



3D Surface Profiler Quick Start Guide

- Profile Measurement -

Introduction

Thank you for your purchase of the VK-X3000 Series 3D Surface Profiler.

First, we will introduce basic operation. You can understand basic operation using a common object such as a coin.

This manual describes profile measurement of 3D data gathered by the VK-X3000.

The profile measurement is the function to measure “height”, “distance (length)”, “cross-sectional area”, “angle”, “R (arc)”, etc. of a profile graph of any profile line (straight line and curve).

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Chapter 1

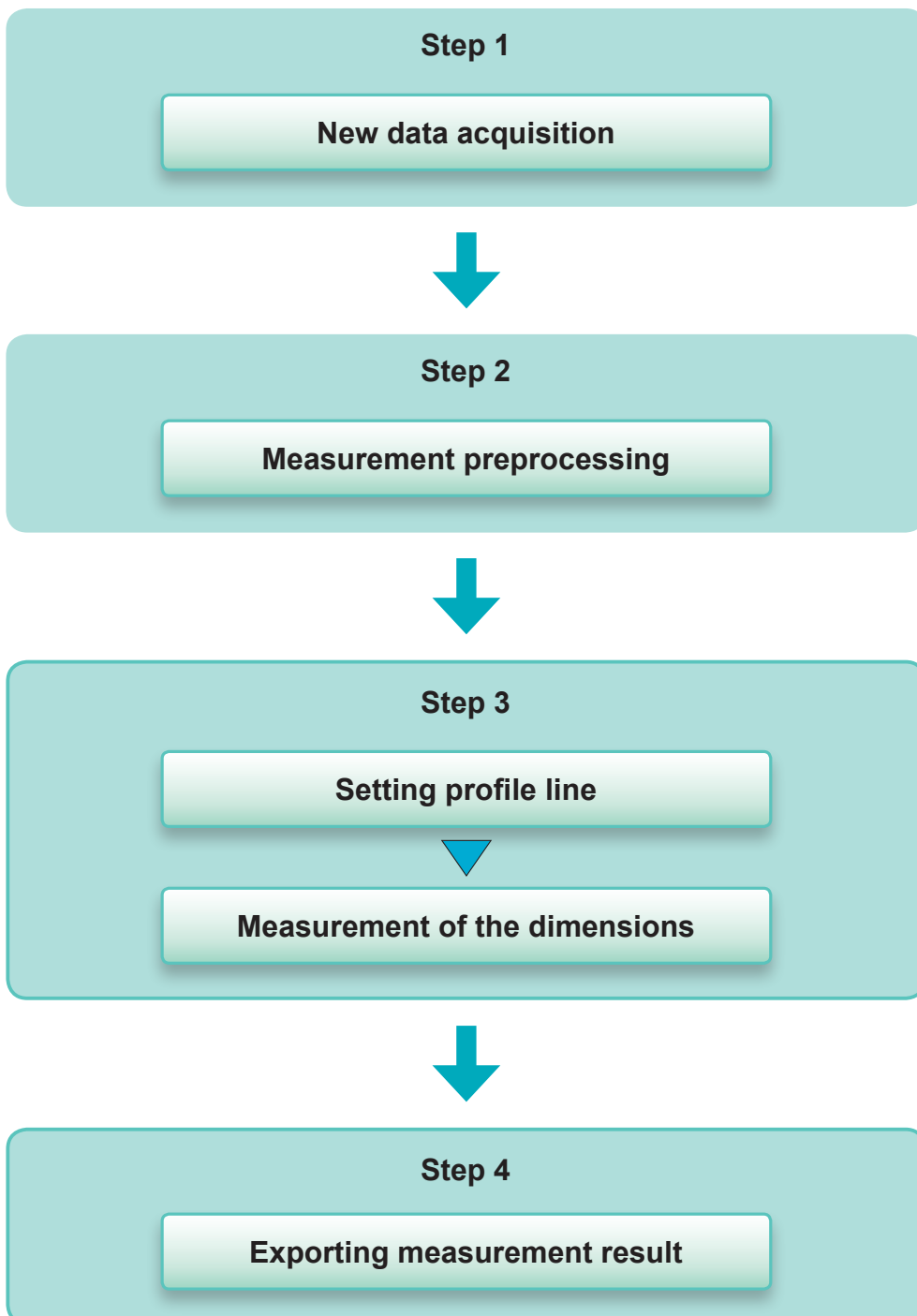
Before Starting Operation



The operation flow of the VK-X3000 Series is as follows.

- | | |
|--------------------------------------|--|
| Step 1: New data acquisition | → Obtain a 3D image by measuring a sample |
| Step 2: Measurement preprocessing | → Remove the tilt and noise of the obtained 3D image |
| Step 3: Use the measurement function | → Measure preprocessed data using various functions |
| Step 4: Export measurement result | → Output a measurement result to a report or Excel |

This manual describes Step 3 and Step 4.



● New data acquisition

Measure an object and obtain a 3D image including color information.

For details, see "Quick Start Guide: Gathering New Data using Focus Variation/White Light Interferometer", and "Quick Start Guide: Gathering New Data using Laser Confocal".



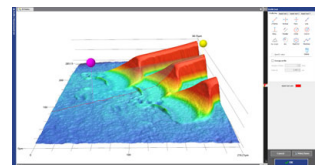
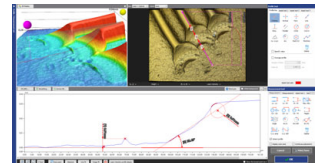
● Measurement preprocessing

For details, see "Quick Start Guide: Image Processing".

● Using the measurement function

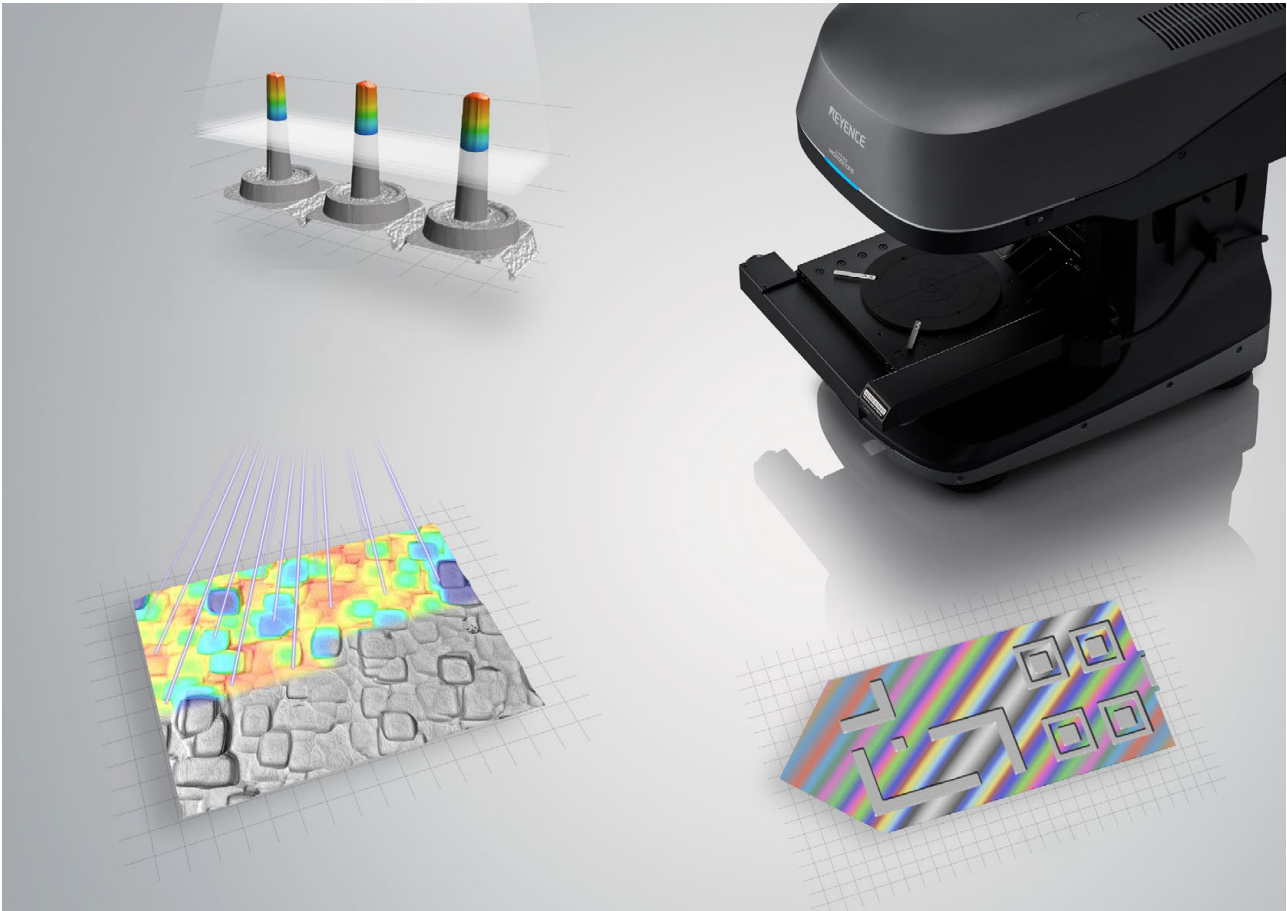
Perform various measurements from an obtained 3D image.

- Cross section shape measurement
- Roughness measurement
- Comparison of two types of data
- Film thickness measurement



Chapter 2

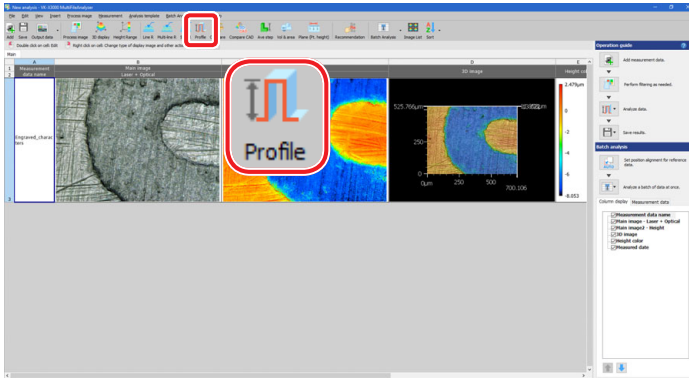
Performing the Profile Measurement



A profile line is a virtual cross-section of a location of interest on your sample. First, a profile line should be created.

1. Select the profile measurement.

Click the [Profile] button on the toolbar. Alternatively, select [Profile measurement] from the [Measurement] menu.

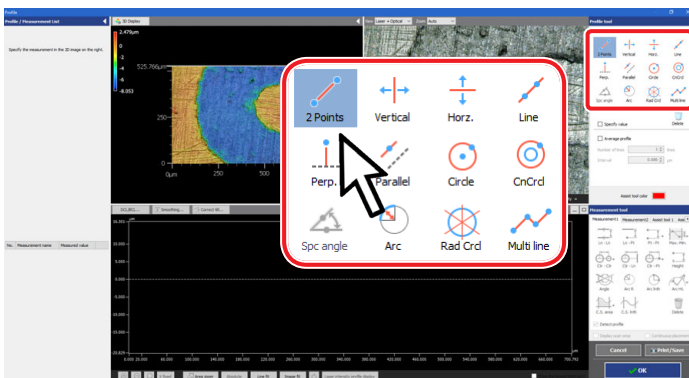


- **Reference plane settings**
An object placed on the stage appears level to the naked eye, but to the microscope it is slightly tilted. Perform "Reference plane settings" in advance to obtain the correct measurement result.

- **Setting profile line**
Set a cross section to be measured to the measured data. These are called "Profile line" for the VK-X3000 Series.

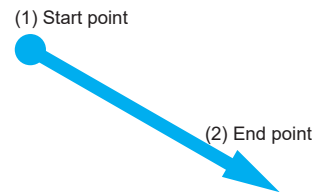
2. Click [2 Points] in [Profile line] to select.

Create a cross section profile using the 12 types of profile tools that appear on the top right of the screen. In this case, select [2 Points].

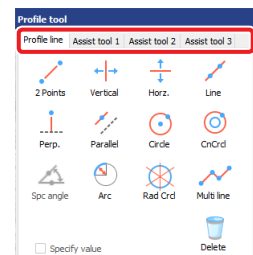


- **How to use the profile tool**
This section describes how to set the measurement line by the 2 points function.

- (1)Click a position to be a start point, and move the mouse pointer.
- (2)Click a position to be the end point.



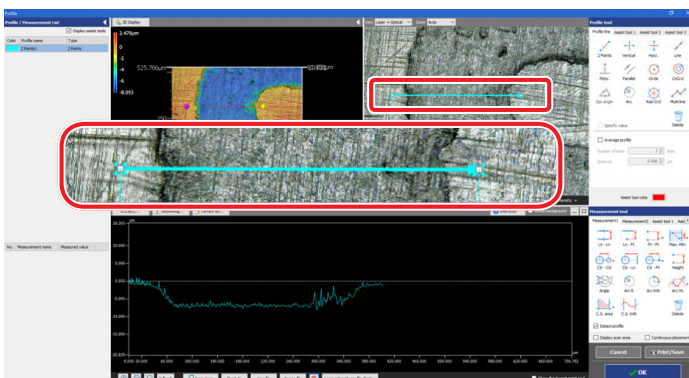
- **Profile line assist tool**
A profile line can be specified using a vertical line, circle, etc. other than the 2 points function. In addition, switching to the assist tool tab can draw a midpoint, intersection, etc.



3. Draw a line by clicking on the image where the cross section should be placed.

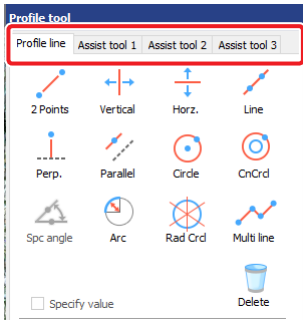
On the top right of the screen, place the cursor over the area where you want to create a cross section profile, then click it.

In the lower half of the screen, the cross section profile is displayed.



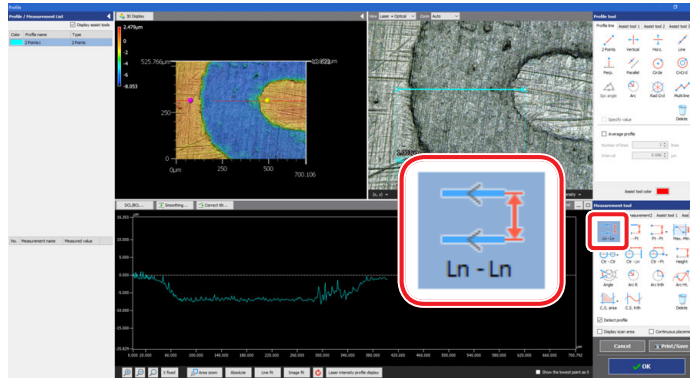
● Profile line assist tool

A profile line can be specified using a vertical line, circle, etc. other than the 2 points function. In addition, switching to the assist tool tab can draw a midpoint, intersection, etc.



The profile measurement can specify arbitrary measurement intervals (between two lines, points and circle centers, etc.) on the profile display area, and calculate the measurement value for each interval.

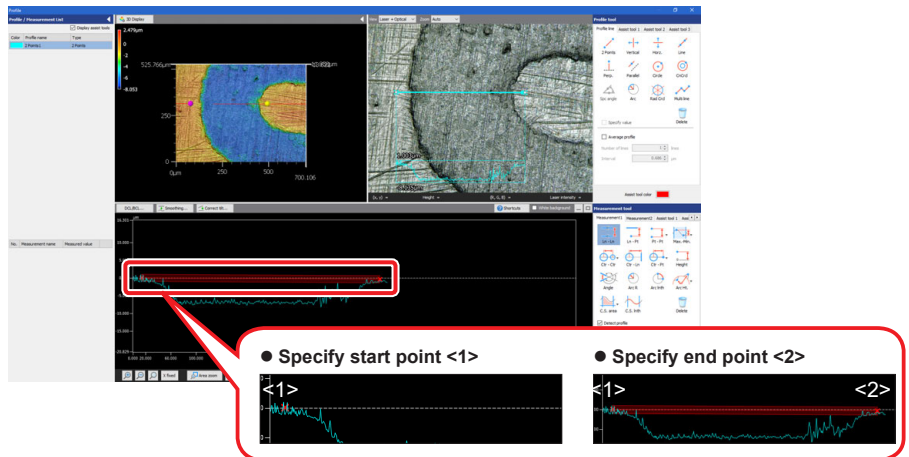
1. Click [Ln - Ln] of [Measurement] to select.



2. Specify the start point and end point of the place to be measured.

Specify the place to be measured within the profile screen.

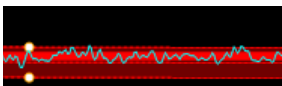
Move the cursor on the start point <1> of the place where you want to detect the line, then specify the red frame by clicking at the end point <2>.



● Extracting the profile

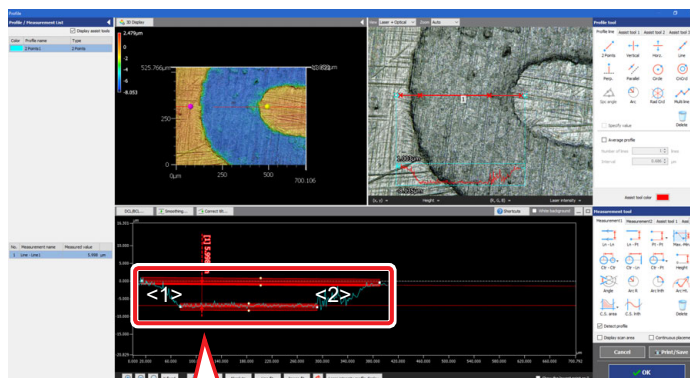
Drawing a measurement line displays a red frame with a belt shape.

Even if the measurement line is drawn with slightly tilted, the measurement data within the red frame is automatically extracted, thus no click error occurs.



3. Draw another measurement tool [Red frame] on the profile graph, and measure the step.

Similarly, specifying the end point <2> sets the range, and a straight line is created.



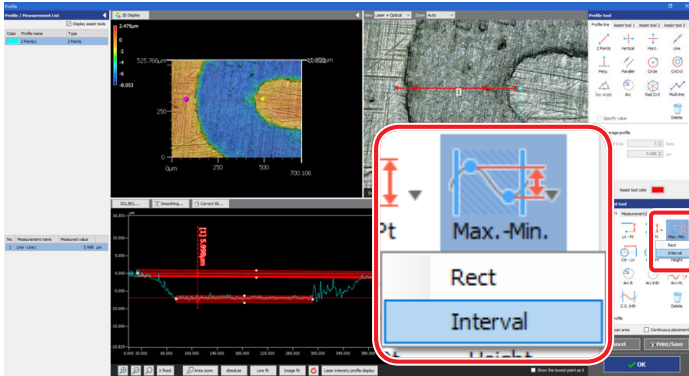
On the profile line, specify the start point <1>, and the end point <2> for the red frame, and draw the measurement line.

Next, determine the maximum value and minimum value on the specified profile graph.

- Click [Max. -Min.] of [Measurement], and select the specification method (rectangle or interval) of the measurement intervals from the pull-down menu.

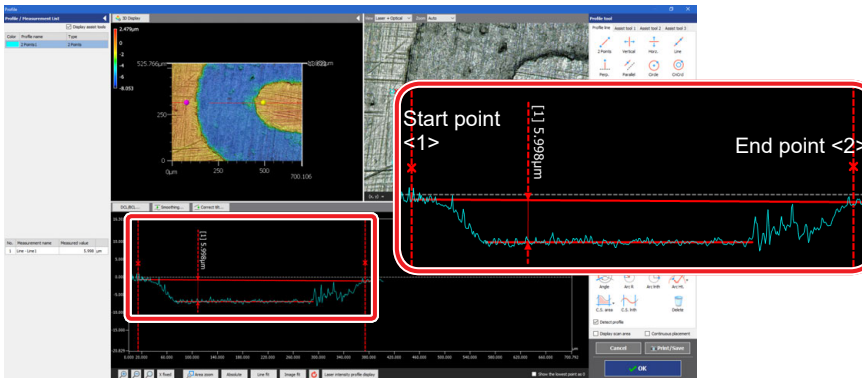
Perform measurement using the 16 types of measurement tools that appear on the bottom right of the screen.

In this case, click the [Interval] button of [Max. -Min.].



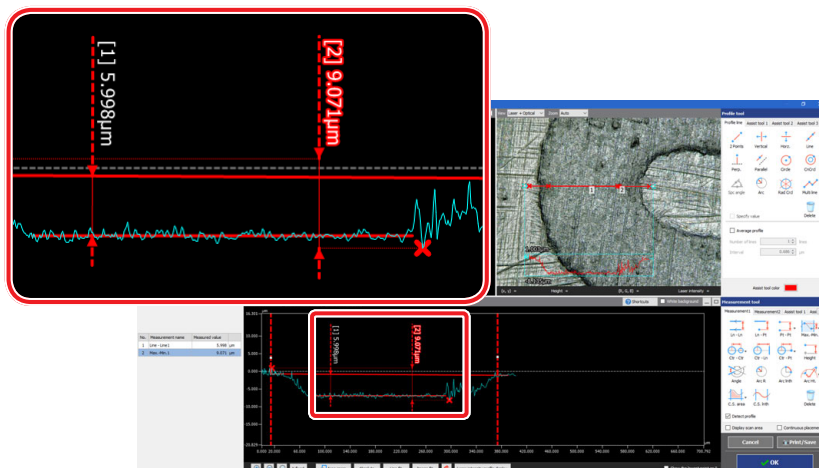
- Specify the range to be measured, or the start point <1> and end point <2>.

Move the cursor and click the position to display the measured value.



- Check the measurement result.

The measurement results of [Max. -Min.] appears.

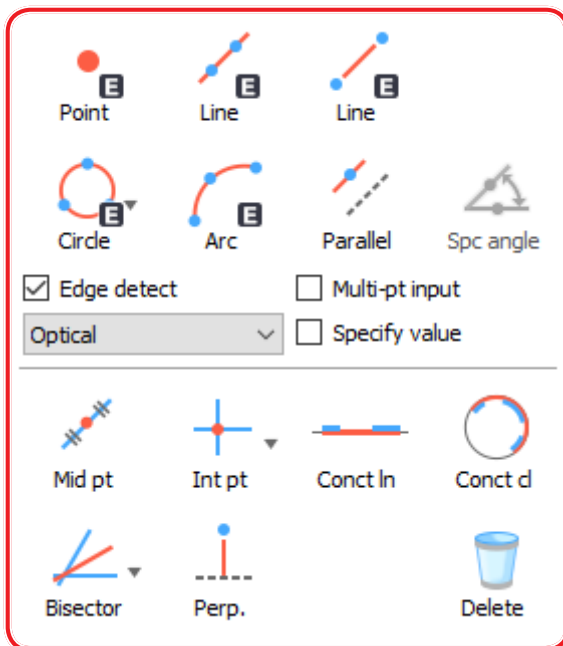
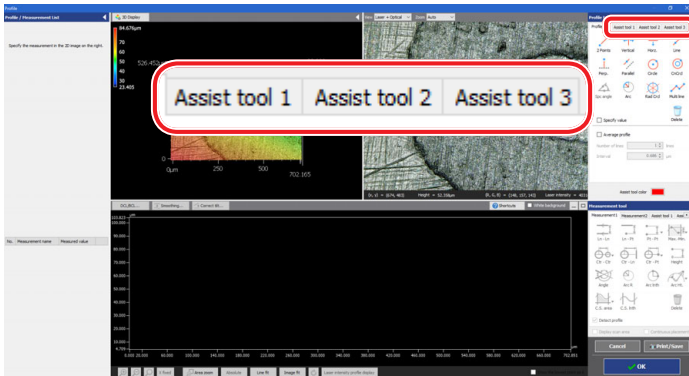


This section describes the use of assist tools in the profile menu.

Assist tools are supplementary points that can be referenced to make measurements more robust. Assist tools will make measurement analysis more accurate and efficient.

1. Click the [Assist tool 1], [Assist tool 2], and [Assist tool 3] tabs to check their contents.

Click [Assist tool 1], [Assist tool 2], and [Assist tool 3] from [Profile tool].

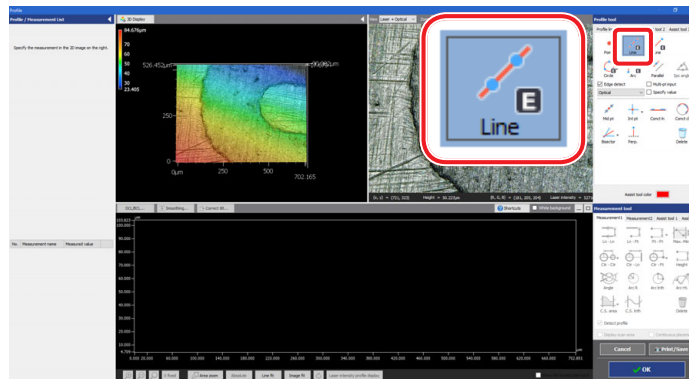


Assist tools such as points, lines, or circles can be used to assist in measurement.

In this example, a bisector will be used.

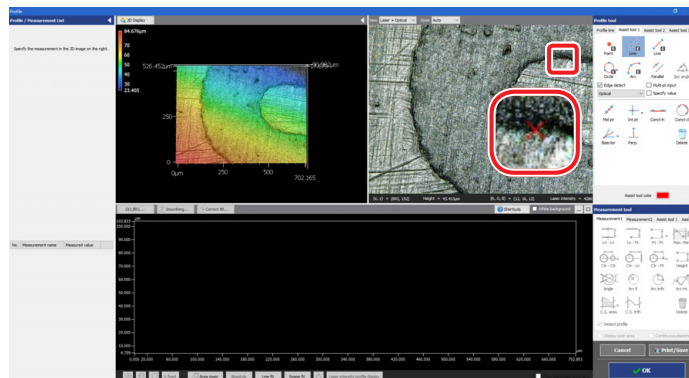
2. Click the [Line] button from [Assist tool 1].

Click the [Line] button from [Assist tool 1] in the profile tool.



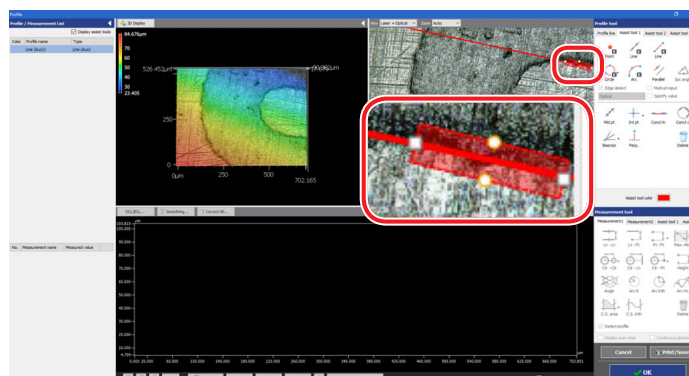
3. Specify the start point of the area where the edge is detected.

Select the area where the edge is detected by setting the clicked point as the start point.



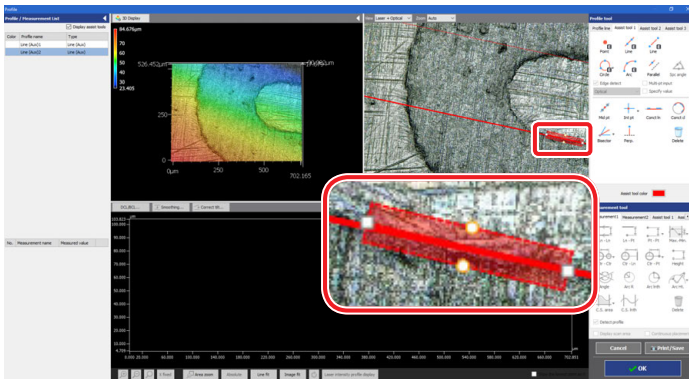
4. Specify the end point of the area where the edge is detected.

Similarly, specifying the end point sets the range where the edge is detected, and a straight line is created.



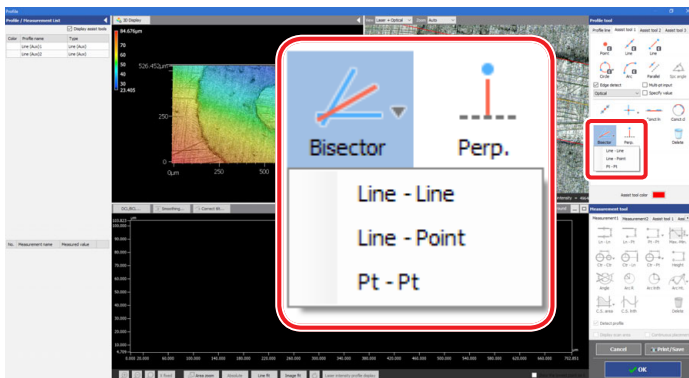
5. Similarly, create another straight line.

Create the other straight line on the bottom side in the same way.



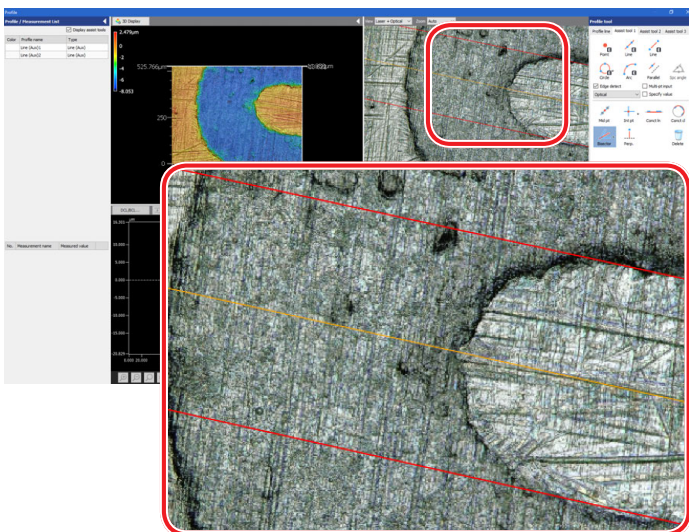
6. Click [Bisector] → [Line - Line] from [Assist tool 1].

Click [Line - Line] of [Bisector] from [Assist tool 1] in the profile tool.



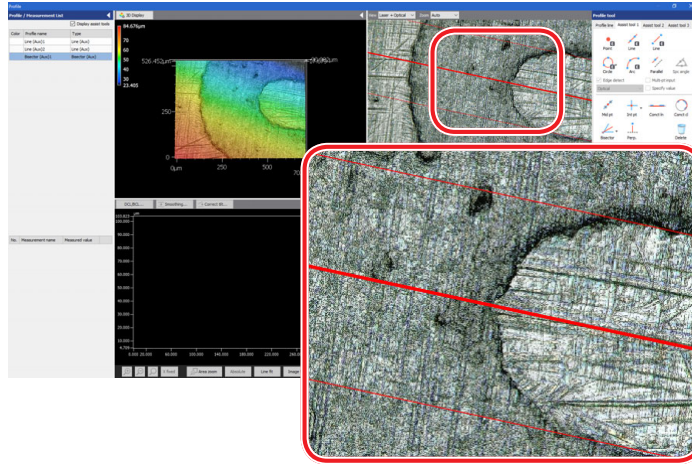
7. Click the top and bottom straight lines in order.

Click the top and bottom straight lines to display the bisector.



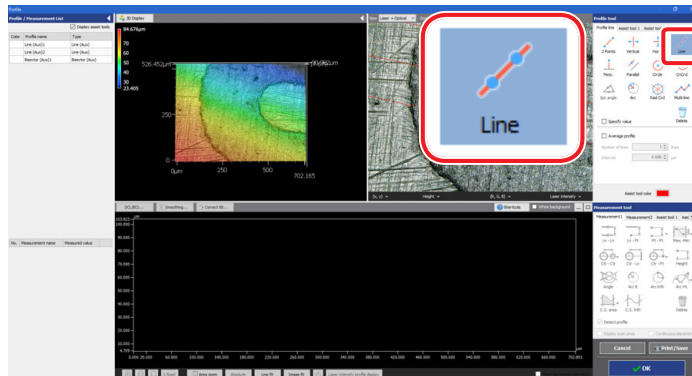
8. Click a position around the displayed bisector.

Clicking changes the display to red, and the bisector is created.



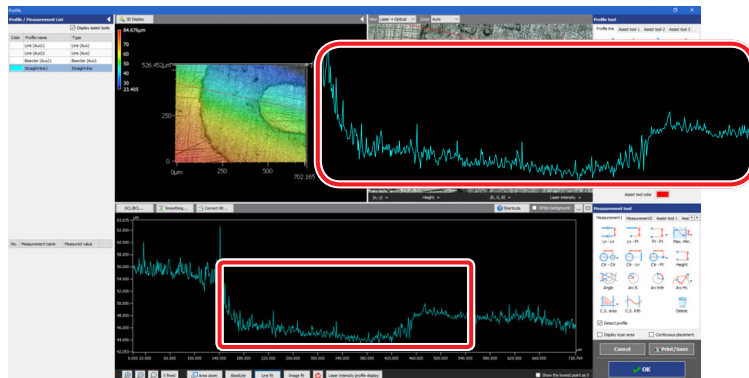
9. Select the profile tool.

Click [Profile line] - [Line].



10. Click the created bisector, and set the profile line.

Clicking the created bisector creates the cross section profile on the bisector.



This operation can make a cross section profile smoother by averaging measured data.

1. Select [Smoothing].

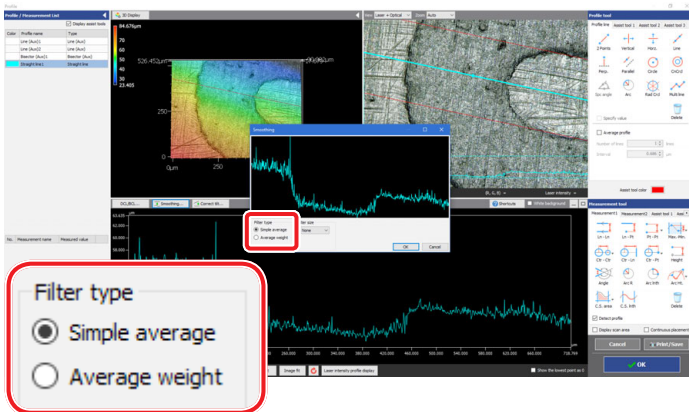
Click the [Smoothing] button.



2. Select a filter type.

Select a filter type in the [Smoothing] dialog box.

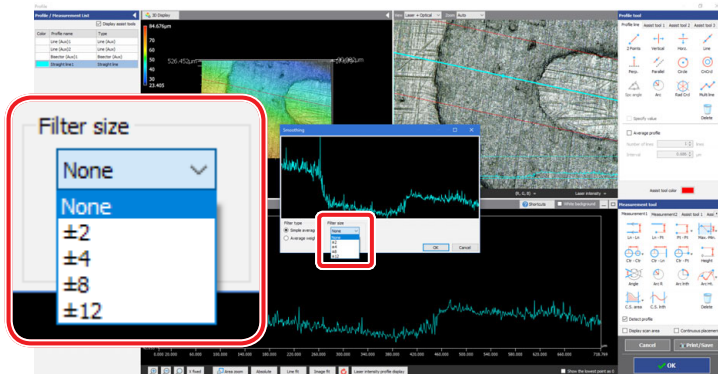
In this case, click the [Simple average] radio button.



3. Select a filter size, and click the [OK] button.

Select a filter size in the [Smoothing] dialog box.

In this case, click ± 2 .



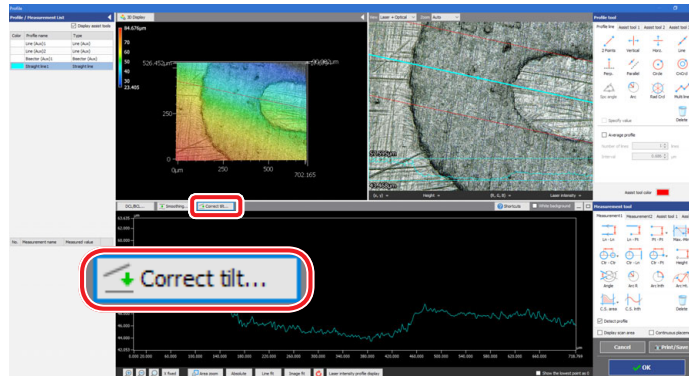
● Filter types

- [Simple average] radio button
Simply averages the height data specified in [Filter size]. This can greatly reduce noise, but shapes (such as edges) tend to become softer than they should be.
- [Average weight] radio button
Multiplies height data specified in [Filter size] by a weighting factor, then average them. This makes the specified range smoother, preserving the sharpness of edges as much as possible.

The tilt of the profile line can be corrected to be leveled.

1. Select [Correct tilt].

Click the [Correct tilt] button.



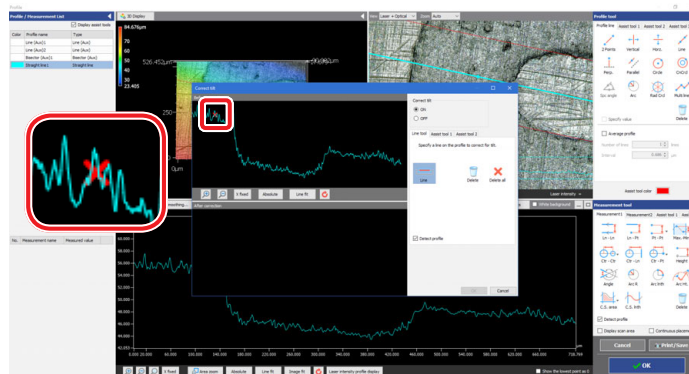
2. Select [Line].

Click the [Line] button in [Line tool].



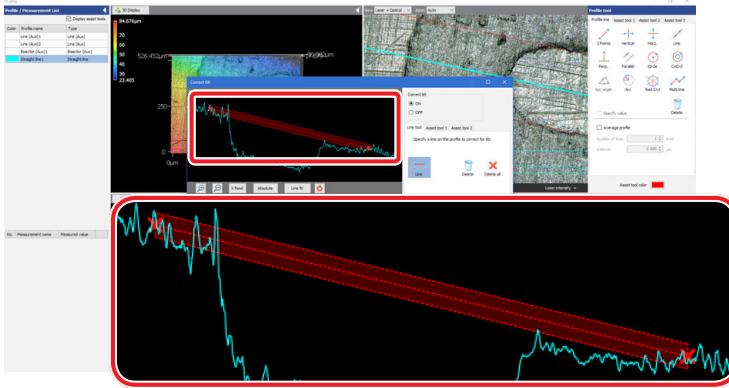
3. Specify the start point of the part where the tilt is leveled.

Select the area where the tilt is leveled to the profile of the area before correction, by specifying the clicked point as the start point.



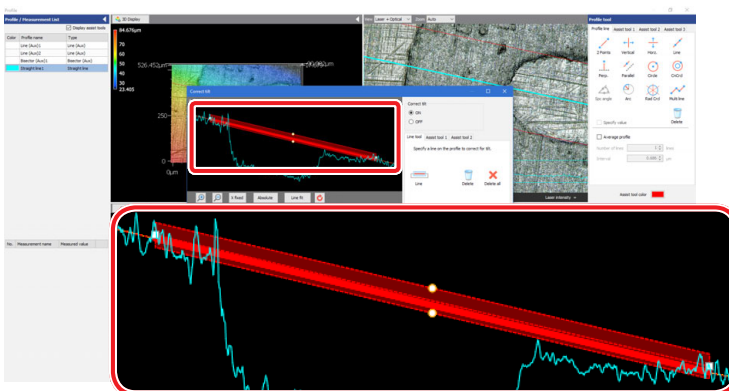
4. Specify the end point of the part where the tilt is leveled.

Similarly, specifying the end point sets the range where the tilt is leveled, and a straight line is created.



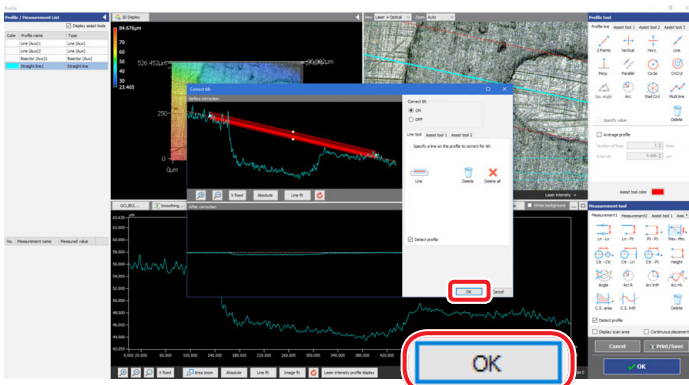
5. Check that the cross section profile has been created.

The image where the tilt has been leveled to the profile of the area before correction is displayed.



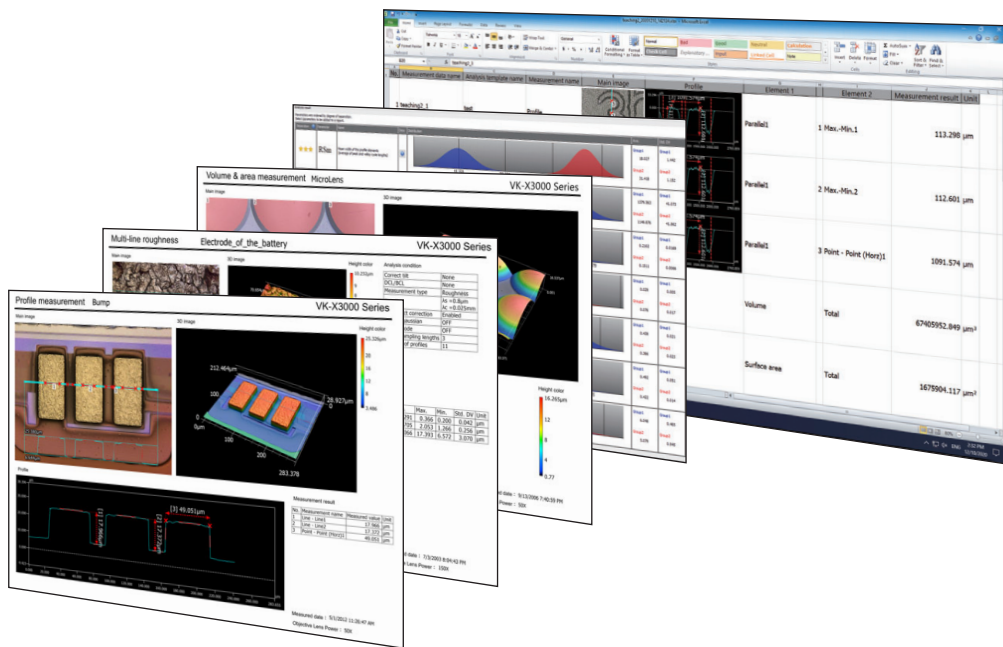
6. Click the [OK] button.

The tilt correction is executed.



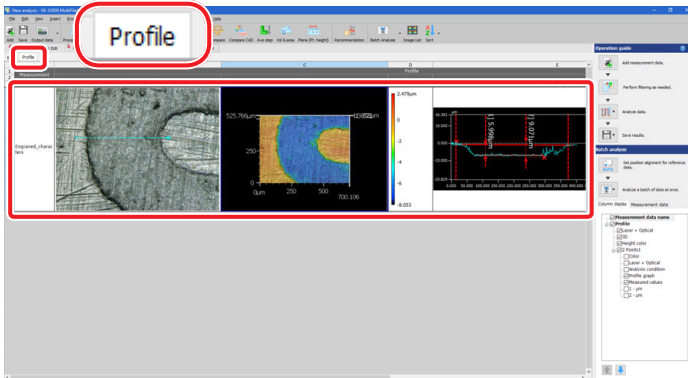
Chapter 4

Exporting Measurement Result



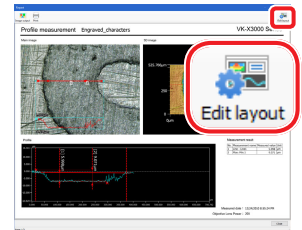
You can display a report of measurement results by the Multifile Analyzer in another window. For the report, its layout can be edited and file can be output.

1. Select the grid sheet including the measurement result you wish to display in report.

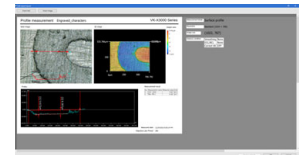


● Edit the report layout

Clicking the [Edit layout] button displays the [Edit report layout] screen.



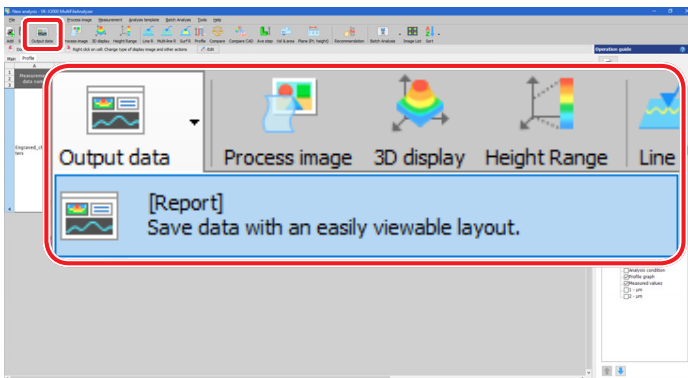
The report layout can be edited.



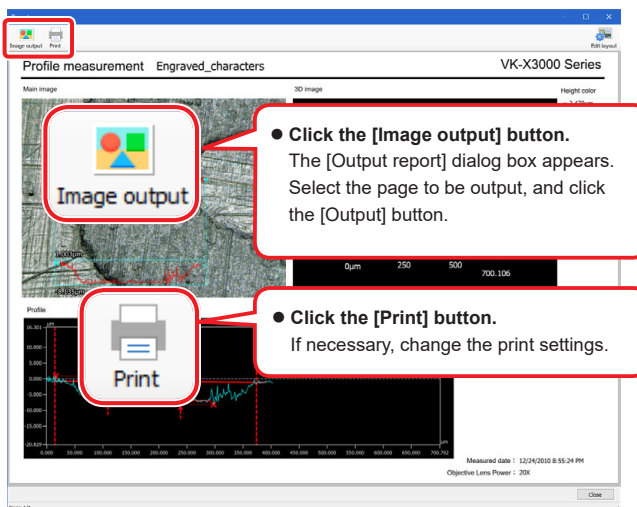
- Click the [Insert text] button to insert the text box.
- Select an image and right click it, a menu related to layout editing will appear.
- Click the [Insert image] button to insert the image.
- Click the [Back to default] button to return to default.

2. Select [Report] from the [Output data] button on the toolbar.

The report screen appears.



3. Save it as an image file by clicking the [Image output] button on the toolbar. Click the [Print] button to print.



4. Click the [Close] button to close the screen.

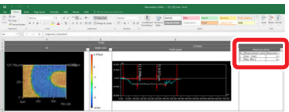
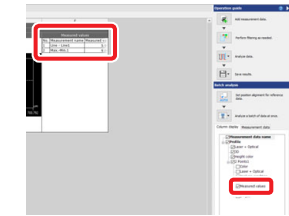
For the result measured by the Multifile Analyzer, the content of the grid view area is output to Excel file in unaltered form.

- The file is saved as an Excel workbook (*.xlsx). This extension is the standard file format for Excel 2007 and later.
- When you export to an Excel file, images, graphs, tables within cells and all other content of the grid sheet is output in unaltered form. Before performing the output, adjust the size of the grid sheet.

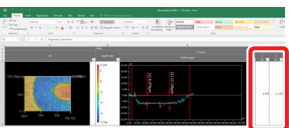
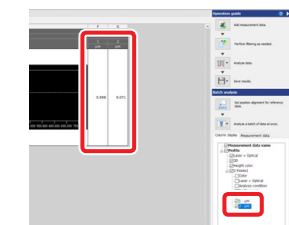
• About the grid sheet layout and the cell of the Excel output

The layout of the grid sheet is applied on the Excel sheet as it is.

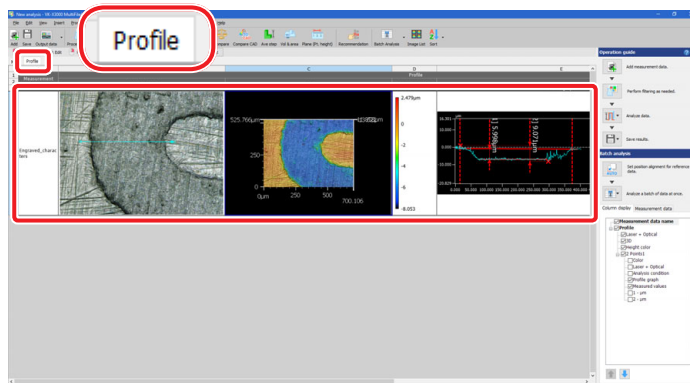
- The measurement results displayed in the [Measurement value list] checkbox of the [Column display] tab are output as images on the Excel sheet.



- The measurement results displayed individually in the [Column display] tab are output as numeric values to each cell on the Excel sheet.

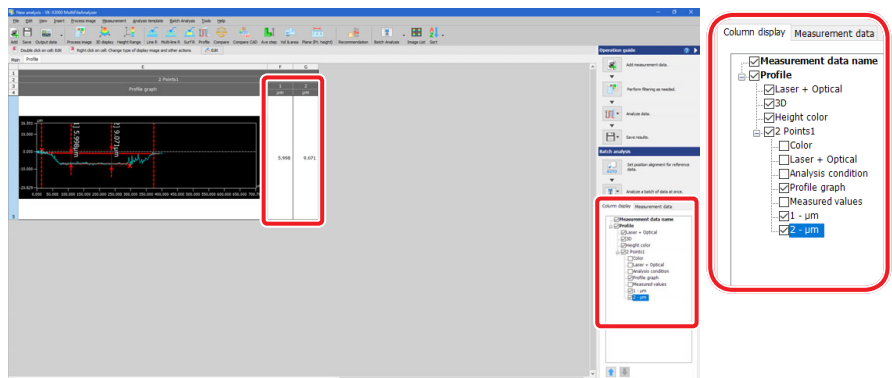


1. Select the grid sheet including the measurement result you wish to output in an Excel file.



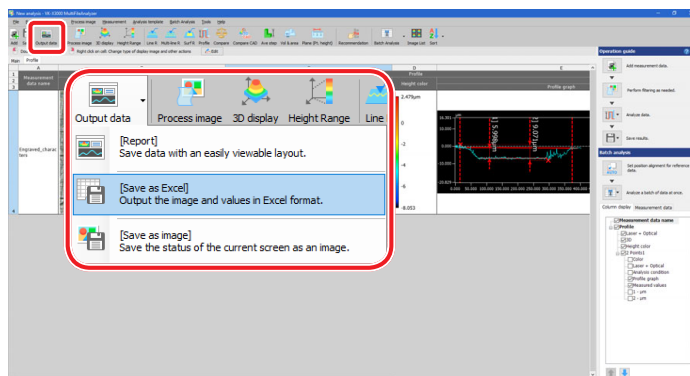
2. Select the measurement results you wish to output to cells in the Excel worksheet from the checkbox of the [Column display] tab.

Selecting the [Column display] tab adds the each result of the measurement items to each cell of the measurement results.

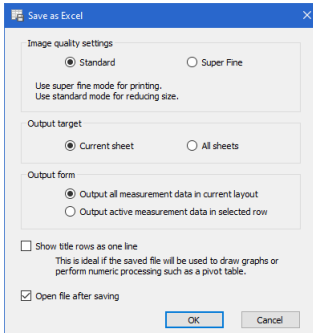


3. Select [Save Excel] from the [Output data] button on the toolbar.

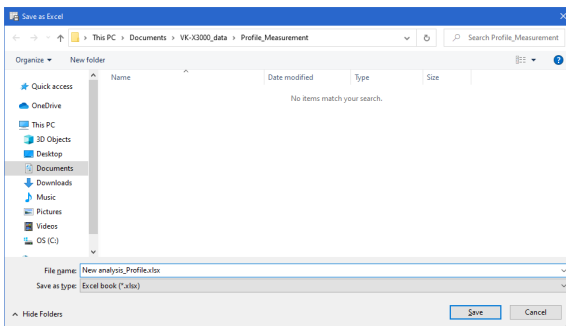
The [Save as Excel] dialog box appears.



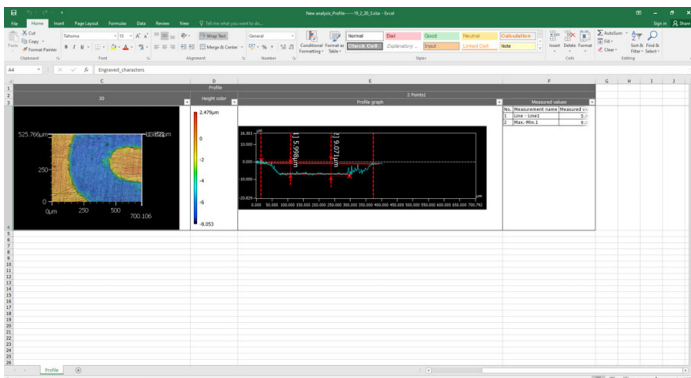
4. Change items as needed, and click [OK].



5. Select a destination folder in which to save the Excel file. Enter the file name, and click the [Save] button.



If Microsoft Office or Microsoft Excel is installed on your PC, the output file is displayed automatically.



Even if Microsoft Office or Microsoft Excel is not installed on your PC, the measurement results can be saved as an Excel format file.

In this case, use the output file with another PC.

- Microsoft Office, Microsoft Excel and Excel are registered trademarks of Microsoft Corporation.
- It is necessary to prepare Microsoft Office and Microsoft Excel separately when KEYENCE delivers the PC.

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Specifications are subject to change without notice.

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