of objects on the screen.

Each clicking the object on the screen one by one allows the position to be marked and added with the number. The measurement result shows the total number. Objects can be grouped into 16 groups for counting; i.e. shape and color of the marker can be selected for each group.



When group is to be changed

The group can be changed in accordance with the object to be counted. When counting the last object in a group, if double-clicking the left button of the mouse, the count can start for the next group. Change the type and color of the marker.



Chapter 4. 3D Construction/Measurement

Construct 3D

An image of the entire object in focus can be synthesized by importing several images with different heights.

Top/bottom setting

The top position (highest position) and the bottom position (lowest position) need to be set to construct 3D image.

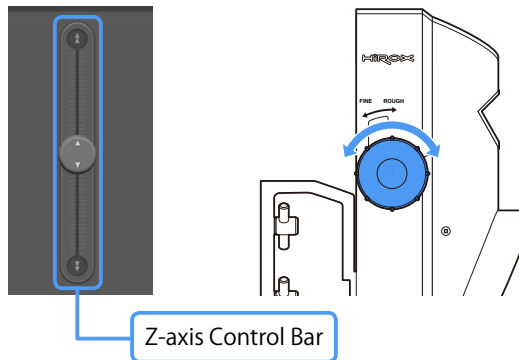
1. Click [3D] icon on the Top Menu.

[3D Composite] window will open.



2. In [3D Composite] window, set [Set Top] and [Set Bottom].

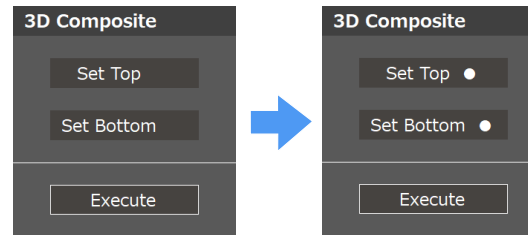
1. Bring the lowest plane of the object into focus.
When the bottom position is determined, click [Bottom Setting] button to complete the setting.
2. Bring the highest plane of the object into focus.
When the top position is determined, click [Top Setting] button to complete the setting.



Z-axis can be moved with [Z-axis Control Bar] of [Control] or by operating the dial of Z-axis stage.

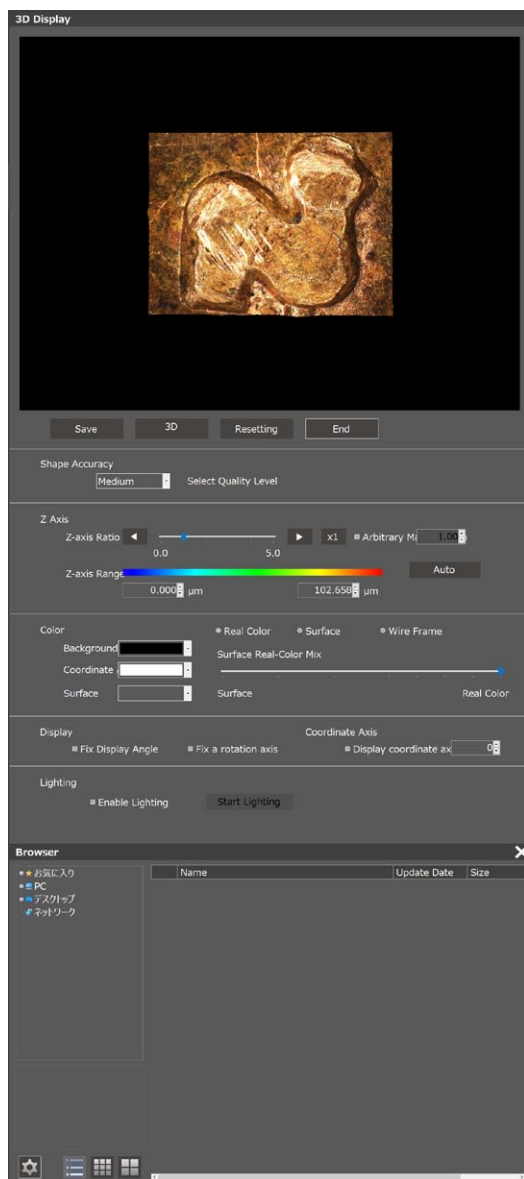
3. After completion of [Top Setting] and [Bottom Setting], click [Proceed].

After completion of the setting of [Top] and [Bottom], the button will show white ●.



Construct 3D

An image of the entire object in focus can be synthesized by importing several images with different heights.



Procedure

After completion of 3D construction, the Main Menu will switch.

1. Constructed 3D image will be displayed.
2. Setting on 3D display can be performed.
Perform setting when needed.
The settings such as Z-axis and color saved here can be changed in the 3D Measurement Menu.
3. If the constructed 3D image has no problem, choose "Save" or "3D Measurement."
You can discard the setting with "Reset" or "Terminate" and return to before image-taking.

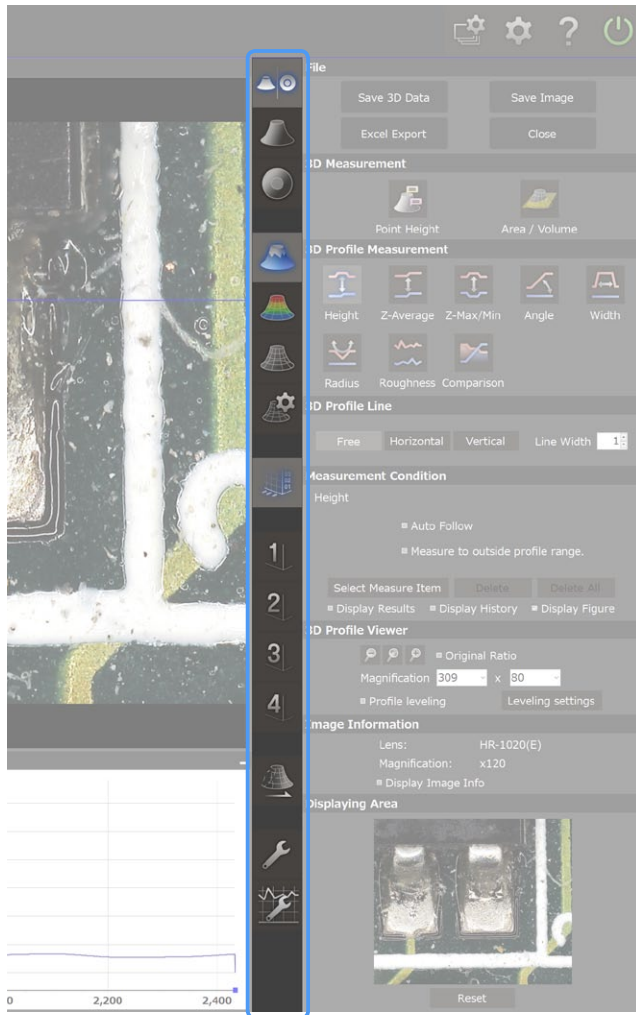
Description

Item	Description
Save	Save constructed 3D image.
3D	Main Menu will switch to 3D Measurement Menu, and 3D measurement function will become available.
Resetting	Discard the current 3D image and return to [Decide 3D Image Synthesis Area].
End	Discard the current 3D image and end 3D display.
Shape Accuracy	High, Medium, or Low can be selected for the accuracy of shape.
Z-axis	Z-axis scaling factor: Z-axis scaling factor can be changed. Increase the scaling factor to accentuate unevenness. (Default scaling factor is 1). Z-axis area: The area to be displayed as 3D can be set.
Color	The background color and the percentages of surface and real color for mixed display can be set.
Display	Display angle can be fixed by checking [Fix Display Angle], [Fix Rotary Axis].
Lightin	Lighting will be activated when checked. Lighting angle can be adjusted with [Start Lighting].









3D Measurement Screen





When 3D measurement is selected or 3D image is opened after 3D image construction, the menu will switch to the menu for 3D measurement.

Option



Description

Icon	Description
3D+2D 	Divide the screen to display 2D and 3D.
3 D 	Display 3D.
2 D 	Display 2D.
Original Color 	Display 3D model where the image taken is pasted onto the surface of 3D as texture.
Pseudo Color 	Display 3D model where the height of Z-axis is expressed in color. Blue (low) Red (high)
Wire frame 	Display 3D wireframe model
3D Display settings 	Perform setting of Z-axis scaling factor and display.
Display XYZ Axis 	Perform scale ON/OFF setting.

Icon	Description
Pattern 	Change 3D display angle. Fixed display angles are registered.
Adjustment 	Perform plane correction and noise elimination correction for 3D.
Profile Display Settings 	Perform graph setting.
Various Settings 	Perform setting such as scale and label .

Observe 3D

This page explains the basic operational method and display setting of 3D image.

Option

Open 3D data

The Menu for 3D observation/measurement will open after taking 3D image or opening saved TDR data.

1. Select an image from the browser.
Double-click an image or drag-and-drop an image onto video, then 3D image will open. The menu will switch to 3D menu.

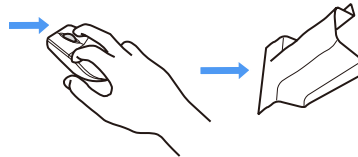
2. 3D image can be operated with a mouse.

Rotation



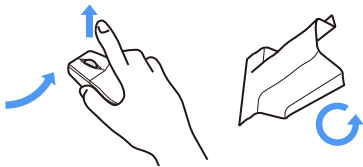
Rotate by dragging the mouse on the 3D display.

Movement



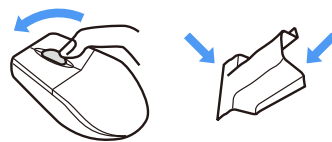
Moves by dragging while pressing the right mouse button.

Automatic rotation



If you drag and release (release the button while moving the mouse), the rotation will continue.

Reduction (enlargement)



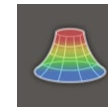
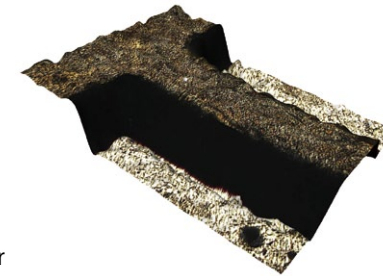
Turn the scroll wheel toward you to zoom in, and turn it away to zoom out.

3D display method

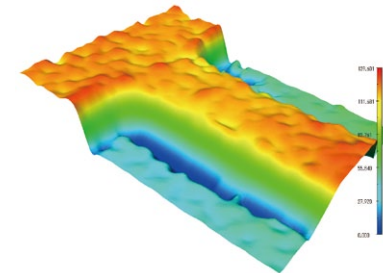
There are 3 kinds of 3D display methods to choose from. Choose one from the icons on the sub menu. It is displayed in real color first.



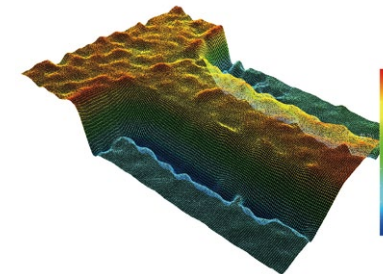
Original Color



Pseudo Color



Wire frame



View Settings



On [View Settings], Z-axis scaling factor setting and display setting such as scale and graph can be performed.

View Settings [X]

3D Shape Quality
 Medium Select Shape Quality

Z-axis Magnification
 0.0 5.0 x1 Manual 1.00

Z-Axis Range
 0.0 μm 102.7 μm Auto Adjustment Fix Z-Axis Position

Color
 Background [Black]

Pseudo/Original Color Mix
 Pseudo Color Original Color

Angle
 Fix Angle Fix Reference Point

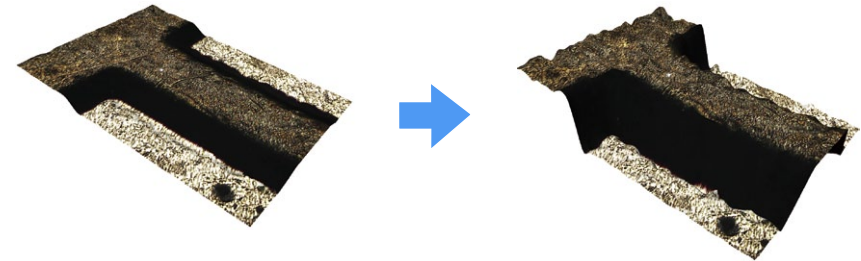
Angle Registration

Lighting
 Enabled [Lighting Icon]

Item	Description
Resolution	Choose 3D model accuracy from High, Medium, and Low.
Z-axis Ratio	Choose Z-axis scaling factor. As the value becomes larger, height difference in 3D form will be more accentuated.
Z-axis Range	Set the area to be displayed as 3D.
Manual	Z-axis area can be entered as a value.
Auto adjustment	Set Z-axis area automatically.
Fix Z-axis	Open the menu.
Background	Background color will be set.
Pseudo/Original Color Mix	The percentages of Pseudo/Original color display can be respectively set.
Angle	Display angle and rotary axis can be fixed.
Lighting	Presence or absence of lighting for 3D can be set.

Z-axis Magnification

Z-axis scaling factor can be changed by moving [Z-axis Magnification] bar or checking a scaling factor and setting a number. 3D form unevenness can be accentuated.



Lighting

Shed light on data if you want to accentuate the stereoscopic effect of 3D display,



Check [Lighting] for activation, and click the icon to change lighting position.

Horizontal angle

Elevation angle

Side surface of object

Upper surface of object

Measure 3D - Measurement

[3D Image Measurement] in 3D measurement, point height and area/volume can be measured.

Option

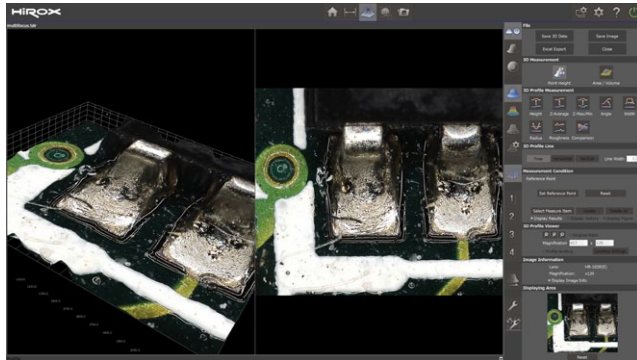
Point height measurement

Click 3D image, and the height at the clicked point can be measured.

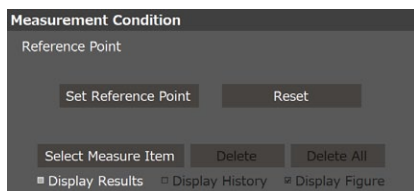
1. Choose [Point Height] in [3D Image Measurement].



2. Click anywhere on the screen to see the height.
A label is displayed near the clicked point, and the height is displayed in the label. When the measurement list is displayed, the measurement locations of all specified points are displayed as a list.



After choosing [Specify] of reference height items, click a point, then the point height can be measured with the height of the clicked point as "0."



Click "Reset" to return to the original values of 3D image.

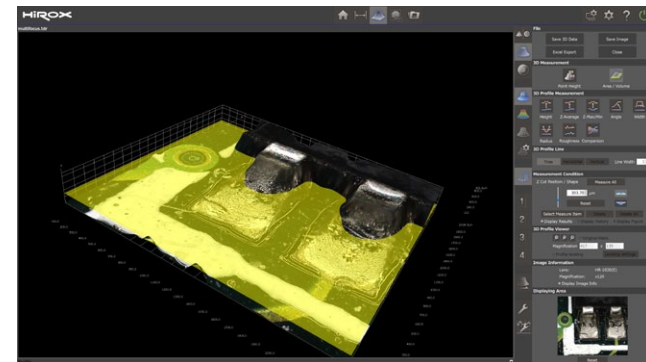
Area/Volume

Area and volume of 3D image can be measured.
Partial measurement is also possible by setting a measurement area.

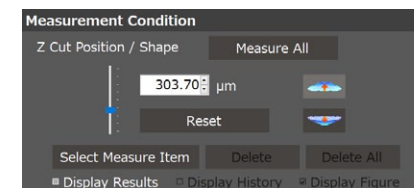
1. Choose [Area/Volume] in [3D Image Measurement].



2. A slicer will be displaced in 3D image.



3. Area/volume of the upper part or lower part of the slicer will be measured.
 - The cut position where the slicer is displayed can be changed from [Cut Position/Form] in [Form Condition] items.
 - Measurement position (upper/lower part of the Slicer) can be selected by clicking 3D image or the arrow of [Measurement Condition].



Measure 3D - Profile

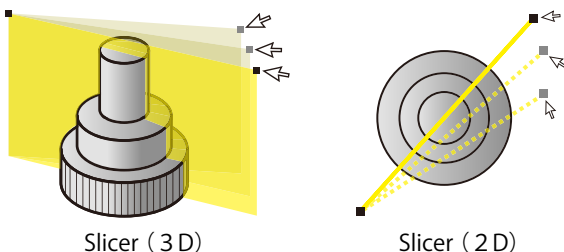
Profile and the slicer will be used for 3D measurement.
The area specified with the slicer will be displayed on Profile (graph).

Option

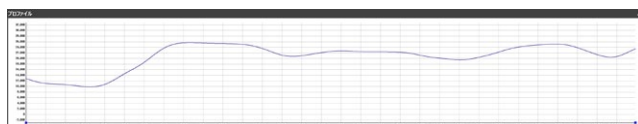
What is Profile?

Display the object at an arbitrary inclination angle, divide with the slicer (plate-like plane), display the cross-section by planar profile (graph), and measure height, width, etc. Click [3D Profile] on the Menu Screen to start up 3D profile.

Choose 3D Profile Measurement, and profile (graph) and the slicer will be displayed.
Perform measurement by operating profile and graph.



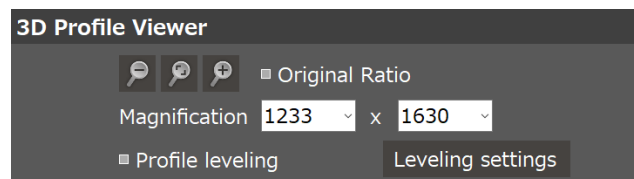
Operate the slicer, and the shape of the slicer cross-section will be displayed on profile.






Profile

3D Profile Viewer

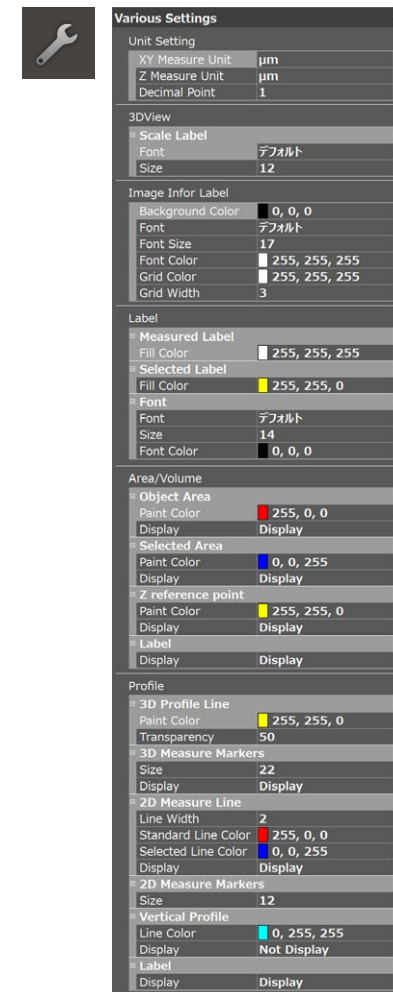
3D profile display magnification factor and inclination correction can be performed.



Item	Description
Reduce 	Reduce according to the window size.
Auto 	Display according to the horizontal-to-vertical ratio of measured values.
Enlarge 	Enlarge according to the window size.
Magnification	Display scaling factor can be directly specified using Combo Box.
Profile leveling	Profile inclination can be corrected. Auto: Inclination will be obtained from all data and correction will be performed. Manual: Correction will be performed to make the data of specified 2 points horizontal.

Various Settings

Setting of 3D profile, slicer, and label can be performed on [Various settings].



Measure 3D - Profile

There are 8 measurement tools in [3D Profile Measurement].

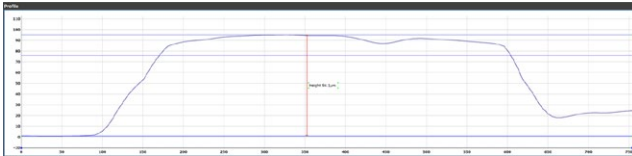
Option

3D height measurement



The height between specified 2 points can be measured.

1. Click arbitrary 2 points on profile, and the height between the 2 points can be measured.

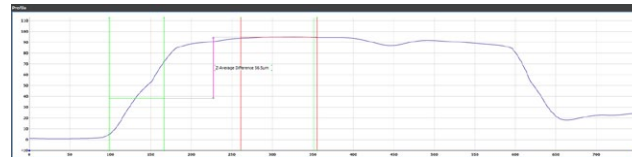


Z-Average



The mean difference in height of 2 sections can be measured.

1. Specify 2 sections.
Specify 4 points in total.
The first 2 points will be the first section, and the next 2 points will be the second section.

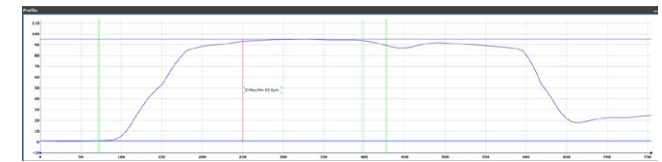


Z-Max/Min



The biggest height difference in the specified section can be detected and measured.

1. Click arbitrary 2 points on profile, and the point with the biggest height difference between the 2 points will be detected.



Measure 3D - Profile

There are 8 measurement tools in [3D Profile Measurement].

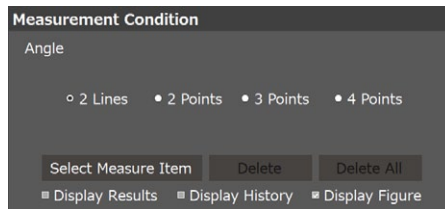
Option

Angle



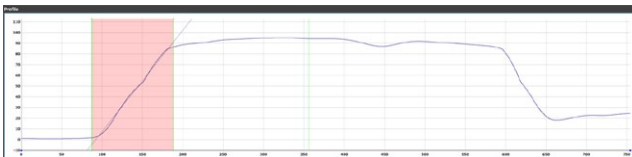
Angle can be measured. There are 4 types of methods to specify measurement points.

1. Choose measurement condition from [2 Lines], [2 points], [3 points], and [4 points].



- 2 Lines : Specify 2 section (specify 4 points), and measure the angle between straight lines detected in each section.
- 2 Points : Specify 2 points and measure the angle consisting of 2 points.
- 3 Points : Specify 3 points and measure the angle with the second point as the vertex.
- 4 Points : Specify 4 points, and measure the angle consisting of the straight line connecting the 2 points first and the next connecting the 2 points.

2. Specify points on profile according to measurement conditions.

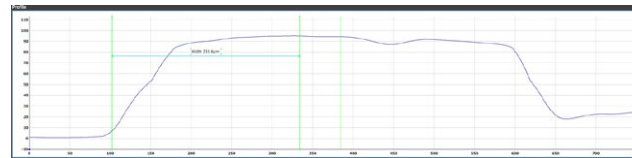


Width



The width between specified 2 points can be measured.

1. Click 2 arbitrary points on profile, and the width between the 2 points can be measured.

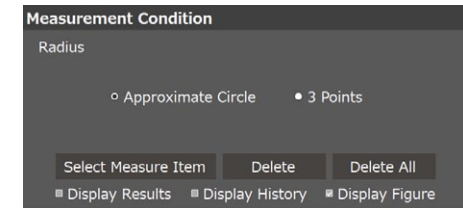


Radius



Create a circle on the profile and measure its radius.

1. Choose measurement condition from [Approximate circle] and [3 points].

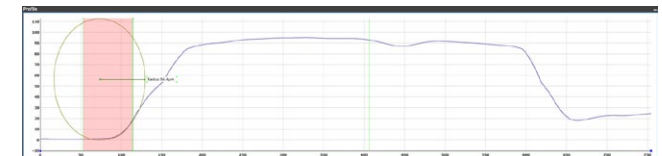


Approximate Circle :

Specify two points, the circle that best fits the interval is drawn, and the radius is measured.

3 Points : Specify 3 points, a circle passing through 3 points is drawn, and the radius is measured.

2. Specify points on profile according to measurement conditions.



Measure 3D - Profile

There are 8 measurement tools in [3D Profile Measurement].

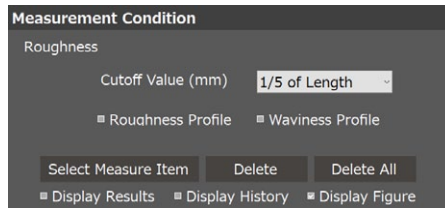
Option

Roughness measurement



Profile roughness (Ra, Rz, Rzjis) can be measured.

1. Choose [Cutoff Value] for measurement conditions and choose either [Roughness Profile] or [Waviness Profile].



Roughness Profile: A curve obtained by removing surface waviness component longer than the specified wavelength with phase compensation high-pass filter
Waviness Profile A curve obtained by removing surface roughness component shorter than the specified wavelength with phase compensation low-pass filter

2. Roughness will be measured according to measurement conditions.

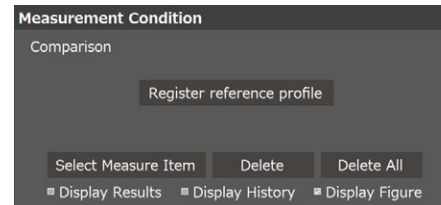


Comparison



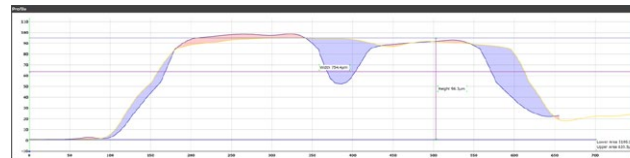
Length and area can be compared with registered profile.

1. Click [Register reference profile], and the current profile will be registered as reference profile.



2. Operate the slicer, and comparison with reference profile will be displayed on profile.

Blue: Increased area
Red: Decreased area



Correct 3D

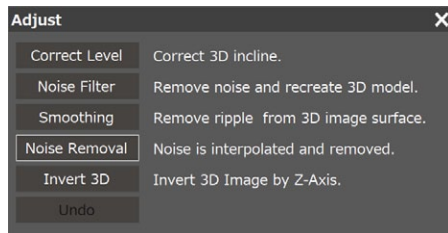
3D correction such as 3D inclination correction and noise elimination can be performed.

Option

Adjustment



Correction Menu will be displayed by clicking [Adjustment] in the sub menu.



- When plane correction, noise elimination, smoothing, or noise cut is performed, processing results will be reflected to 3D display on the screen. However, the results will not be saved in 3D data of the original file.

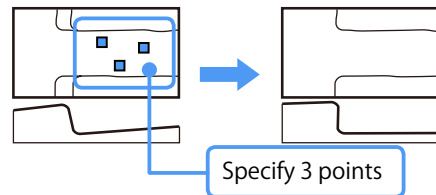
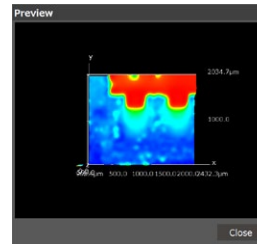
Plane correction

It corrects the entire tilt so that the tilting surface on the 3D display is straight. The field which should be the plane without any tilt is specified by the virtual plane obtained by 3 points.

- Click 3 points on the image displayed after clicking [Plane correction].

The rectangles appear on the clicked points. The average value of the heights in each rectangle is obtained.

If the size of the rectangle is to be changed Enter the peak size numeric value. The size of the rectangle changes.



- Click [Preview] for confirmation.
If the correction result is to be canceled, click [Reset] and click [OK].
- Click [OK].
The correction result confirmed on the preview screen is reflected on the 3D display.

Removing noise

When coarse grainy irregularities (noise) appear in the 3D display, this noise is removed.

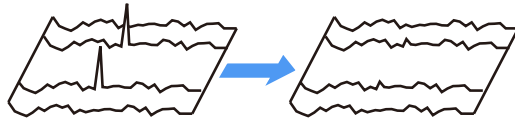
- Click [Noise removal].
The left side shows the preview of the settings which displays the parts judged as noise in black. While checking the preview, drag the slider or enter a numeric value.
The smaller the numeric value is, the narrower the field judged as noise is.
- Specify the processing method.
Follow the surroundings: It adjusts the height of the noise field to that of outer next field to it.
Follow the lowest position: It adjusts the height of the noise field to that of the lowest position around it.
Follow the highest position: It adjusts the height of the noise field to that of the highest position around it.
- Specify the strength of smoothing.
Drag the slider or enter a numeric value.
The stronger the smoothing is, the smoother the difference in heights appears.
- Click [Preview] for confirmation.
Click [Close] to return to the noise removal screen.
- Click [OK].
The noise removal effect confirmed on the preview screen is executed on the 3D display.

Correct 3D

3D correction such as 3D inclination correction and noise elimination can be performed.

Option

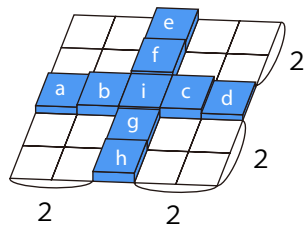
Smoothing



1. Click [Smoothing].
2. Select the processing method.

Moving average: It makes correction by calculating the average of heights.

Weighting average: It makes correction by adding the weight of a coefficient to the average of heights.



3. Select the number of points.
Specify the number of points around the measurement height when calculating the average of the heights.
The larger the numeric value is, the smoother the surface is.
Setting values 2, 4, 8, 12

3. Click [Preview] for confirmation.
Click [Close] to return to smoothing.
4. Click [OK].
The smoothing is done to the 3D display.

Moving average The height of the measurement point is obtained by averaging the height of the measurement point and "n" heights around the measurement point.

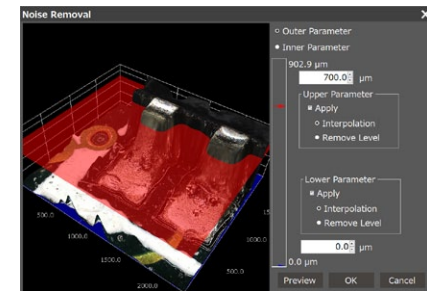
The height at every point is adjusted by moving the measurement point one by one.

Weighting average The height of the measurement point is obtained by adding the weight coefficient to the height of the measurement point and "n" heights around the measurement point and averaging them.
The height at every point is adjusted by moving the measurement point one by one.

Cutting 3D image noise

Cuts noise in 3D images

1. Set the level.
Set the upper and lower levels used to judge the noise.



2. Setting can be done by sliding the arrow mark or entering a value in the edit box.

[Interpolation] or [Cut level] should be selected for the processing method of each of upper and lower levels.

3. Interpolate the noise part with [Interpolation].
It interpolates the noise part; i.e. the data to be cut and the valid data next to it are connected by the straight correction value.
Cut level: It changes the noise part to the predefined cut level value.

4. Use Preview for confirmation.
Click [Close] to return to Noise Cut.

5. Click [OK].
The noise cut effect confirmed in the preview is applied to the 3D image.

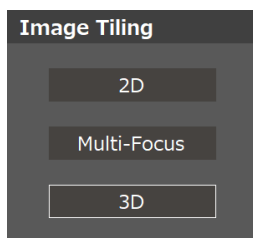
Chapter 5. Tiling

Procedure

1. Click [Tile] icon on the Top Menu.
The window for tiling will open.



2. There are 3 types of tiling.
Choose one according to use.



Item	Description
2D	Stitch 2D images taken.
Multi-Focus	Stitch images after creating omnifocal images.
3D	Construct images with height information and then stitch them.

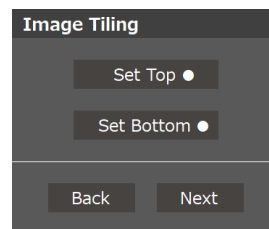
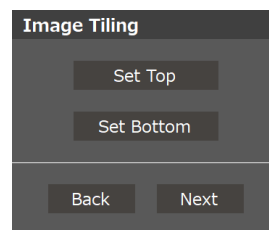
3. Perform [Top Setting] and [Bottom Setting] for [Omnifocal] and [3D].

This process is not required for [2D]. Proceed to the next item.

Click [Top Setting] and [Bottom Setting] at the highest and lowest positions of the image, respectively.

After completion of [Top Setting] and [Bottom Setting], the button will show white ● . See [Construct 3D] for details.

After completion of the setting, click [Next].



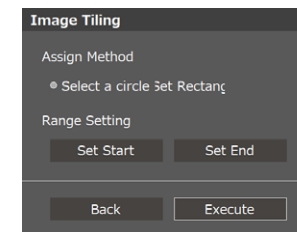
4. Specify the area for tiling.
Choose the specification method from [Circular Specification] and [Rectangular Specification].

Set Rectang

Take an image of the rectangular area set with the start point and end point.

The image when [Set Start] and [Set End] were clicked will be set as corresponding points.

After completion of the setting, the button will show white ● .



Select a circle

Take an image of the incircle area set with 3 points.

The image obtained by clicking [Point 1], [Point 2], and [Point 3] will be set as corresponding points.

After completion of the setting, the button will show white ● .

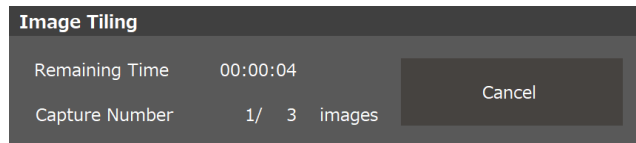
Tiling

Wide-range image can be taken while maintaining high resolution by tiling (linking) images taken.

Option

Procedure

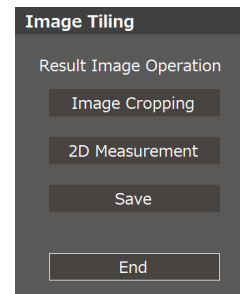
- 5.** Tiling starts.
The remaining time to tiling completion and the number of images taken will be displayed.
To suspend image-taking, click [Cancel].



- 6.** After completion of tiling, [Result Image Operation] window will be displayed.

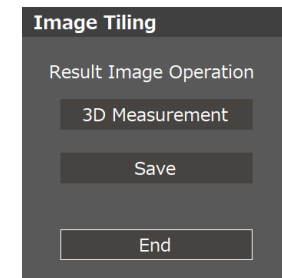
2 D / Multi-Focus

[Image Cropping], [2D Measurement], and [Save] can be performed.

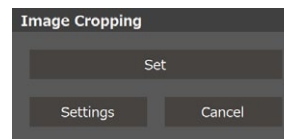


3 D

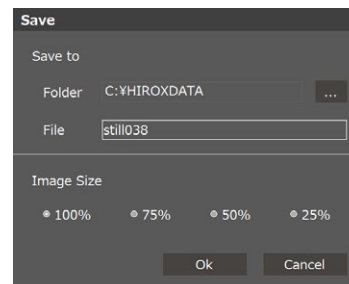
[3D measurement] and [Save] can be performed.



- Cutout Image: A blue rectangle will be displayed. Circle the cutout area by operating the rectangle and choose [Set], then the image will be cutout.



- Save: Image can be saved.



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