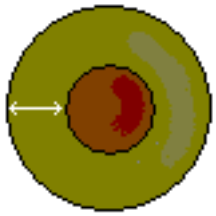


kaloSOFT

Version 3.66

Manual

BAQ

Content

1 Introduction

kaloSOFT is a computer-assisted video evaluation system for the determination of layer thickness and wear resistance.

By means of kalosoft, layer thickness and wear coefficient can be determined simply with a few mouse clicks. The calculation, storage and administration of data is easy and comfortable. Several series of measurements are summarized in a project and can be managed easily.

For measuring the layer thickness of coatings or layer systems, a small spherical cap is grounded into the layer down to the base material by means of the kaloMAX cap grinder. On flat surfaces, the outline of the cap is circular. On cylindrical surfaces, it is elliptical. The layer thickness can be calculated from the difference of the cap diameter at the surface of the sample and the diameter of the boundary between layer and base material. These diameters can be measured with a microscope. The diameter of the grinding ball, which goes into the calculation, is known. This purely geometrical method for the determination of layer thickness can be extended to layer systems.

For the abrasive wear characterization of materials and layers, the high-precision wear resistance tester kaloMAX NT is used in combination with the kaloSOFT program.

The wear crater should be ground into the layer without breaking through to the base material. The width and depth of the wear crater has to be measured by means of a surface profiler or a microscope.

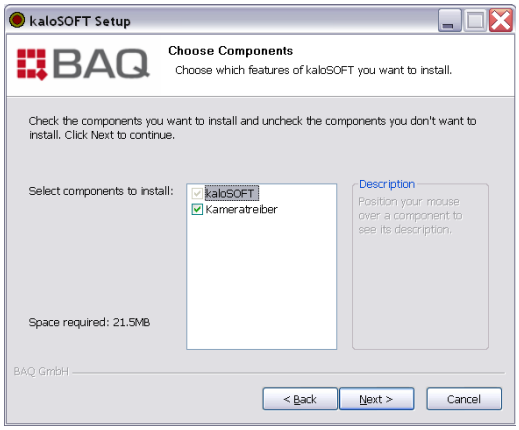
The wear coefficient specific to the abrasion slurry can be determined from the volume of the wear crater, the bearing strength and the grinding path. The volume of the wear crater can be calculated from the diameter of the grinding ball and the depth or the diameter of the wear crater.

Note: Please notice that the display of the camera image is bound to the associated camera.

2 Installation

Start Setup.exe on the provided CD to install kaloSOFT.

Press ' **Next >** ' to start the installation.



On the next screen, select the components you want to install. Usually, you should install the camera driver.

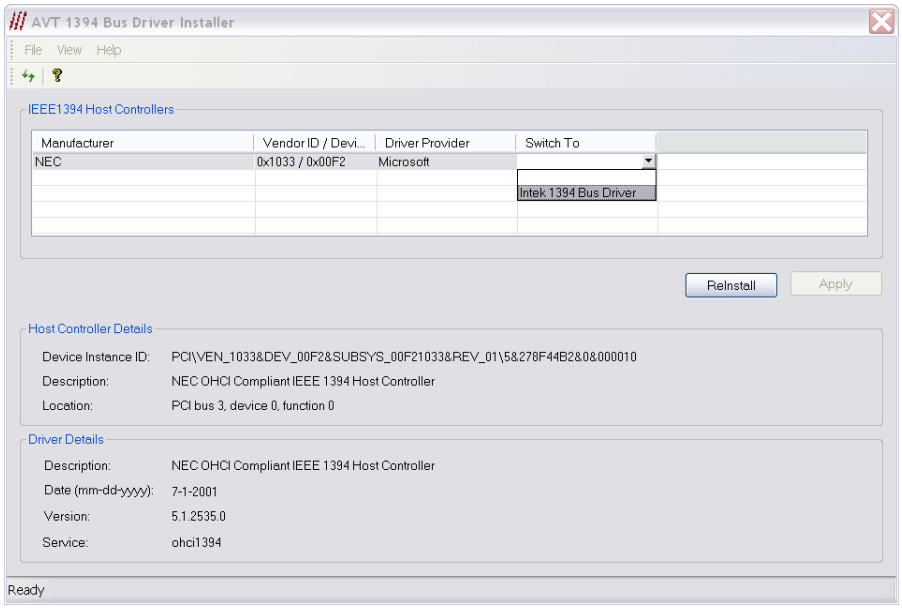
Press ' **Next >** ' to continue.

On the next screen, you can select the folder in which kaloSOFT will be installed. Then the start menu folder can be selected. The installation starts after you have pressed ' **Install** '.

If the camera driver shall be installed, the according routine will be started at the end of the installation process.

Press ' **Next >** ' to start the installation.

At the end of the installation of the AVT FirePackage, the IEEE 1394 driver has to be installed. To do so, check the box labelled '**Run Driver Installer**' and press ' **Finish** '. The AVT 1394 Bus Driver Installer' will be started.



Click on the empty box beneath 'Switch To'. A list of valid drivers will be shown. Select 'Intek 1394 Bus Driver' and press ' **Apply** '. Close the window when the installation is finished.

3 Projects

kaloSOFT combines the measurement data into series of measurements which are summarized to projects.

To create a new project, select the menu item **Project / New** and enter path and file name in the dialogue.

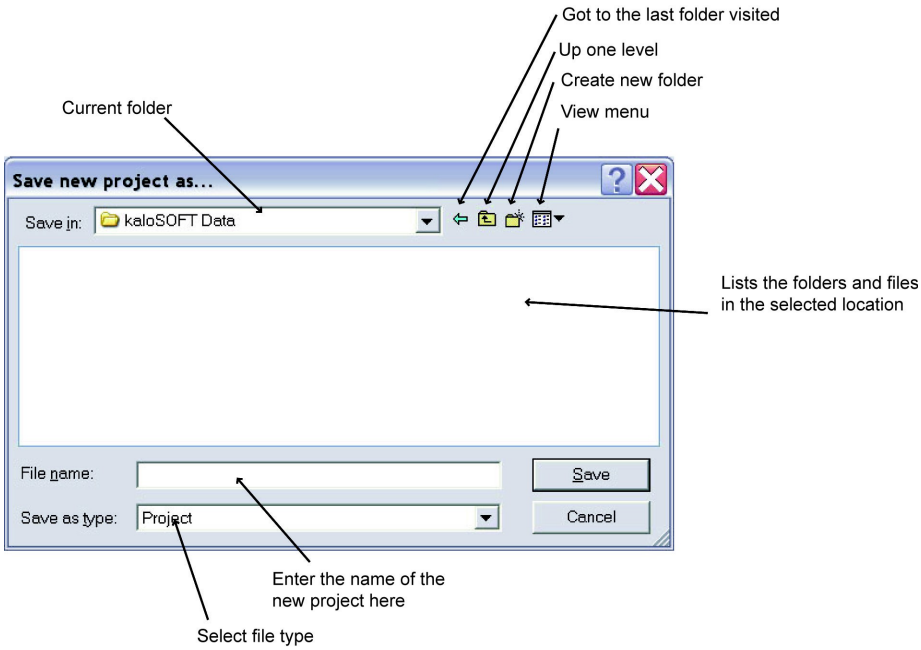


Figure 1

Click **Project / Open** in the menu to open an existing project.

You can take measurement without having created or opened a project first, but if you want to save the series, you will be asked for the project. The measurement series belonging to a project will be automatically stored into the same folder as the project. For the purpose of clarity, it is advisable to create a new folder for every project.

To save the project, select the menu item **Project / Save**.

4 Main Window

The main window will be opened when kaloSOFT has been started. The project view will be selected.

The menu and the toolbar are placed at the top of the main window. The most commonly used commands are easily accessible in the toolbar (see Figure 2).

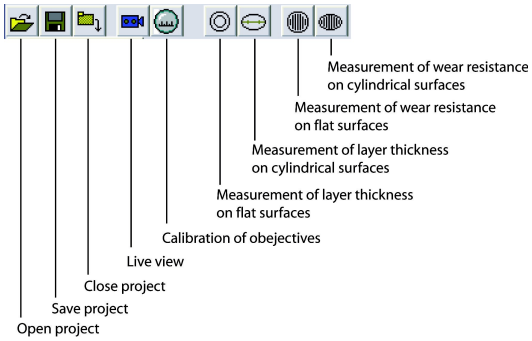


Figure 2

If a project is loaded, you can switch between the project view and the graph view with the 

tabs .

The project view shows the project data and an overview over the series of measurements belonging to the project.

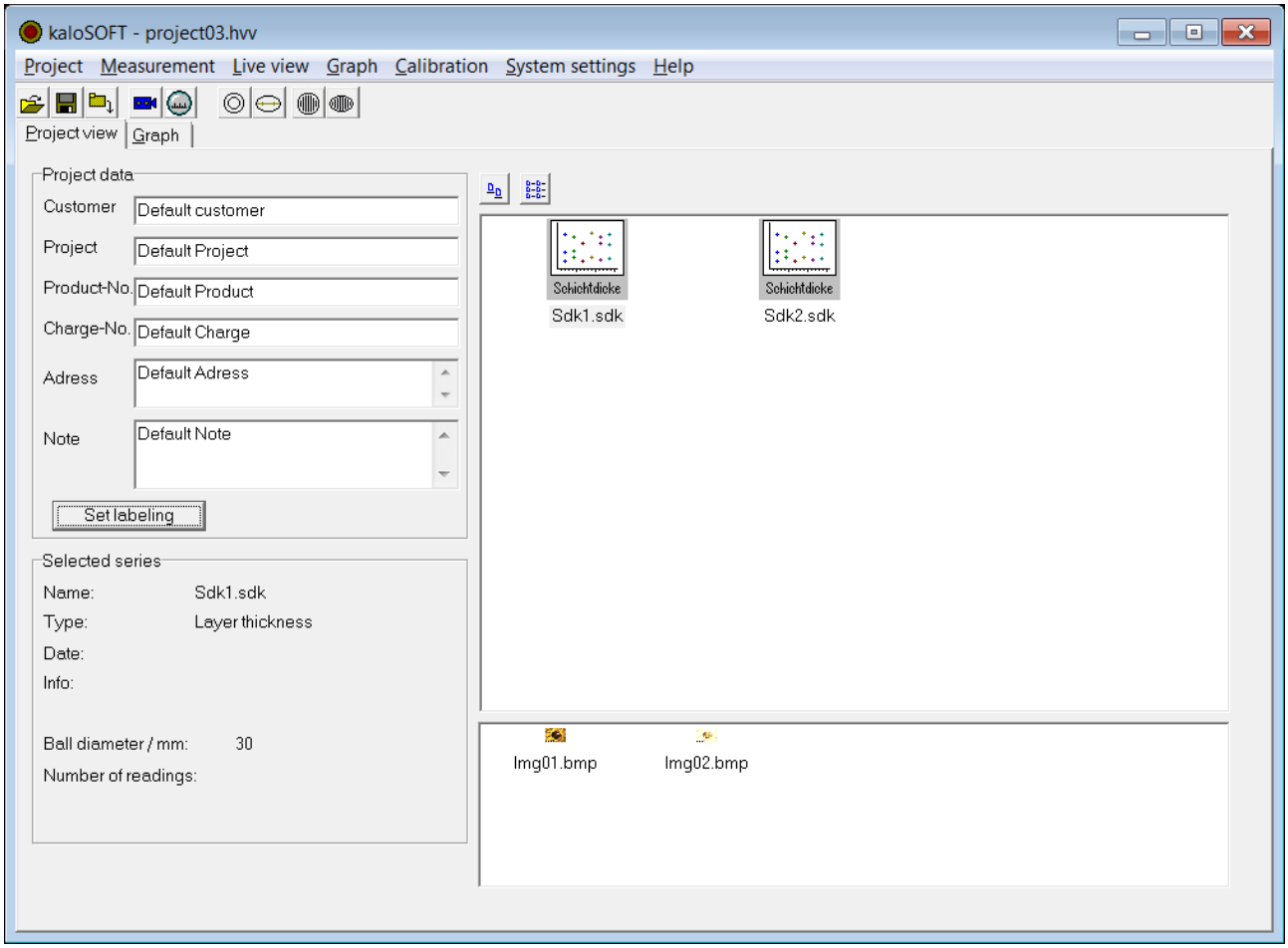


Figure 3

On the left side, the project data and some information about the selected series are shown. On the right side, a list of the series of measurements belonging to the project is displayed. Beneath the series of 

measurements, the measured images are shown. Use the buttons to switch between the list view and the symbol view. The selected series is highlighted.

The project data keeps information which are common to all series of measurements belonging to this project. To change the labelling of this data fields, open the settings dialogue with the 

button .

Figure 4

Now the labelling can be changed according to your needs.

The labels are saved with the project, so different projects can have different labels. The labels can be saved as default, so that every new project is created with the same labelling.

To display the graphical view of a series of measurement, select the appropriate list item and press the tab 

. In case of wear resistance files, it is possible to display multiple series in one graph. To select more than one series, hold the Ctrl-key on your keyboard while clicking on the list items.

The graph view is discussed in chapter 6.

5 Measurement

5.1 Measurement modes

kaloSOFT is useful to determine layer thickness and wear coefficient on flat and cylindrical surfaces.

kaloSOFT combines the measurement data into series of measurements. Before the spherical caps can be measured, you have to select the measurement mode. The data will be interpreted in different ways, depending on the measurement mode. Available measurement modes are:

- Layer thickness on flat surfaces
- Layer thickness on cylindrical surfaces
- Wear resistance on flat surfaces
- Wear resistance on cylindrical surfaces
- Image measurement

According to the selected mode, various parameter must be set for the measurement (see chapter 5.2). For recurrent test conditions, these parameter can be saved and reloaded.

5.2 Measurement parameter

For each measurement mode, the parameter can be saved, so that they can be reloaded if similar conditions are needed.

5.2.1 Layer thickness

For the calculation of layer thickness, the diameter of the grinding ball must be known.

Select the menu item **Measurement / Layer thickness flat surfaces** or **Measurement / Layer thickness cylindrical surfaces**.

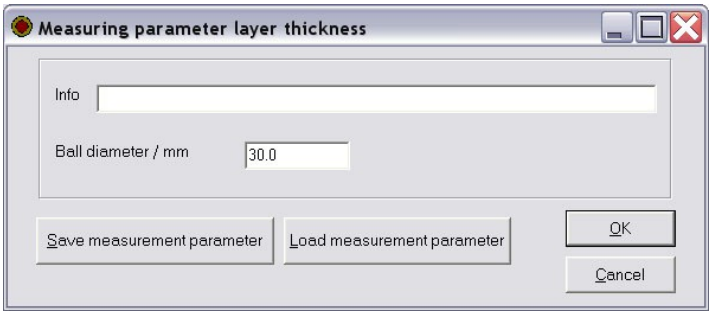


Figure 5

Enter the diameter of the grinding ball and an information text for this series.

Close the dialogue by pressing *OK*.

Now the camera image will be displayed and the spherical cap can be measured (see chapter 5.3).

5.2.2 Wear resistance

The diameter of the grinding ball, the bearing strength (see kaloMAX NT manual) and the grinding path or the

number of revolutions of the grinding ball must be known to calculate the wear coefficient.

Select the menu item **Measurement / Wear resistance flat surfaces** or **Measurement / Wear resistance cylindrical surfaces**.

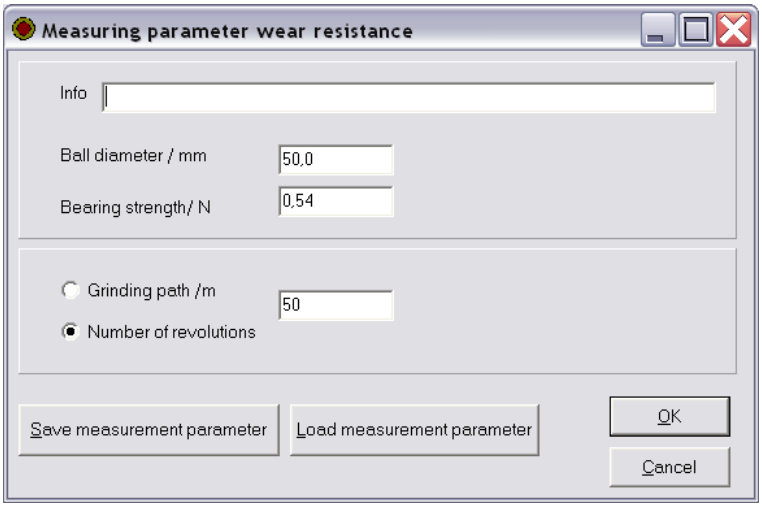


Figure 6

Enter the *ball diameter*, the *bearing strength* and, if needed, an *information* about this series.

The grinding path can be entered directly or it can be calculated from the ball diameter and the *number of revolutions* of the ball.

Close the dialogue by pressing OK.

Now the camera image will be displayed and the wear crater can be measured (see chapter 5.3).

5.2.3 Image measurement

To do measurements on a freeze image, only the camera image must be selected. No further parameter are required.

Select the menu item **Measurement / Image measurement**. Now the camera image will be displayed. Adjust the image and select the correct objective, then press *Measure this image*. The camera image will be grabbed and the measurements can be done (see chapter 5.3.5).

5.3 Measurement

The spherical caps or wear crater can be measured in the measurement window, which shows the camera image.

Note: Please notice that the display of the camera image is bound to the associated camera. Contact the technical service if you get a message like “You have no licence to use the software with the connected camera” when opening the measurement window.

5.3.1 Layer thickness on flat surfaces

At first, the outline of the cap has to be determined. This can be achieved by:

- Clicking 3 points at the outline of the cap or by
- Adjusting 4 measuring lines to the outline of the cap

Switch between these modes by the  buttons.

Figure 7 Shows the measurement window when the outline is determined by 4 measuring lines.

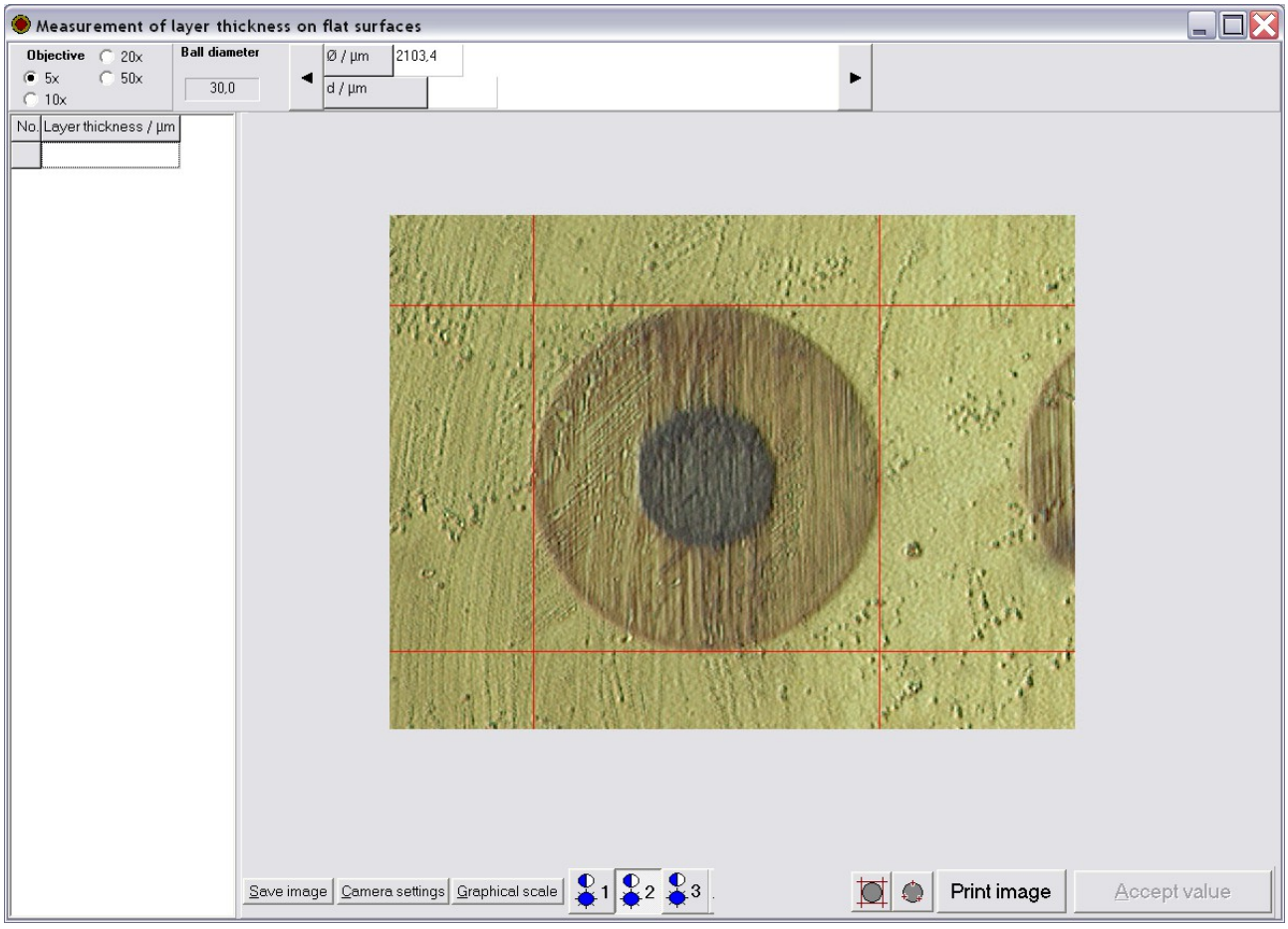


Figure 7

Move the mouse pointer to a measuring line until the cursor changes into a cross. Now press the left mouse button and keep it pressed while you move the measuring line to the edge of the cap.

When all 4 measuring lines are placed correctly, press the right mouse button. Now the determination of the

outline is complete and a circle is displayed on the camera image (see Figure 8).

This circle can be moved and altered in diameter. To move the circle, click on the cross in the centre of the circle, keep the mouse button pressed and move the mouse.

To change the diameter of the circle, click on its outline, keep the mouse button pressed and drag until the circle has the desired size.

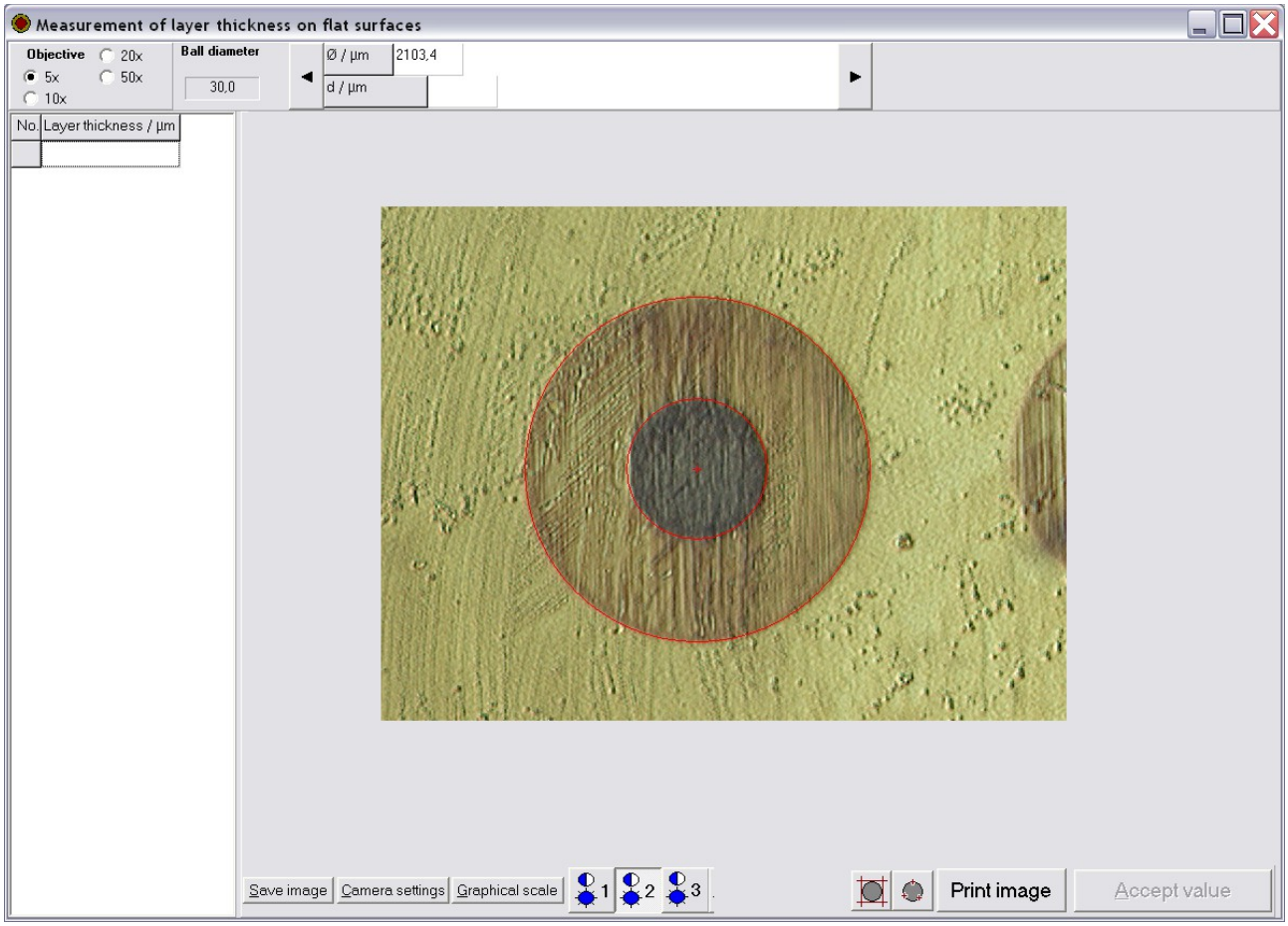


Figure 8

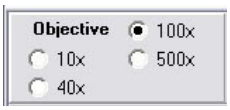
For the determination of layer thickness, click on the boundary between layer and base material (or another layer in case of a layer system). A second (concentric) circle will be displayed. You can alter the diameter of this circle in the same way as described above for the first circle. The layer thickness is calculated from the difference between the diameters of the circles. If a layer system shall be measured, click on each boundary between the layers and more concentric circles will be displayed. To delete one of these measuring circles, right-click on its outline and select **Delete measuring circle** from the appearing context menu.

If you click the right mouse button when the cursor is above the camera image, a context menu will be opened. To change the colour of the measuring lines, select **Set colour of measuring lines** and choose an appropriate colour in the dialogue (see Figure 9).

To change the line width, select **Line width** from the context menu.

Figure 9

In the top left hand corner of the measurement window, the used objective can be selected. **Please note**:



Before a measurement can be taken, the used objective has to be calibrated (see chapter 7). Because the number and the labelling of the objectives may differ depending on the used microscope, they can be configured individually, as described in chapter 9.1.

The ball diameter is shown in the upper part of the measurement window. Next to it, a table shows the diameters of the concentric circles (Ø) and the calculated layer thickness (d). In the last cell of the row where the layer thickness is displayed, the overall layer thickness is shown.

To accept the calculated layer thickness, press the button 

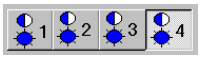
On the left side of the measurement window, a table is shown, containing the already accepted values of this series. If multiple layers are measured, the total layer thickness is displayed in the last column of the table.

The camera image can be saved by means of the 

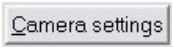
button.

To print the current image including measuring lines and current result press 

.



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button.

To change the camera settings, press the 

button . Details of the camera settings are described in chapter 10.

When you have finished the measurement of a series, close the measurement window and the series can be saved.

5.3.2 Layer thickness on cylindrical surfaces

On cylindrical surfaces, the outline of the spherical cap is elliptical. The distance between the boundaries of the layers and/or the layer and the base material is used for the calculation of layer thickness. An ellipse will be displayed on the camera image.

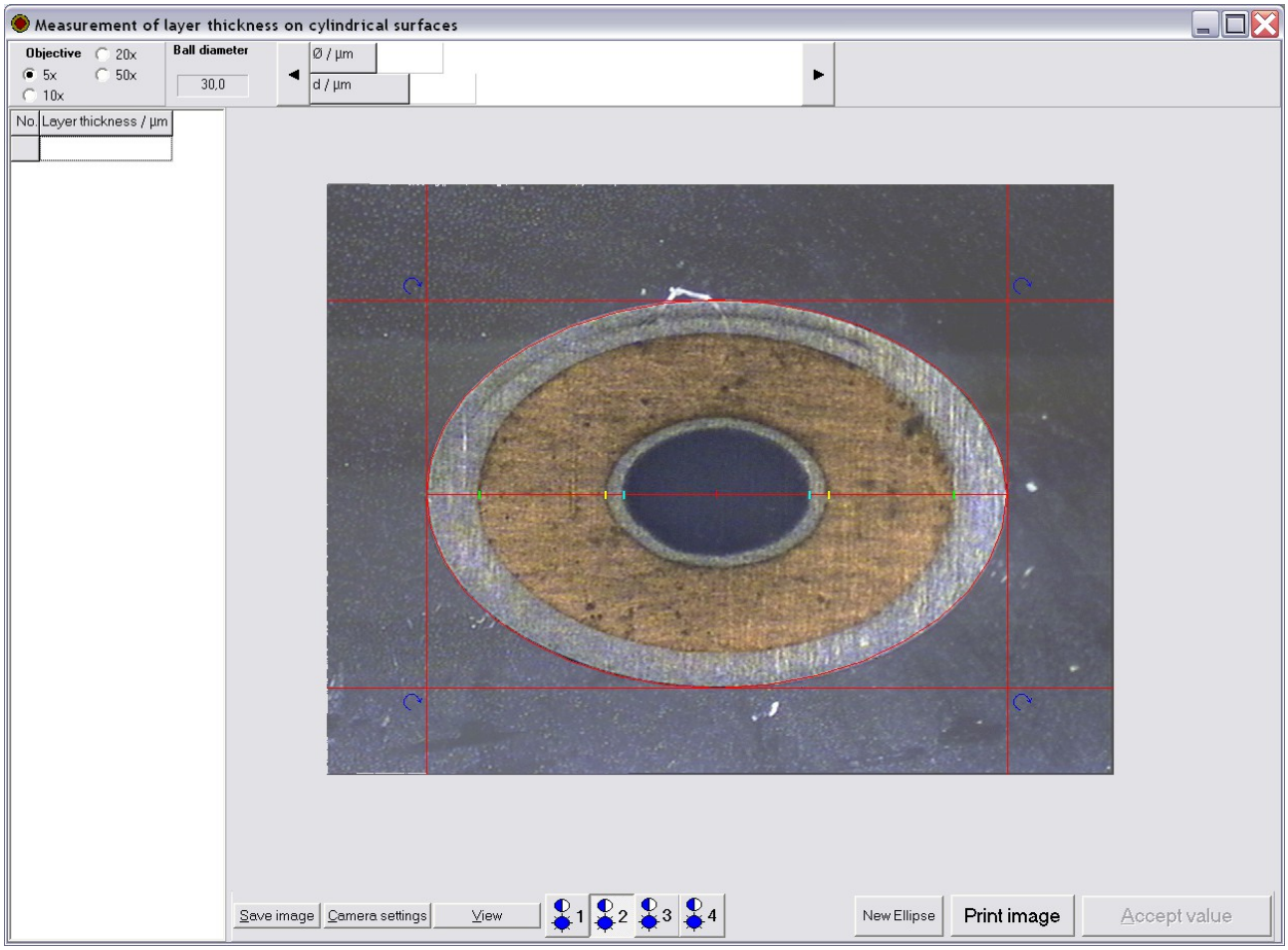


Figure 10

The form and position of the displayed ellipse can be adjusted to the outlines of the elliptical spherical cap by means of the 4 measuring lines. Move the mouse pointer to a measuring line until the cursor changes into a cross. Now press the left mouse button, keep it pressed while moving the measuring line.

Furthermore, the displayed ellipse can be rotated by clicking one of the four rotation symbols and keeping the mouse button pressed while rotating the ellipse.

To determine the layer thickness you have to click on the boundary between two layers (or between a layer and the base material) at the major axis of the ellipse. Then two small measuring lines will be drawn on the major axis of the ellipse, which mark the boundary. These measuring lines can be moved with the mouse. To delete a measuring lines, right-click on it and select **Delete measuring line** from the context menu.

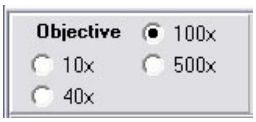
If you click the right mouse button when the cursor is above the camera image, a context menu will be opened. To change the colour of the measuring lines, select **Set**

Figure 11

colour of measuring lines and choose an appropriate colour in the dialogue (Figure 11).

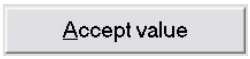
To change the line width, select **Line width** from the context menu.

To customize the predefined colours of the measuring lines and to change the settings for the graphical scale, press the button **View** and select the appropriate item from the menu.



In the top left hand corner of the measurement window, the used objective can be selected. **Please note**: Before a measurement can be taken, the used objective has to be calibrated (see chapter 7). Because the number and the labelling of the objectives may differ depending on the used microscope, they can be configured individually, as described in chapter 9.1.

The ball diameter is shown in the upper part of the measurement window. Next to it, a table shows the length of long axis of the ellipses (Ø) and the thickness of the calculated layers(d). In the last cell of the row where the layer thickness is displayed, the overall layer thickness is shown.

To accept the calculated layer thickness, press the button 

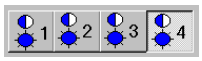
On the left side of the measurement window, a table is shown, containing the already accepted values of this series. If multiple layers are measured, the total layer thickness is displayed in the last column of the table.

The camera image can be saved by means of the 

button.

To print the current image including measuring lines and current result press 

.



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button

To change the camera settings, press the 

button . Details of the camera settings are described in chapter 10.

When you have finished the measurement of a series, close the measurement window and the series can be saved.

5.3.3 Wear resistance on flat surfaces

The wear coefficient specific to the abrasion slurry can be calculated from the volume of the wear crater, the bearing strength and the grinding path. The bearing strength and the grinding path are known. The volume of the wear crater can be calculated from the diameter of the grinding ball and the diameter of the wear crater.

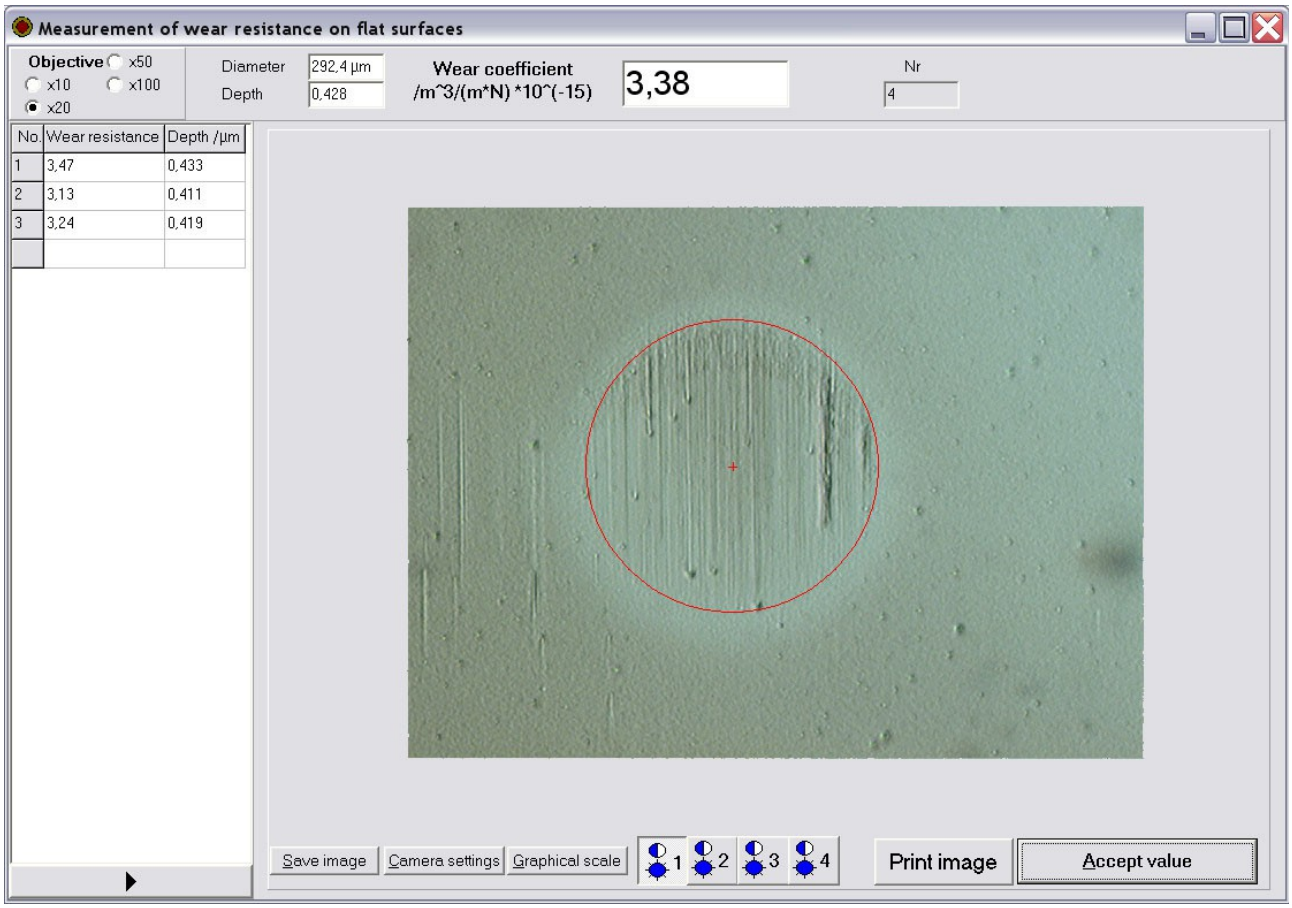


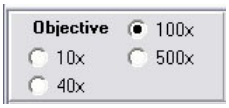
Figure 12

To determine the diameter of the wear crater, a circle is displayed on the camera image. This circle must be adjusted to the outlines of the wear crater. For that purpose, the circle can be moved and altered in diameter. To move the circle, click the cross in the centre of the circle, keep the mouse button pressed and move the mouse. To change the diameter of the circle, click on the outline of the circle, keep the mouse button pressed and drag until the circle has the desired size.

If you click the right mouse button when the cursor is above the camera image, a context menu will be opened. To change the colour of the measuring lines, select **Set colour of measuring lines** and choose an appropriate colour in the dialogue (Figure 13).

To change the line width, select **Line width** from the context menu.

Figure 13



In the top left hand corner of the measurement window, the used objective can be selected. Please note: Before a measurement can be taken, the used objective has to be calibrated (see chapter 7). Because the number and the labelling of the objectives may differ depending on the used microscope, they can be configured individually, as described in chapter 9.1.

In the upper part of the window, the diameter of the wear crater, the wear coefficient and the depth of the wear crater are displayed. The unit of the wear coefficient is:

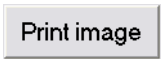
$$\frac{m^3}{m*N}*10^{-15}$$

To accept the calculated wear coefficient, press the button 

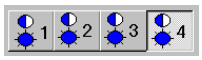
On the left side of the measurement window, a table is shown, containing the already accepted values of this series.

The camera image can be saved by means of the 

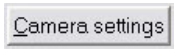
button.

To print the current image including measuring lines and current result press 

.



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button

To change the camera settings, press the 

button . Details of the camera settings are described in chapter 10.

When you have finished the measurement of a series, close the measurement window and the series can be saved.

5.3.4 Wear resistance on cylindrical surfaces

On cylindrical surfaces, the outline of the wear crater is elliptical. The wear coefficient specific to the abrasion slurry can be calculated from the volume of the wear crater, the bearing strength and the grinding path. The bearing strength and the grinding path are known. The volume of the wear crater can be calculated from the diameter of the grinding ball and the length of the major and minor axes of the elliptical wear crater.

An ellipse will be displayed on the camera image, which has to be adjusted to the outlines of the elliptical wear crater.

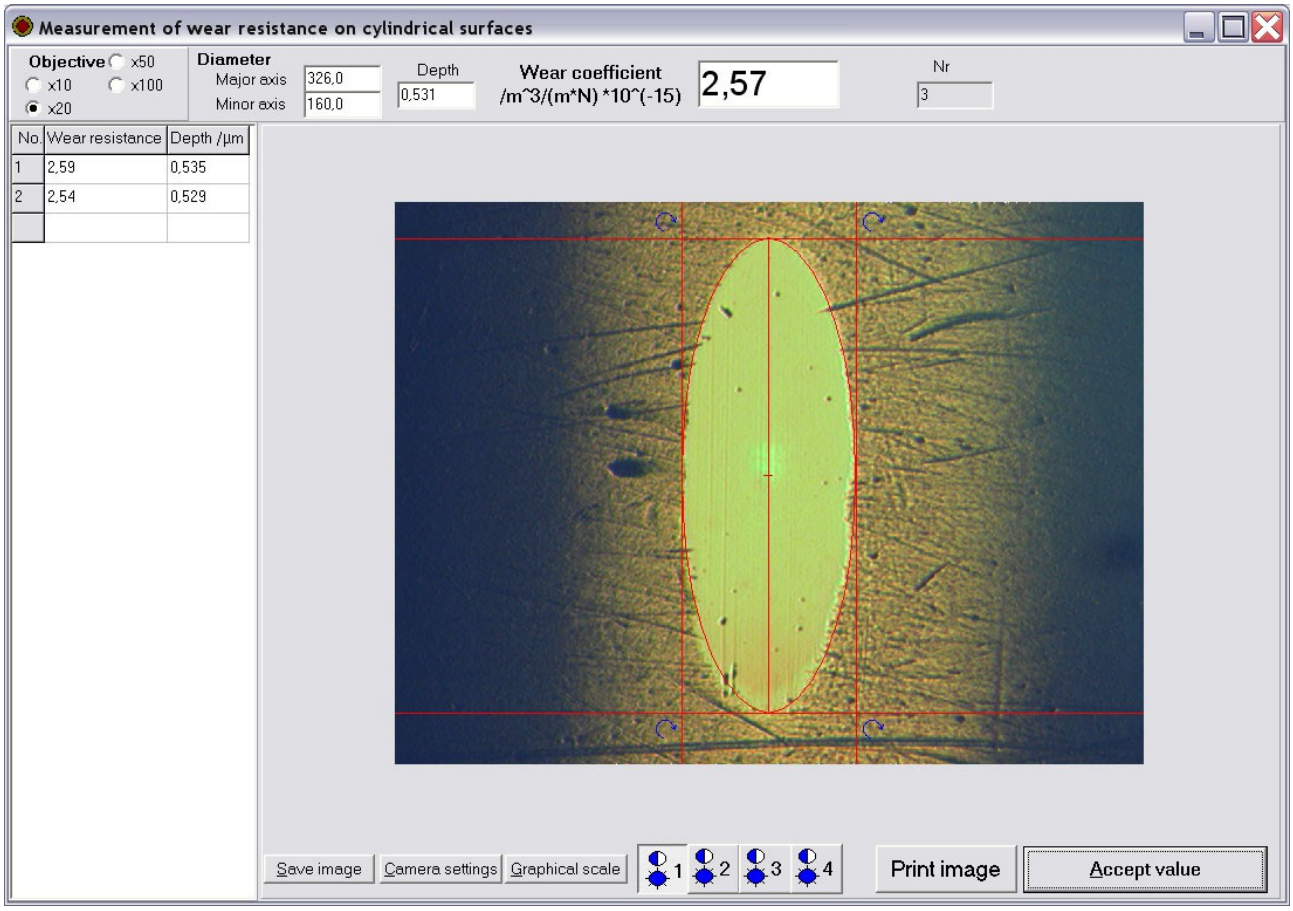


Figure 14:

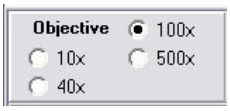
The form and position of the displayed ellipse can be adjusted to the outlines of the elliptical spherical cap by means of the 4 measuring lines. Move the mouse pointer to a measuring line until the cursor changes into a cross. Now press the left mouse button and keep it pressed while moving the measuring line.

Furthermore, the displayed ellipse can be rotated by clicking one of the four rotation symbols and keeping the mouse button pressed while rotating the ellipse.

If you click the right mouse button when the cursor is above the camera image, a context menu will be opened. To change the colour of the measuring lines, select **Set colour of measuring lines** and choose an appropriate colour in the dialogue (Figure 15).

To change the line width, select **Line width** from the context menu.

Figure 15



In the top left hand corner of the measurement window, the used objective can be selected. **Please note**: Before a measurement can be taken, the used objective has to be calibrated (see chapter 7). Because the number and the labelling of the objectives may differ depending on the used microscope, they can be configured individually, as described in chapter 9.1.

In the upper part of the window, the diameter of the wear crater, the wear coefficient and the depth of the wear crater are shown. The unit of the wear coefficient is:

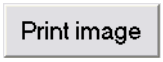
$$\frac{m^3}{m*N}*10^{-15}$$

To accept the calculated wear coefficient, press the button 

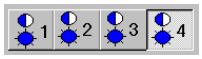
On the left side of the measurement window, a table is shown, containing the already accepted values of this series.

The camera image can be saved by means of the 

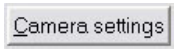
button.

To print the current image including measuring lines and current result press 

.



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button

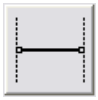
To change the camera settings, press the 

button . Details of the camera settings are described in chapter 10.

When you have finished the measurement of a series, close the measurement window and the series can be saved.

5.3.5 Image measurement

First, an image has to be aquired (see chapter 5.3.5.1), then various kinds of measurements can be done on the image and text items can be added. The font size of labelling and texts is defined as percent of the image height, so that the texts have the same size on printouts, saved images and when displayed on the screen.

	Section	Measurement of the distance between 2 points
	Angle	Measurement of the angle between two lines
	Radius	Measurement of the radius of a circle
	Diameter	Measurement of the diameter of a circle
	Parallels	Measurement of the distance between two parallel lines
		Measurement of the distance between two parallel lines. In addition to the parallels, the centre line and two lines indicating the tolerance zone are displayed.
	Text	Text input

Select the kind of measurement with the buttons on the left side of the measurement window.

To save the image without measurement objects, press the button *Save image*. Press the button *End*

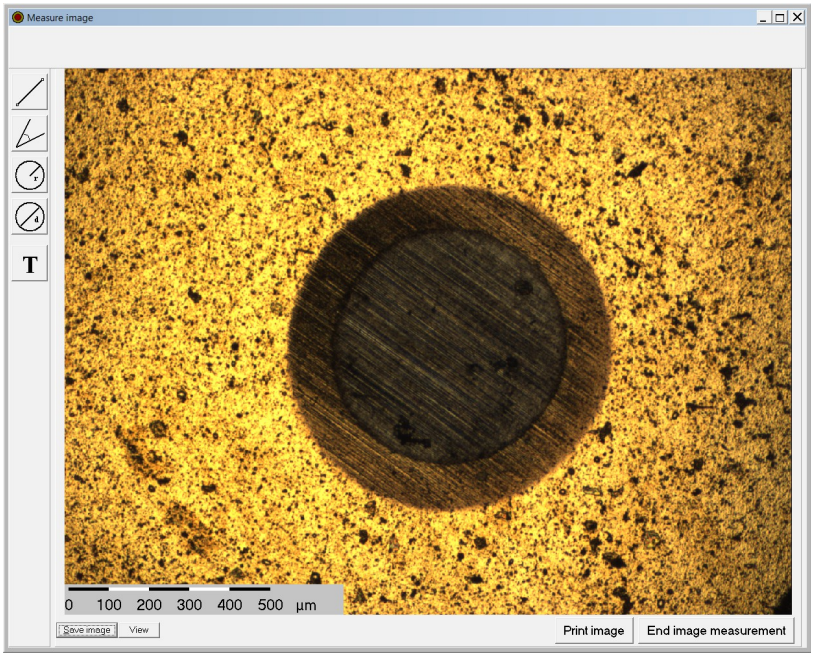


Figure 16:

image measurement to end the measurement, save the image to the project directory and add the image to the project.

Press the button View or click the right mouse button on the image to adjust the default settings for colours and fonts.

Menu item	***Subitem***	***Function***
Graphical scale		Settings for the graphical scale
Colour of temporary lines	Measuring lines	Sets the line colour.
	Auxiliary lines	
	Parallels	
	Centre line	
	Tolerance lines	
Default number of decimal places	Section	Number of decimal places with which the measurement result is displayed after construction.
	Angle	
	Radius	
	Diameter	
	Parallels distance	
	Parallels distance with centre tolerance	
Default font size		Font size in % of image height
Line width	Measuring lines	Sets the line width
	Auxiliary lines	
	Parallels	
	Centre line	

Menu item	*Subitem*	*Function*
	Tolerance lines	

The measurement objects are created using the default settings. Press the right mouse button on the labelling of an object to delete it or to change its settings (see chapter 5.3.5.7).

5.3.5.1 Image acquisition

Once you have selected the menu item the menu item **Measurement / Image measurement**, the camera image will be displayed. Adjust the camera settings and focus, select the correct objective and press *Measure this image*.

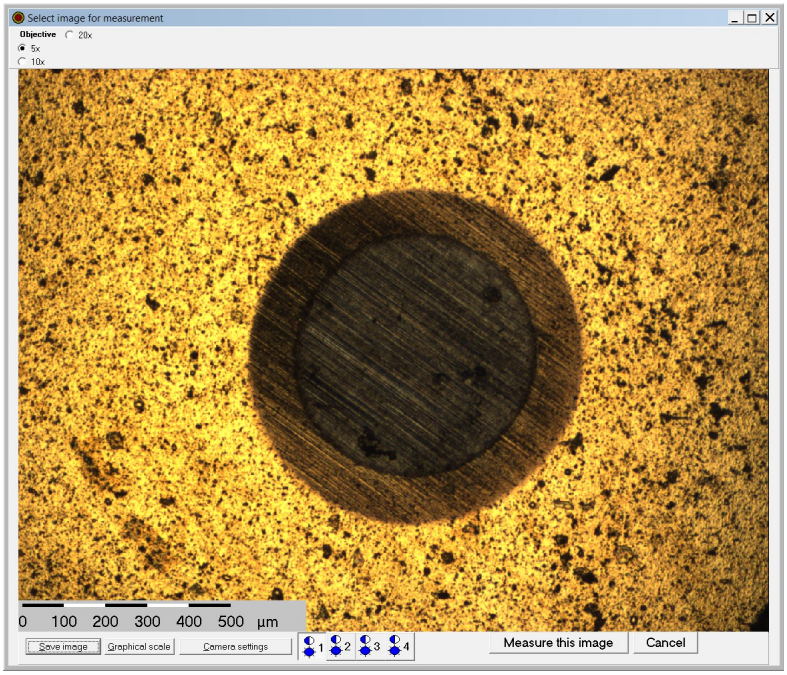


Figure 17:

5.3.5.2 Section measurement

To measure the distance between two points, select the points by clicking on the image with the left mouse button.

Once the first point is set, a measuring line is drawn from this point to the mouse position. An auxiliary line perpendicular to the measuring line will also be displayed.

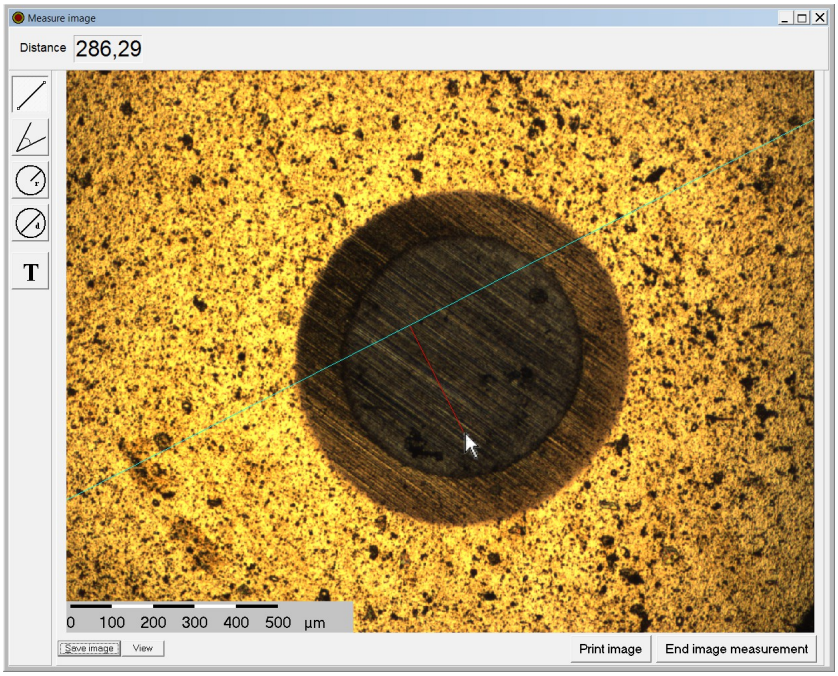


Figure 18:

The measurement is completed after the second point has been set. Now the object will be created and displayed.

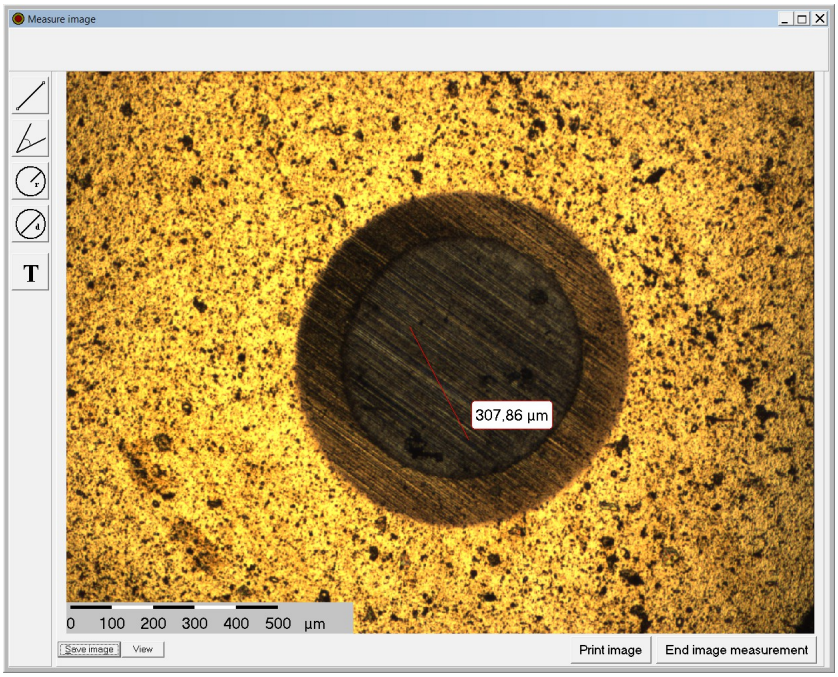


Figure 19:

5.3.5.3 Angle measurement

For an angle measurement, two lines have to be defined by clicking the endpoints with the left mouse button.

Once the first line and the first point of the second line are set, auxiliary lines will be displayed to show where the lines intersect.

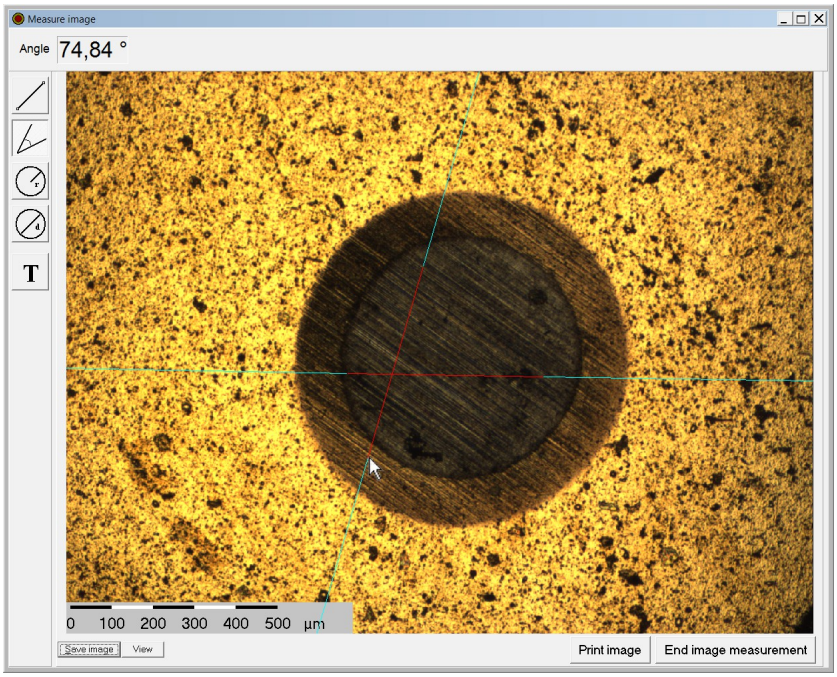


Figure 20:

The measurement is completed after the second point of the second line has been set. Now the object will be created and displayed.

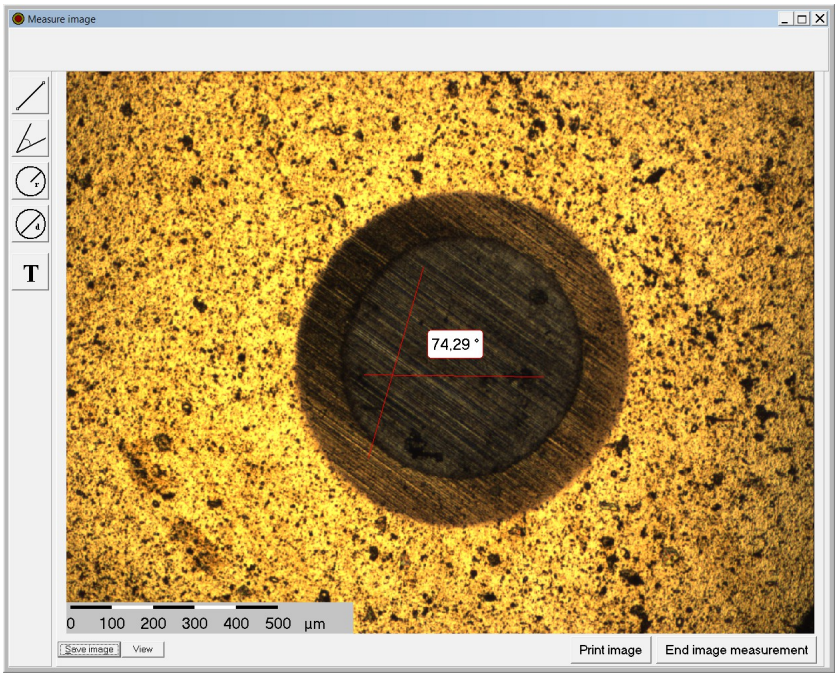


Figure 21:

5.3.5.4 Measurement of radius or diameter

To measure a radius or a diameter, a circle is displayed on the image. This circle can be moved and altered in diameter. To move the circle, click on the cross in the centre of the circle, keep the mouse button pressed and move the mouse. To change the diameter of the circle, click on its outline, keep the mouse button pressed and drag until the circle has the desired size.

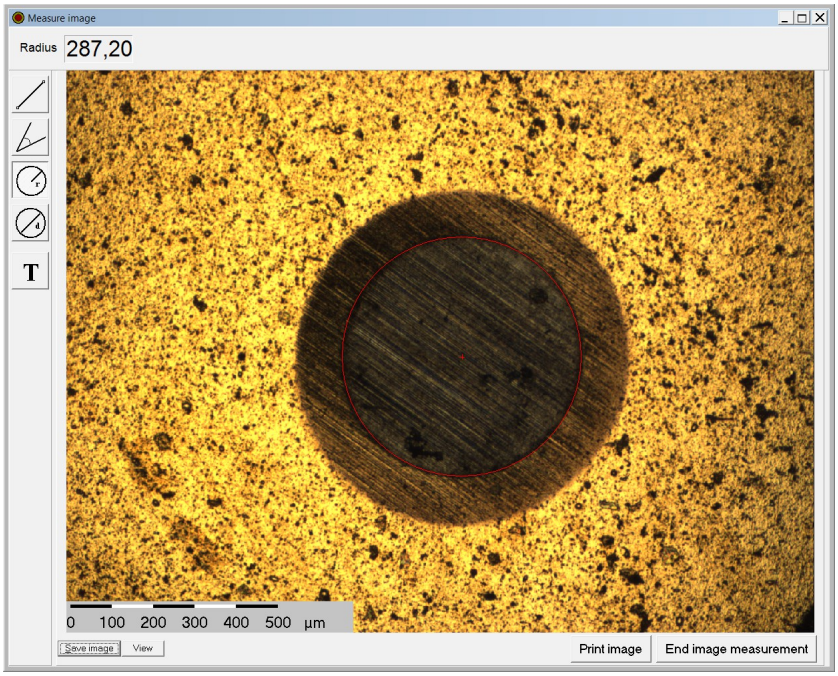
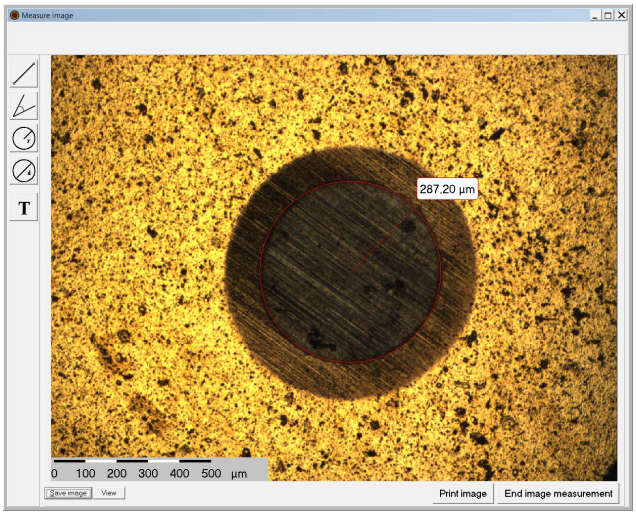
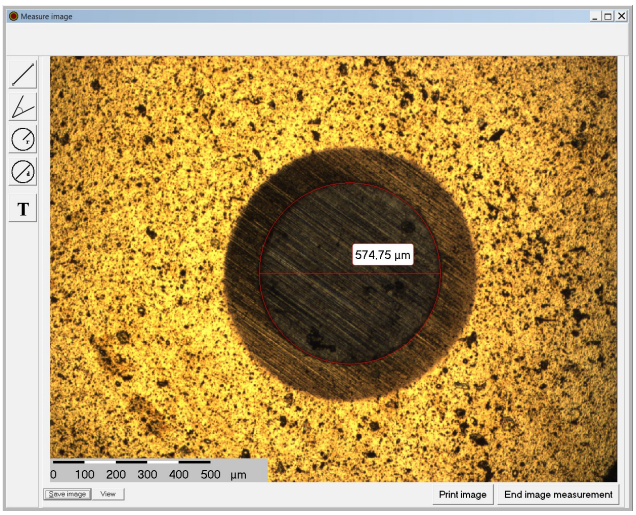


Figure 22:

To complete the measurement, click the left mouse button anywhere on the image outside the circle. Now the object will be created and displayed.





5.3.5.5 Measurement of the distance between parallel lines

For the measurement of the distance between parallels, two lines must be defined. To set the first line, click the endpoints with the left mouse button.

Once the first line is set, auxiliary lines will be displayed to show the position of the parallel and the measurement line.

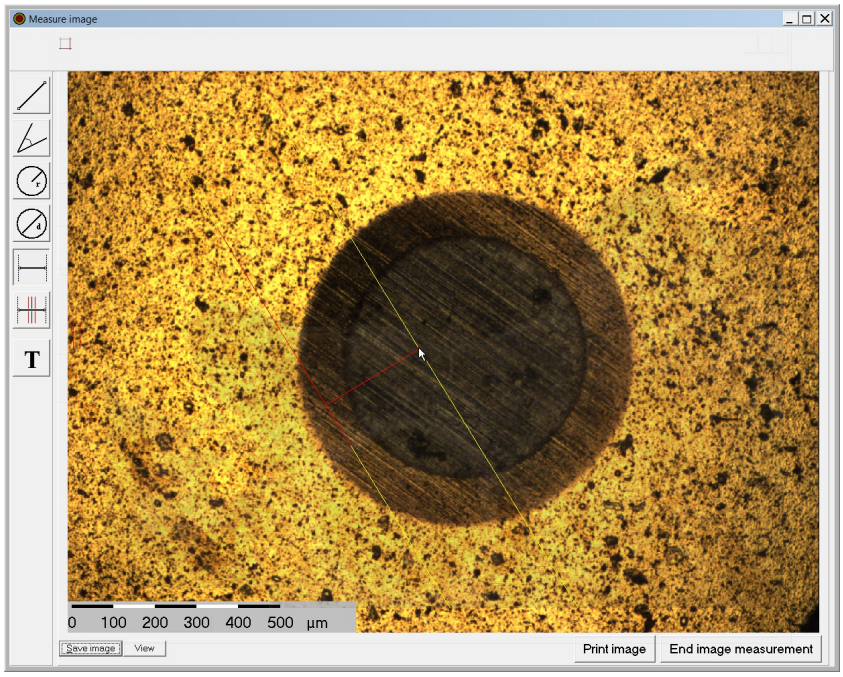


Figure 23:

To complete the measurement, click the left mouse button. Now the object will be created and displayed.

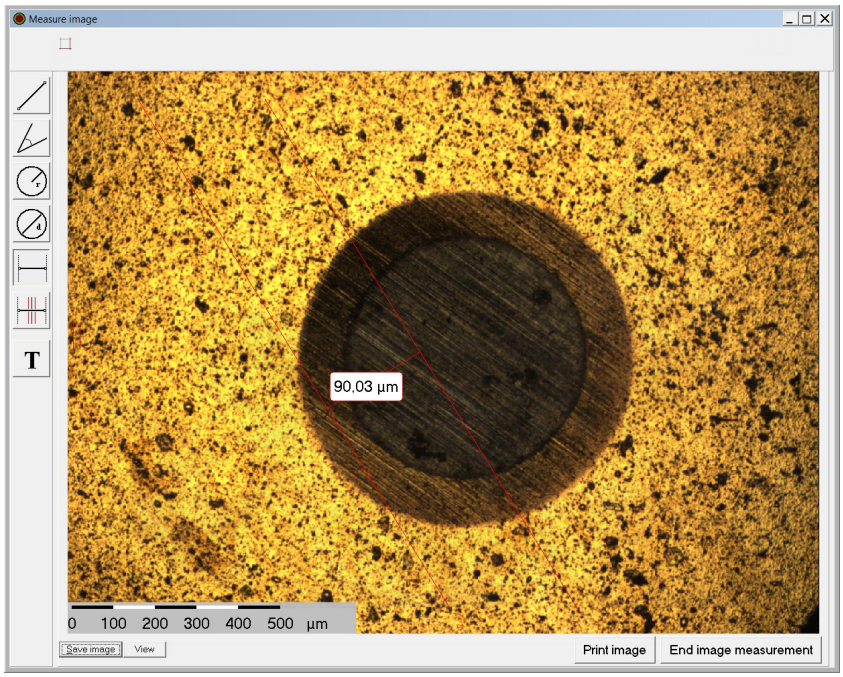


Figure 24:

5.3.5.6 Measurement of the distance between parallel lines with centre tolerance

To measure the distance between parallels with centre tolerance you must input the tolerance at first. Then the first line is set by clicking the end points with the left mouse button. Once the first line is set, auxiliary lines will be displayed to show the position of the parallel, the tolerance lines and the measurement line.

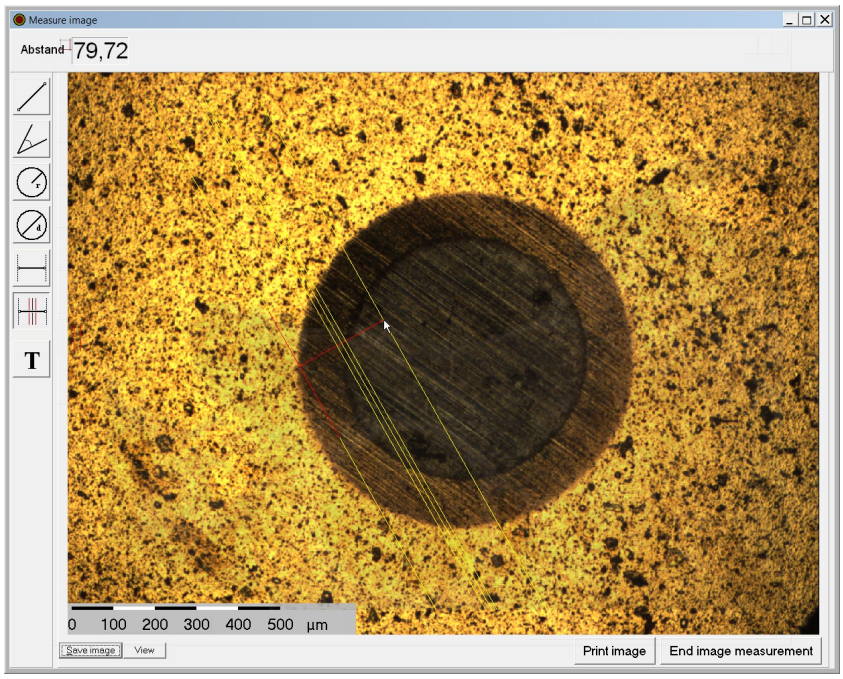


Figure 25:

To complete the measurement, click the left mouse button. Now the object will be created and displayed.

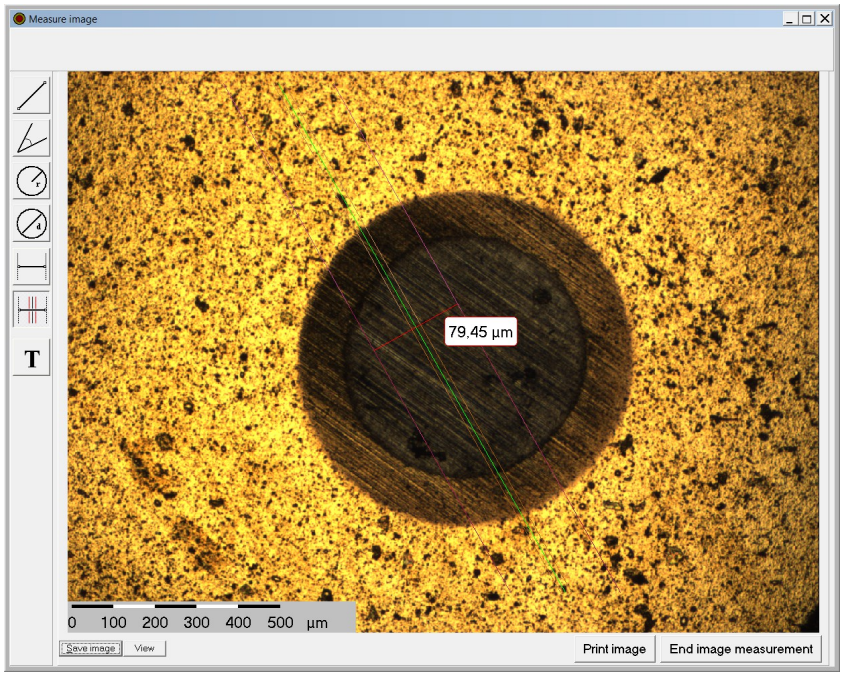
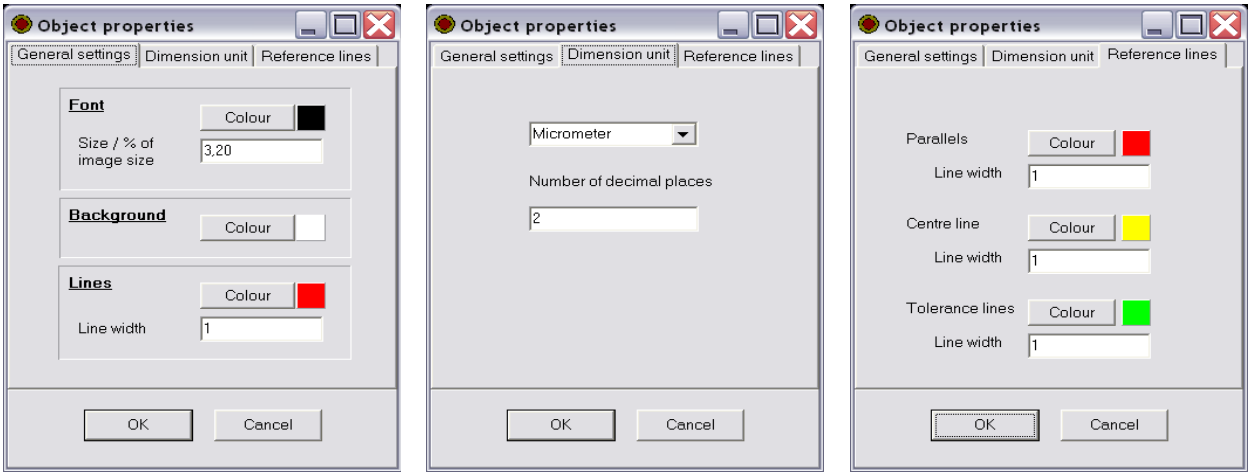


Figure 26:

5.3.5.7 Object settings

To change the object settings, click the right mouse button on the labelling of an object and select *Properties*.



If the selected object is a measurement of parallels (with or without centre tolerance), the tab *Reference lines* is enabled so that the colours of the parallels, the centre line and the tolerance lines can be selected.

5.3.5.8 Save image

The image not including the measurement lines and results can be saved by means of the *Save image* button.

To save the image including the measurement objects and results to the project directory, press the button *End image measurement*.

5.3.5.9 Print image

To print the image, press either the button *Print image* in the measurement view or open the image from the project view by a double click and select the button *Print image* in the image view.

6 Graph view

The graph view shows the measurement series as chart and table. Also the statistics on the series is displayed.

For series of wear resistance, multiple series can be shown together in the graph. The series to be shown can be selected in the list on the right side of the project view (see chapter 4). The series will be displayed in different colours.

For series of layer thickness, only one series can be shown at a time. Here the layers are shown in different colours.

On the left side of the graph view, a table containing the measured values is shown. At the lower part of this table, the statistics on the measured data is displayed. Minimum, maximum, mean value and standard deviation are calculated. If this table is not completely visible, press  to expand it.

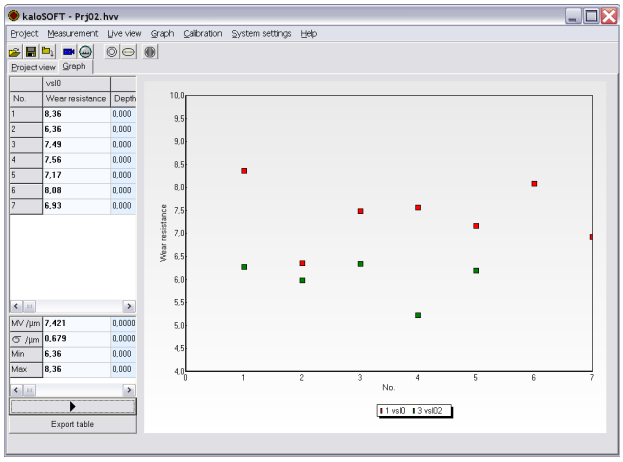


Figure 28:

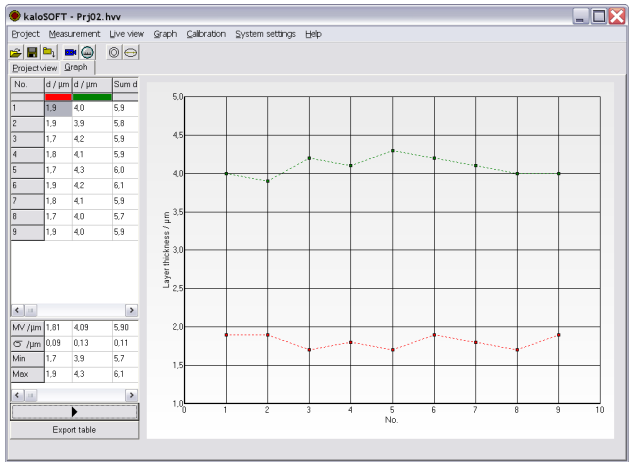


Figure 27

To scale the axes or to change the colour of the graph background, click the right mouse button when the cursor is above the graph and select the appropriate item from the context menu.

6.1 Scaling the axes

The axis settings can be modified in the dialogue shown in Figure 29. To open this dialogue:

- double-click the axis of the graph or
- press the right mouse button when the cursor is above the graph and select **Scale X-Axis** or **Scale Y-Axis** from the context menu or
- select **Graph** from the main menu and then select **Scale X-Axis** or **Scale Y-Axis.**

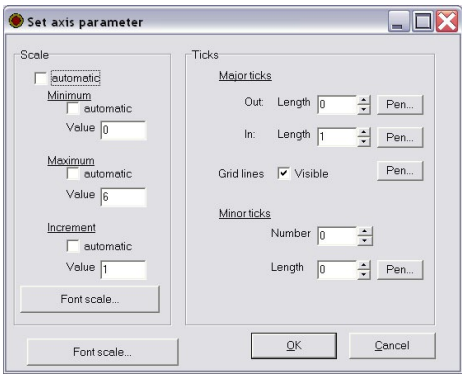


Figure 29

6.2 Printing

You can print the measurement series shown in the graph with the *Print series*-button. The standard Windows print-dialogue will be shown.

Figure 30 shows an example of a printout.

On top of the report, the project data will be printed, followed by the chart. Then a table with the measured values will be printed.

If the table does not fit to the first page, further pages will be printed. On this pages, the header with the project data will be shortened.

The logo, that will be printed to the upper left corner of the report can be selected with the menu item **System settings / Select logo**. To leave the logo out, select **System settings / Hide logo** from the menu.

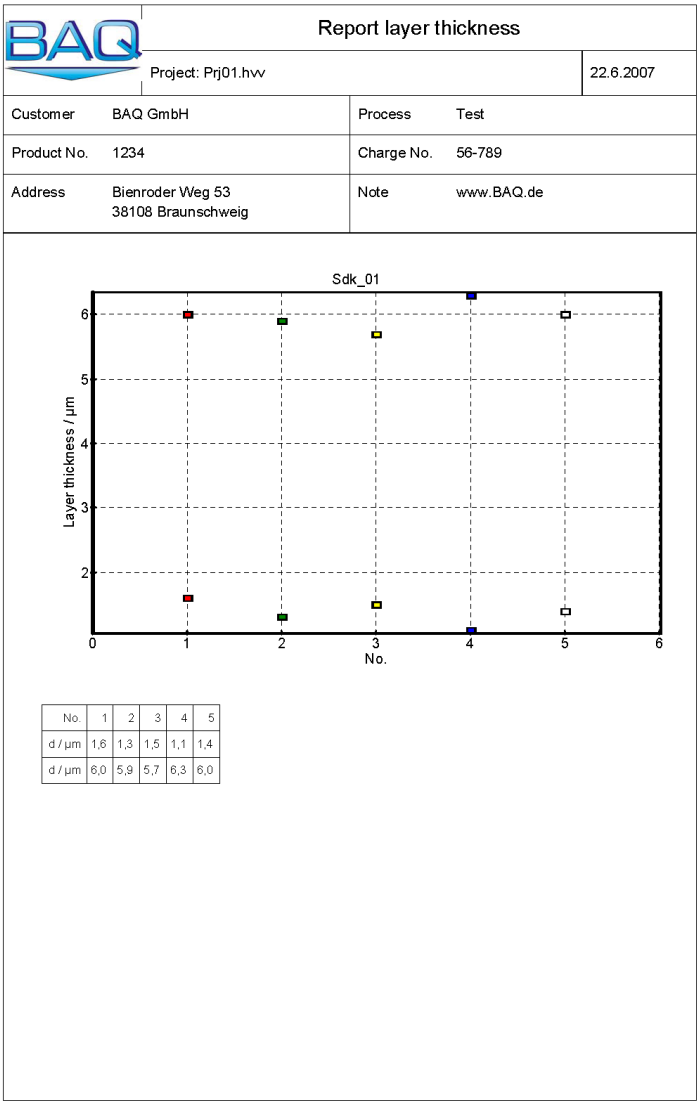


Figure 30

6.3 Correction of data

If some data need correction, select the menu item **Edit data**.

Now the password must be entered. The standard password, which is preset during the setup of the program, is „passwort“. So, if you have not yet changed the password, enter „passwort“ in the dialogue. Otherwise, enter the password that you have defined. The input is case sensitive. You can change the password as described in chapter 9.2 Set password.

After the password has been verified, the table shown in Figure 31 will be opened and the data can be edited.

The modifications will be assumed when you press *OK*. To discard the changes, press *Cancel*.

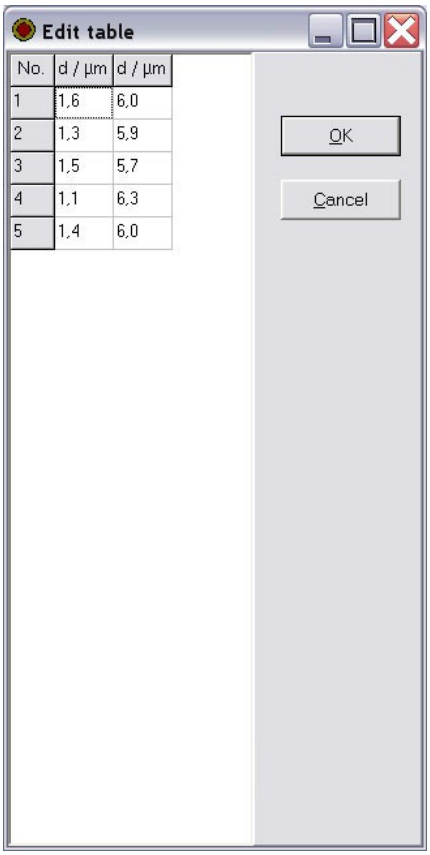


Figure 31

6.4 Graph settings and series properties

To edit the graph properties and / or display the measuring parameter, select **Set series properties** from the menu.

6.4.1 Series parameter

On the tab *Series*, the measurement parameter of the series will be displayed.

6.4.1.1 Layer thickness

The file *info*rmation can be edited. The *Ball diameter* cannot be modified.

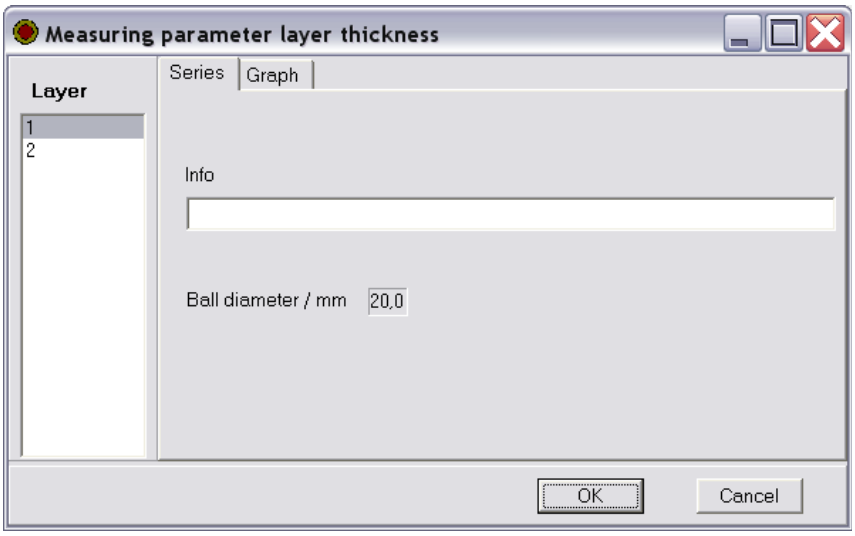


Figure 32

6.4.1.2 Wear resistance

On the left side of the dialogue, a list of the series in the graph is shown. Click here to select the series of which the parameter shall be displayed. If one single series is shown in the graph, this will be automatically selected.

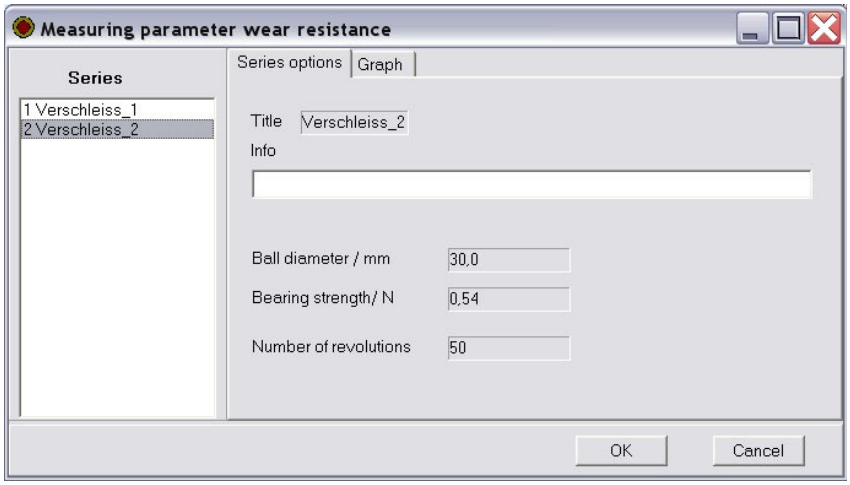


Figure 33

The file *info*rmation can be edited. *Ball diameter*, *bearing strength* and *number of revolutions* cannot be modified.

6.4.2 Modification of graph properties

The tab *Graph* shows the graph properties of the selected layer or the wear resistance series. Select the layer or series, whose properties shall be modified, from the list on the left side of the dialogue.

To change the symbol colour, press the button **Colour** and select an appropriate colour from the opened dialogue.

The *Height*, *Width* and *Style* of the symbol can be modified with the corresponding input fields.

To hide the layer, disable the check box *Visible*.

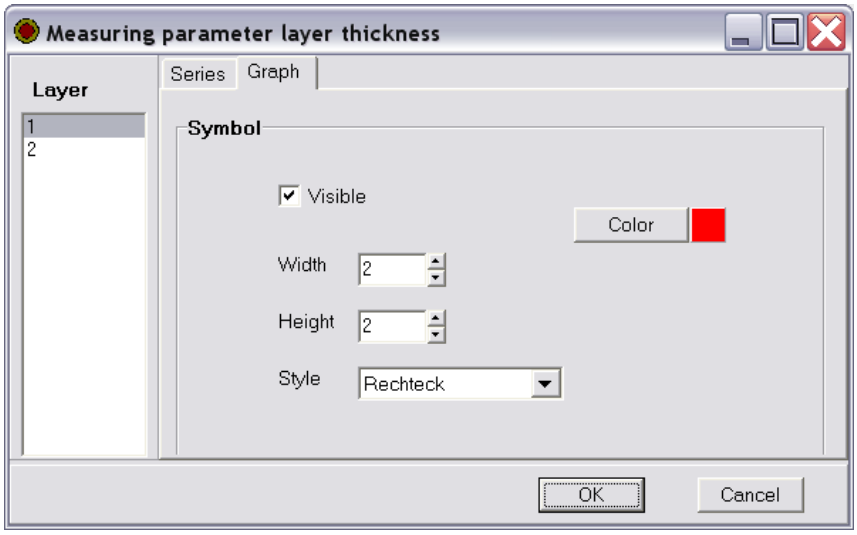
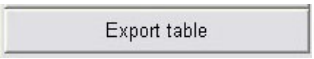


Figure 34

6.5 Export of a table or a graph



Press the button *Export table* that is provided below the table in the graph view to export the table in the file format CSV.

The CSV file format is a simple format. The data will be exported in plain text, one measurement point per line. The individual values for each layer will be separated by a given field delimiter. Text fields will be enclosed in so called text delimiter. Before the data can be exported, you have to select the delimiter to be used.

As field delimiter, the semicolon, the colon, the comma and the space character are available. For the text delimiter, you can select the double quote or the inverted comma.

To hide the column headers, deselect the check box *Show column headers*.

Figure 35

To export the graph, select the menu item **Graph/Export graph**. The graph can be exported in bitmap (BMP) or JPEG format.

First, the size of the image has to be defined. If the check box *Keep original aspect ratio* is selected, the width or the height will be calculated if the other specification is modified.

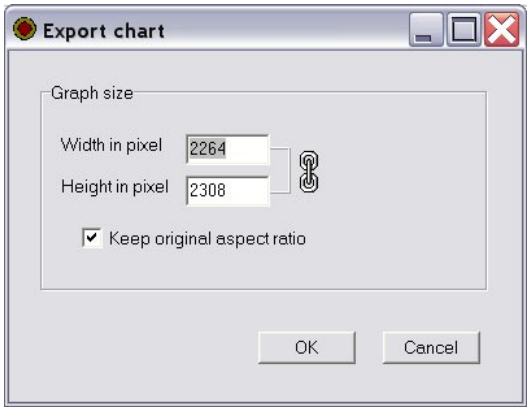


Figure 36

7 Calibration

Each objective used needs to be calibrated before a measurement can be taken. This calibration has to be done before initial use of the software or when an objective has been replaced. Because the number and the labelling of the objectives may differ depending on the used microscope, these settings can be configured individually,as described in chapter 9.1.

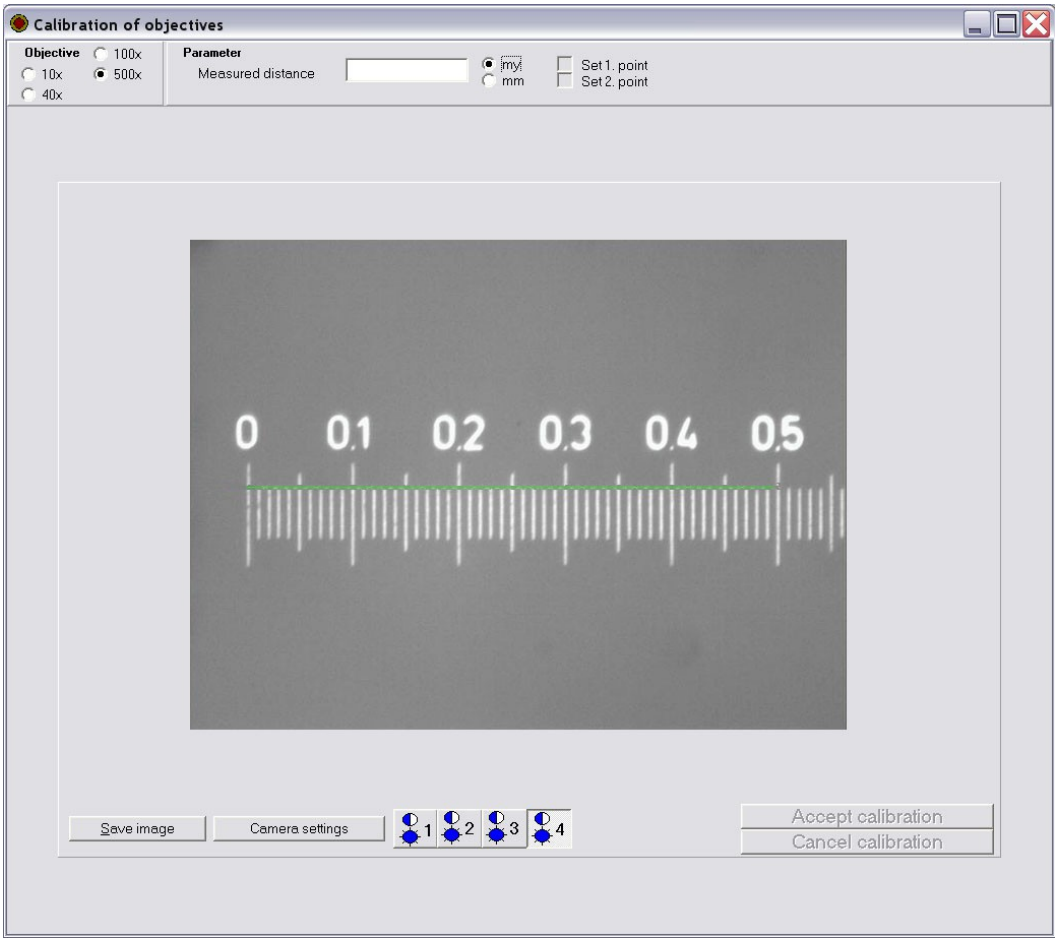
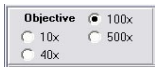


Figure 37

Take the following steps to calibrate an objective:

- Select menu item **Calibration.** The dialogue shown in Figure 37 will be opened.
- Enter the password. The standard password, which is preset during the setup of the program, is „passwort“. So, if you have not yet changed the password, enter „passwort“ in the dialogue. Otherwise, enter the password that you have defined. The input is case sensitive. You can change the password as described in chapter 9.2 Set password.
- Select the objective to calibrate 

- Place a stage micrometer on the microscope stage.
- Press the left mouse button when the cursor is above the graduation mark you want to define as starting point of the *Measured distance*. Keep the mouse button pressed and draw a line to the graduation mark that states the end point of the *Measured distance*.

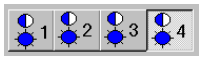
- Enter the *Measured distance* (real size).
- Press **Accept calibration**.

8 Live view

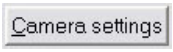

The menu item *Live view* shows the camera image.

The camera image can be saved by means of the 

button.



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button

To change the camera settings, press the 

button . Details of the camera settings are described in chapter 10.

9 System settings

9.1 Objectives setup

The number and the labelling of the objectives may differ depending on the used microscope. Select the menu item **System settings / Set up objectives** to configure number and labelling of the objectives individually.

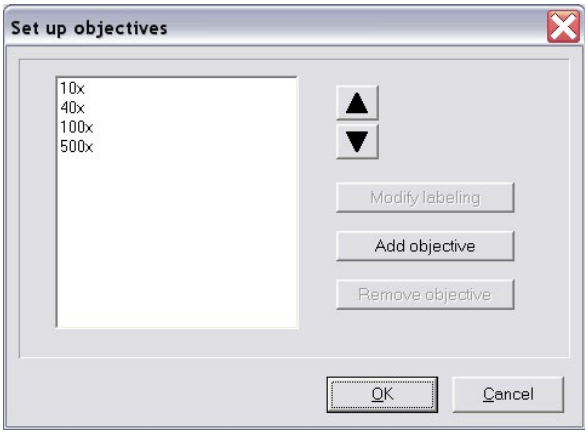
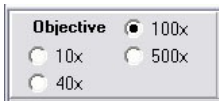


Figure 38

This menu item is protected by a password. The standard password, which is preset during the setup of the program, is „passwort“. So, if you have not yet changed the password, enter „passwort“ in the dialogue. Otherwise, enter the password that you have defined. The input is case sensitive. You can change the password as described in chapter 9.2 Set password.



The objectives entered in this dialogue, will be displayed for selection in the measurement window and the calibration dialogue.

The highest number of objectives possible is 5.

To insert a new objective, press the button *Add objective* and enter the labelling for the new objective. Before you can use the objective for measurements, it must be calibrated (see chapter 7).

Select an objective in the list on the left side of the dialogue to modify the labelling or remove the objective.


The arrow buttons can be used to change the position of the objective in the list. The order of the objectives in the list determines the order in which the objectives will be displayed for selection in the measure-

ment window and the calibration dialogue.

Press the button *Modify labelling* and enter a new text to change the labelling of the objective selected in the list.

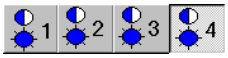
To remove an objective, select it in the list and press the button *Remove objective*.

9.2 Set password

Some menu items are protected by a password. The standard password, which is preset during the setup of the program, is „passwort“. To change the password, select the menu item **System settings / Change password**.

Now the old password must be entered. If you have not yet changed the password, enter „passwort“ in the dialogue. Otherwise, enter the password you have defined. The input is case sensitive. Now enter the new password.

10 Camera settings



4 different combinations of camera settings can be saved with kaloSOFT. To restore a combination of settings, press the appropriate button.

The optimal camera settings depend on different variables:

- Reflectivity of the sample surface
- Brightness of the lighting
- Brightness setting of the camera
- Contrast setting of the camera

The microscope lighting should be adjusted first. Too bright illumination leads to overexposure.

Software settings have subsequent effects to the camera image, whereas hardware settings affect the image previous to the digitalization.

10.1 General settings

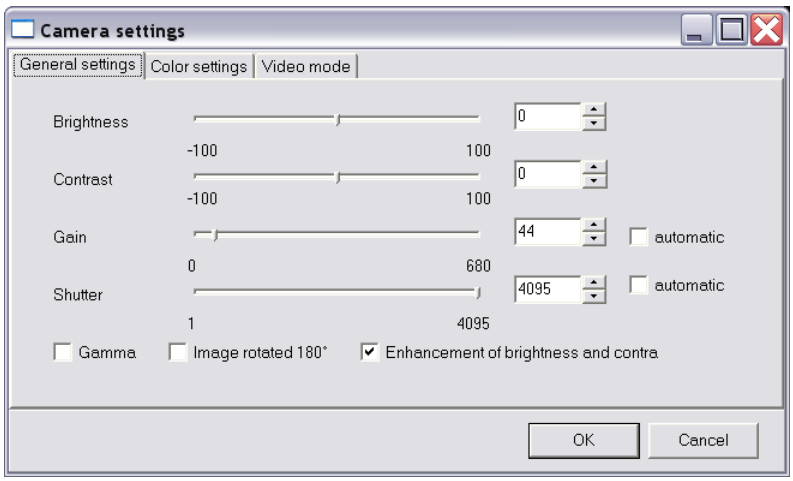


Figure 39

Brightness	Brightness can be set to values in the range of -100 to 100 (0 = neutral) (Software setting)
Contrast	The allowed values for contrast lie in the range of -100 to 100. Values greater than 0 enhance the contrast, whereas values below than 0 lead to lower contrast. (Software setting)
Gain	Set the *gain* to values between 0 and 680 or select the *automatic* gain setting. The noise growth with higher *gain*, so you should try higher values for *brightness* or *shutter* first.
Shutter	*Shutter* can be set to values in the range of 0 to 4095 or an *automatic* adjustment can be selected. This setting affects the exposure time. For dark samples, the shutter should be adjusted to a relative high value. The shutter setting influences also the brightness of the image. (Camera hardware setting)
Gamma	*Gamma* correction is necessary to redistribute tonal information to correspond more closely to the way the human eye perceives brightness. A digital camera perceives light in a linear fashion. Twice as much light produces twice as large a response on the sensor. This property is known as linear gamma. The human eye perceives light in a logarithmic fashion. Twice as much light is perceived as brighter, but not twice as bright. Conversely, eyes are more sensitive to shadow detail than a camera sensor. Standard setting for *gamma* is OFF (linear gamma)
Enhancement of brightness and contrast ON	This check box enables the sliders for *Brightness* and *Contrast*.

To achieve a high image quality, the *gain* should be set as low as possible and the sliders for *brightness* and *contrast* should be set to neutral values (or these settings should be disabled by deselecting the check box *Enhancement of brightness and contrast ON*). The brightness of the image can be set by

means of the microscope illumination and the setting for the *shutter*. With a high value for the shutter the image can get blurred when the sample is moved, but because the measurements are normally taken on a still image, it is a good approach to set the shutter high to get a brighter image.

As a general rule it is preferable to adjust the brightness of the light source than controlling the brightness of the image by means of the *brightness* software setting.

10.2 Colour settings

If a colour camera is connected, a tab for colour settings will be shown in the dialogue.

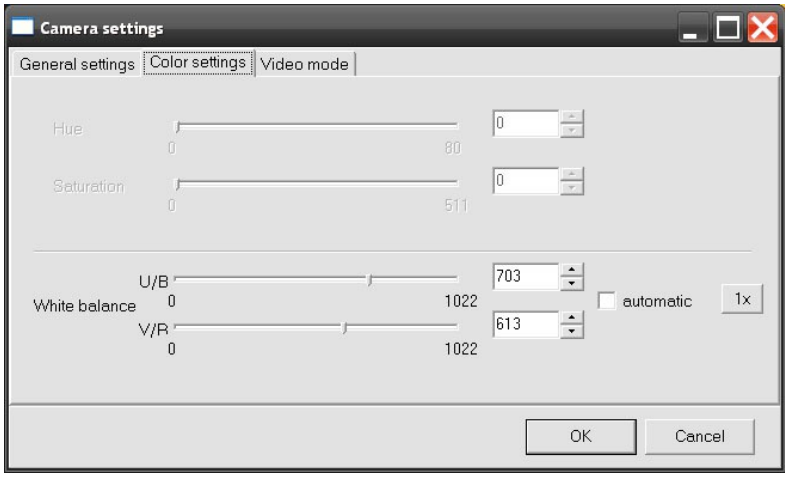


Figure 40

Hue	*Hue* can be set to values in the range of 0 and 80. It affects the coloring of the image without changing the white balance.
Saturation	Saturation intensifies the colors of the image. It can be set to values between 0 and 511.
White balance	The white balance of the camera should be set so, that white areas are displayed without colour casts. It can be set manually or automatically. Focus the camera to a white area before performing the white balance adjustment. The slider U/B changes the colour between green and blue, the slider V/R changes the colour between green and red.
Automatic white balance	The automatic white balance can be set to permanent adjustment or it can be carried out one time. It is not recommended to set the white balance to permanent adjustment, because this will lead to a permanent changing of the image colors. To set the white balance to permanent adjustment, select the check box *automatic*. To do a one-time white balance, press the button *1x*.

10.3 Video mode

The resolution of the camera image can be modified. The highest resolution will show the whole lens coverage of the camera. With lower resolutions the image will be clipped. Therefore a higher frame rate can be achieved with a lower resolution.

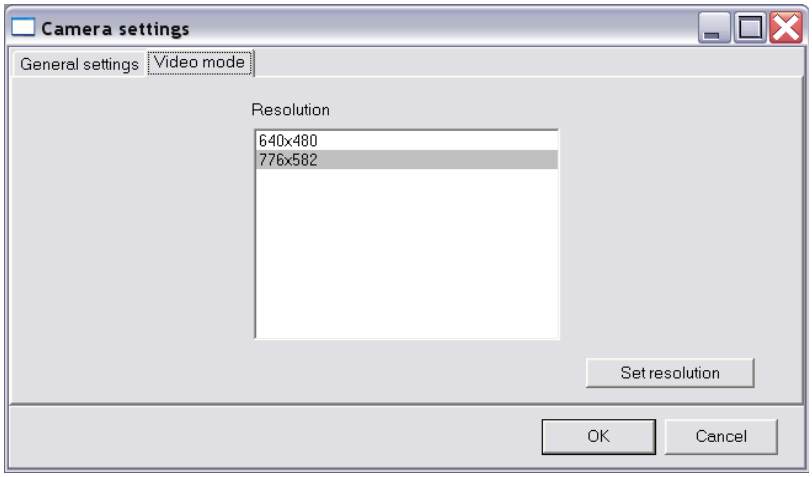


Figure 41

If the camera image is greater than the display area, the image will be scaled down.

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