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DISS 5

Reference Manual

Version 5.9.9.1

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Important Anybody assigned to work with DISS 5 is required to have read and to have understood the relevant parts of this manual.

Accessibility For avoidance of operating errors and to guarantee failure-free operation of DISS 5 the manual must be accessible for the assigned personnel at any time.

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Note All efforts have been made to ensure that the information contained in this document is complete and correct at the time of printing. This manual describes all units and functions known of today.

Address point electronic GmbH

Ackerweg 104

D-06130 Halle (Saale)

Tel: +49 (0)345 1201190

Fax: +49 (0)345 1201223

E-Mail: info@pointelectronic.de

http://www.pointelectronic.de

This manual was created by
LenzKD – Kommunikation und Dokumentation
www.lenz-kd.de

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E Introduction

Chapter overview

Purpose This chapter contains information to simplify working with this manual.

Contents This chapter contains the following information:

› Structure of this Manual E-2

› Representations in this Manual E-3

Structure of this Manual

Purpose This manual describes the following components of DISS 5:

- Image Acquisition
- Image Processing

Structure This manual is structured into chapters which are organized by technical aspects.

Numbering The chapters are numbered with Arabic numerals. Chapters can be structured in sections. Sections are numbered as second numbering level (e.g. 3.1). Sections are used to structure large chapters into sub-chapters. Page numbering always consists of the chapter number and page number. Each chapter starts with page 1. The page number 3-11 for example means page 11 in chapter 3.

Chapter Overview Each chapter and section contains an overview with content and page numbers. This allows a direct entrance into a topic and the independent use of parts of this manual.

Related Information Related information within the manual is marked by the note "Continuation next page ..." resp. "... Continuation:". Please pay attention to the completeness of the information when copying parts of the manual.

Cross References The content of this manual is structured by topics. If more information on one topic can be found on another place in the manual, the relevant chapter and page are pointed out.

Representations in this Manual

Illustrations Illustrations used in this manual do not always contain all details or special cases. They only represent the relevant information.

Menu Functions In this manual, the various menu functions are presented as follows:

Finding a menu point: Open → File

Keyboard Shortcuts Frequently used functions and instructions can be activated by using certain key combinations. These are presented as follows:

Keyboard Shortcut	Representation
Key	Ctrl
Key combination	Ctrl+Alt+Del

Inputs and Outputs Certain recurring symbols or descriptions are used to symbolize possible screen inputs and outputs. These are used as follows:

Inputs and Outputs	Representation
Buttons	**| Button |**
Dialog window	**Dialog window**
Elements of the user interface	**GUI element**

Continued on next page ...

... Continuation: Representations in this Manual

Mouse Functions The following table explains the concepts used in this manual to describe the handling of the mouse:

Concept	Explanation
Click	Singular pressing of the left mouse button
Double-click	Double pressing of the left mouse button
Right-click	Singular pressing of the right mouse button
Pressed mouse button	Left or right mouse button is kept pressed during a process
Drag & Drop, a standard mouse procedure:	"Drag & Drop" Click on an element of the user interface, drag the element with pressed mouse button to another position, drop the element to this position

Notes Important notes are marked as follows:

Notes explain relations that even for expert users might not be evident at first glance. The neglect of a note is no direct security risk. However, it can lead to disturbances in the operating procedure.

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1 System Overview

Chapter overview

Purpose This chapter describes the DISS 5 system. It contains information on the structure and function of the system as well as the system requirements.

Contents This chapter contains the following information:

› System Requirements 1-2

› System Description 1-3

System Requirements

Computer System

The following table contains information on the computer's system requirements:

Component	Minimum Requirements
Computer	IBM-compatible from P4 with 3 GHz or Core2Duo 1.8 GHz min
Operating system	Windows 2000, SP4 Windows XP, SP2 Windows Vista Windows Vista x64 Windows 7 Windows 7 x64
RAM	1 GB min.
Graphics	Resolution at least 1280x1024 pixel, true color
Interfaces	– USB 2.0 (or a free PCI slot)

USB 2.0 Controller Drivers

For operating DISS 5, we recommend USB 2.0 controller drivers by Microsoft. Drivers by other suppliers can cause problems during operation of the DISS 5 unit.

The recommended Microsoft USB drivers are included in Windows 2000 SP4 and in Windows XP SP2.

For Windows XP with Service Pack 1, a patch is available. This patch can be downloaded from the following web page:

http://support.microsoft.com/?kbid=822603

USB 2.0 Controller Drivers

The following table contains information on the recommended minimum versions of USB 2.0 controller drivers:

Operating System	Driver Version
Windows 2000, SP4	usbehci.sys: 5.0.2195.6709 usbhub.sys: 5.0.2195.6689 usbhub20.sys: 5.0.2195.6655 usbport.sys: 5.0.2195.6681
Windows XP, SP1	5.1.2600.1243
Windows XP, SP2	5.1.2600.2180

System Description

Introduction

DISS 5 is an active image acquisition and processing system for Scanning Electron Microscopes (SEM), Scanning Transmission Electron Microscopes (STEM) and Electron Microprobe Analyzers (EMPA).

DISS 5 can be installed on all commercially available optoelectronic devices. The installation will not affect any functions of these devices.

During the digital image acquisition, the internal scan generator will be turned off, and the beam control of DISS 5 will take over.

The DISS 5 unit:

- switches the optoelectronic device via hardware or software to external beam control (device-dependent)
- creates X and Y deflecting voltages
- digitizes the analog image signals (SE, BSE, CL)
- counts the impulses of an EDX or WDX system for each pixel for the generation of elemental mapping images or concentration profiles (optional)

Image Acquisition

The image acquisition in DISS 5 allows to acquire up to 4 analog and 12 impulse signals simultaneously. Image format and resolution are freely selectable. A Region Scan with zoom function facilitates focusing and astigmatism correction. Apart from adjustable scan time, functions like line averaging and frame averaging improve the signal-to-noise ratio. For the utilization of EDX signals, elemental mapping, line scan, point scan and area scan are available.

Image Processing

With DIPS (Digital Imaging Processing System), all digitized images can be processed, labeled, measured, printed and saved easily. A special layout technique facilitates the processing of several related images as well as their documentation and archiving.

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2 Installation

Chapter overview

Purpose This chapter contains information and instructions on installation and set-up of hardware and software.

Contents This chapter contains the following information:

› Software Installation 2-2

› Set-up of Mains Voltage 2-3

› Installation of the DISS 5 Unit 2-5

› Set-up of Scan Polarity 2-8

› Set-up of External Settings 2-10

› Adjustment of the DISS 5 Unit 2-12

Software Installation

Installer

The DISS 5 software is provided on a flash drive. Running the file "diss5setup.exe" launches the installer.

The installer installs the following components:

- DISS 5 driver (compatible with Windows 2000 to Windows 7 32 and 64 bit)
- DISS 5 Image Acquisition Software
- Digital Image Processing System DIPS
- Configuration files
- Documentation

Install the DISS 5 software first before connecting the DISS 5 unit to the PC.

Steps

Complete the following steps to install the DISS 5 software:

1. Connect the flash drive to your computer.
2. Run the file "diss5setup.exe" on the flash drive.
3. Follow the instructions on the screen.

   ⇒ The installation proceeds. Application and necessary driver are installed.

Currently, the DISS 5 interface is only available in English.

Attention during the updating process!

If you install DISS 5 on a computer where the software has already been installed, two confirmation prompts will appear on the screen during installation. You will have to confirm whether or not the current installation is to override the existing configuration files of DISS 5.

You have to click the **No** button in these two dialogs. Otherwise your DISS 5 settings will be lost

Set-up of Mains Voltage

Local Voltage

The DISS 5 unit can be run with voltages of 230V and 115V. Prior to initial start-up of the DISS 5 unit, the local voltage must be set.

Attention: do not start the unit with the wrong voltage!

Using the DISS 5 unit with a faulty set voltage different from the local voltage can lead to bodily harm and damage or destruction of the DISS 5 unit.

Only use the DISS 5 unit with the local voltage.

Danger: Electrical Hazard!

Body contact with live parts can lead to death or serious injuries as well as the destruction or damaging of components.

Prior to the set-up of the mains voltage, please make sure that the DISS 5 unit is de-energized and secured against unintentional starting (restart).

Before getting started

Complete the following steps prior to setting up the mains voltage of the DISS 5 unit:

1. Switch off the DISS 5 unit.
2. Remove the mains cable.
3. Remove all connectors from the DISS 5 unit.

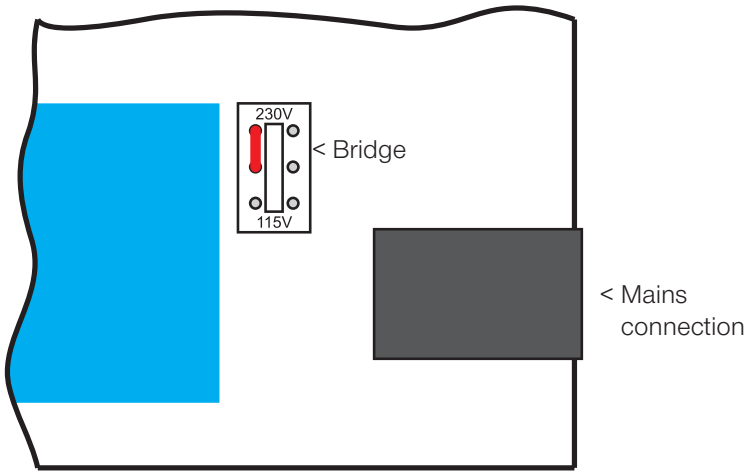
Continued on next page ...

... Continuation: Set-up of Mains Voltage

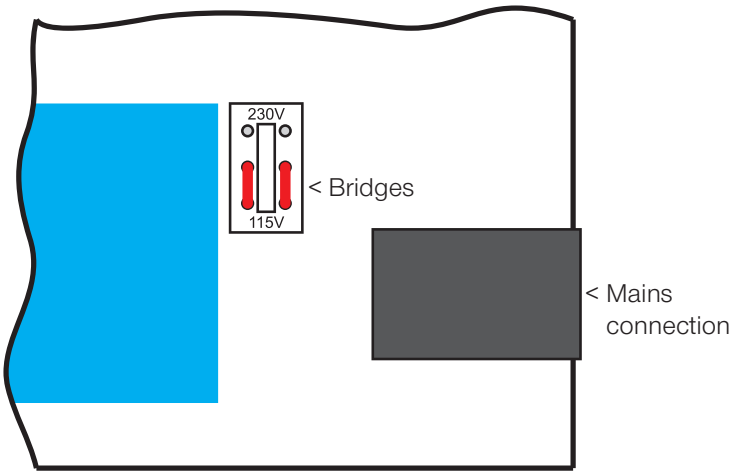
Steps Complete the following steps to set up the mains voltage of the DISS 5 unit:

1. Remove the 4 screws (TORX TX 10) on the back of the DISS 5 unit.
2. Push back the upper casing cover.
3. Set the local voltage with the bridges according to the following figure:

Bridge setting for mains voltage of 230 V



Bridges setting for mains voltage of 115 V



4. Close the casing cover.
5. Attach the 4 screws (TORX TX 10) on the back of the DISS 5 unit.

Installation of the DISS 5 Unit

Requirements

Prior to installation of the DISS 5 unit, please check to make sure that the connected PC complies with the following requirements:

- The PC is equipped with a USB 2.0 gateway. If no USB 2.0 gateway exists, please install a USB 2.0 expansion card. Mind the system requirements for installation of the drivers. (see „System Requirements“ on Page 1-2)
- The DISS 5 software is already installed on the PC.

Before getting started

Complete the following steps to prepare the installation of the DISS 5 unit:

1. Boot the PC.
2. Connect the DISS 5 unit to the mains voltage.
3. Switch on the DISS 5 unit.

Continued on next page ...

... Continuation: Installation of the DISS 5 Unit

Steps Complete the following steps to fully install the DISS 5 unit:

1. Connect the DISS 5 unit with a USB cable to the USB 2.0 gateway of the PC.

   ⇒ A dialog window with a prompt to install the driver appears on the screen.

2. Allow the installer to automatically search your PC for the driver.
3. Configure the digital outputs "ext. Blank" and "ext. Scan".

   The "ext. Blank" and "ext. Scan" outputs are intended for switching the SEM to external beam control. These outputs are floating relay outputs that need to be set according to the SEM requirements. (see „Set-up of External Settings“ on Page 2-10)

4. Connect the DISS 5 unit to the SEM.

   The following figure shows an overview of the pin configuration:

Analog I/O
25pin Sub-D male

1	scan y out
2	scan x out
3	ext. scan out
4	ext. blank out
5	video 1+
6	video 1-
7	video 2+
8	video 2-
9	video 3+
10	video 3-
11	video 4+
12	video 4-
14	scan y in
15	scan x in
16	ext. scan in
17	ext. blank in
18-24	GND

Scan Outputs ±12 V max.

Digital In
25pin Sub-D female

1	X 1
2	X 2
3	X 3
4	X 4
5	X 5
6	X 6
7	X 7
8	X 8
9	X 9
10	X 10
11	X 11
12	X 12
14-25	GND

TTL Counter Inputs

Digital I/O
9pin Sub-D female

1	PixelSync +
2	FrameSync
3	PixelClock
4	LineClock
5	FrameClock
6	PixelSync -
7	ext. blank
8	ext. scan
9	GND

Sync:	TTL Inputs
Clock:	TTL Outputs
	low during line/frame return
Ext.:	TTL Outputs

Continued on next page ...

... Continuation: Installation of the DISS 5 Unit

5. Establish a connection with the EDX/WDX systems. (optional)

   For this, connect the impulse inputs with the counter outputs of the crystal spectrometer (WDX) and/or the output windows of the energy-dispersive x-ray spectrometer (EDX).

   The inputs are designed for TTL levels. For differing levels, adaptation by the manufacturer is necessary.

6. Connect the SEM to the PC via the RS232. (optional)

Functional Test

After complete installation of DISS 5, a functional test independent from the SEM can be carried out. For this, the x and/or y deflecting voltage are assigned to the inputs for analog image signals. The image acquisition provides an optical wedge for X or Y direction.

Set-up of Scan Polarity

Danger: Electrical Hazard!

Body contact with live parts can lead to death or serious injuries as well as the destruction or damaging of components.

Prior to the set-up of the scan polarity, please make sure that the DISS 5 unit is de-energized and secured against unintentional starting (restart).

Before getting started

Complete the following steps prior to setting up the scan polarity of the DISS 5 unit:

1. Switch off the DISS 5 unit.
2. Remove the mains cable.
3. Remove all connectors from the DISS 5 unit.

Steps

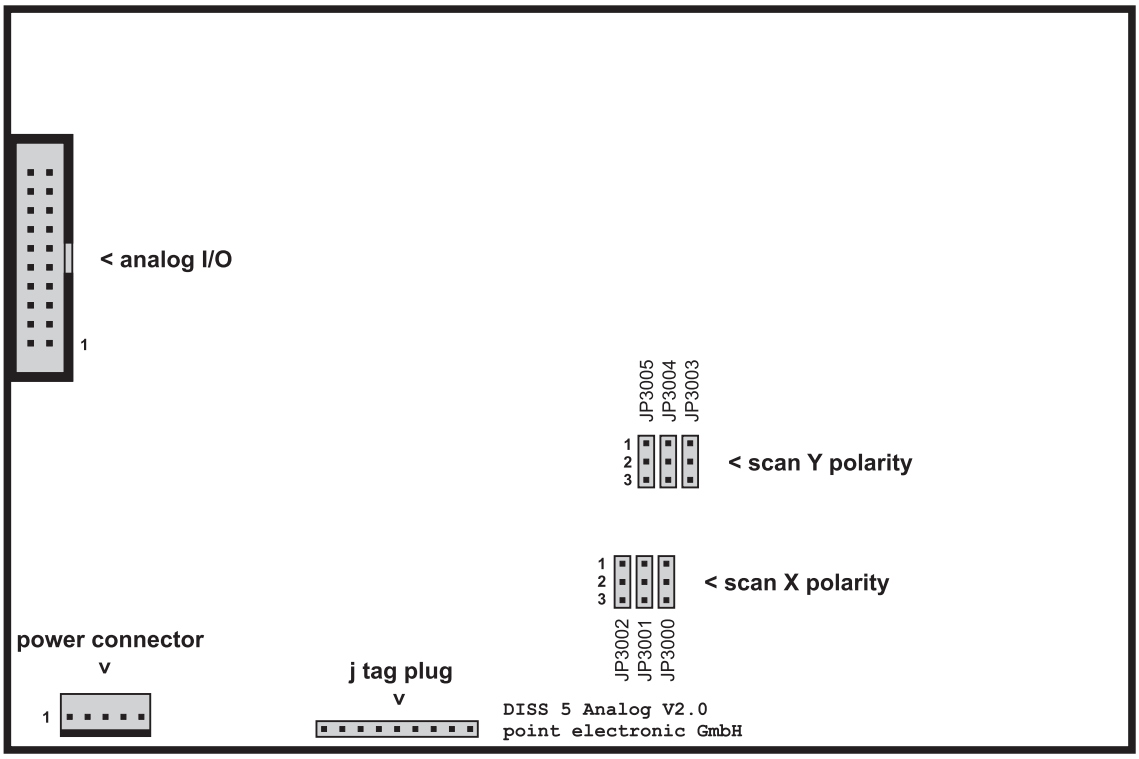
Complete the following steps to set up the scan polarity of the DISS 5 unit:

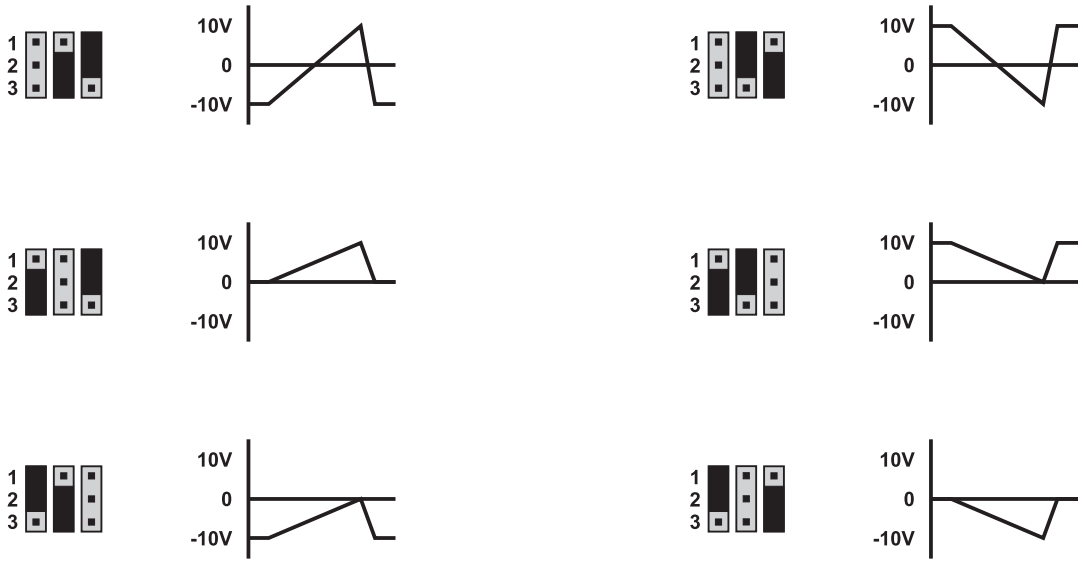
1. Remove the 4 screws (TORX TX 10) on the back of the DISS 5 unit.
2. Push back the upper casing cover.
3. Adjust the preferred scan polarity according to the lay-out plan (Page 2-9).
4. Close the casing cover.
5. Attach the 4 screws (TORX TX 10) on the back of the DISS 5 unit.

Continued on next page ...

... Continuation: Set-up of Scan Polarity

Layout Plan The following figure shows a layout plan with options to set the scan polarity:





Set-up of External Settings

Description With the External Settings, the digital outputs "ext. Blank" and "ext. Scan" are adapted to the requirements of the connected SEM.

Danger: Electrical Hazard!

Body contact with live parts can lead to death or serious injuries as well as the destruction or damaging of components.

Prior to the set-up of External Settings, please make sure that the DISS 5 unit is de-energized and secured against unintentional starting (restart).

Before getting started Complete the following steps prior to setting up the External Settings of the DISS 5 unit:

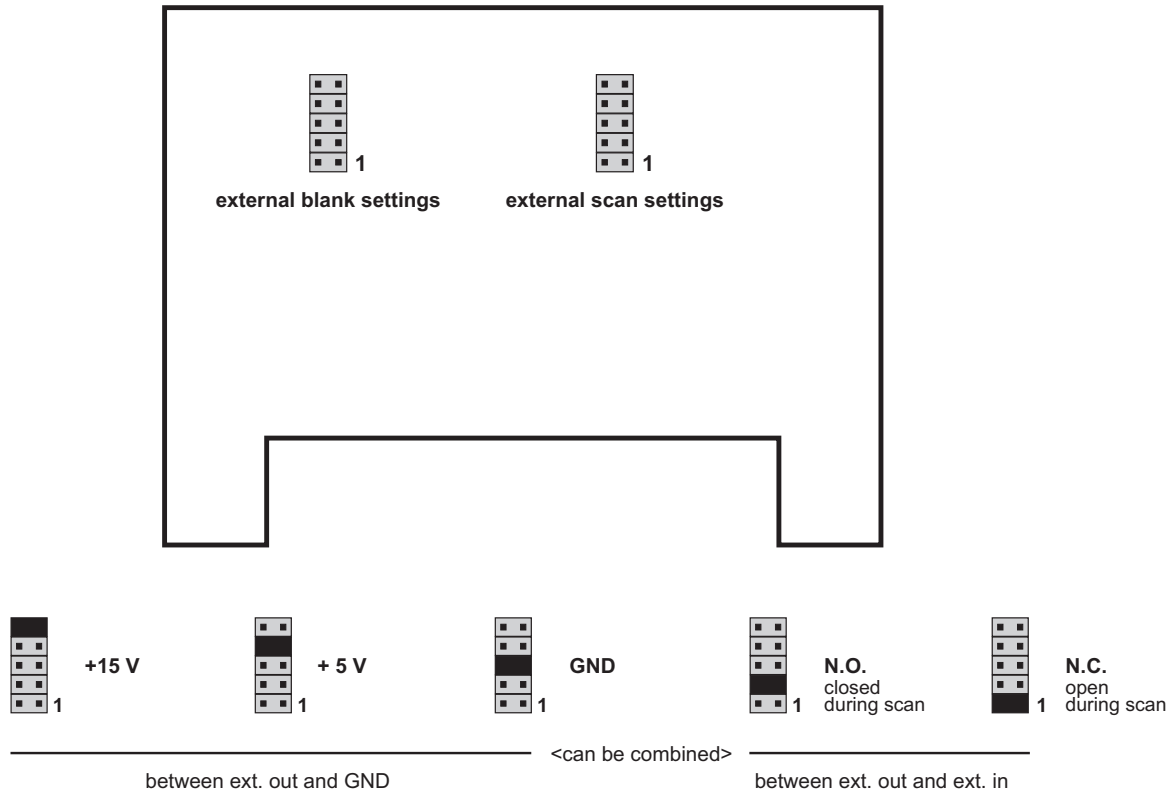
1. Switch off the DISS 5 unit.
2. Remove the mains cable.
3. Remove all connectors from the DISS 5 unit.

Steps Complete the following steps to set up the External Settings of the DISS 5 unit:

1. Remove the 4 screws (TORX TX 10) on the back of the DISS 5 unit.
2. Push back the upper casing cover.
3. Adjust the preferred External Settings according to the layout plan (Page 2-11).
4. Close the casing cover.
5. Attach the 4 screws (TORX TX 10) on the back of the DISS 5 unit.

Continued on next page ...

Layout Plan The following figure shows the configuration of the digital outputs "ext. Blank" and "ext. Scan" as well as the pin configuration of the analog and digital inputs and outputs of DISS 5.



Adjustment of the DISS 5 Unit

Objective

The objective of the adjustment is the accordance of the images on the SEM screen with the DISS image window concerning brightness, contrast and image dimension.
A test sample with known geometric structures is necessary for the adjustment of DISS 5.

Before getting started

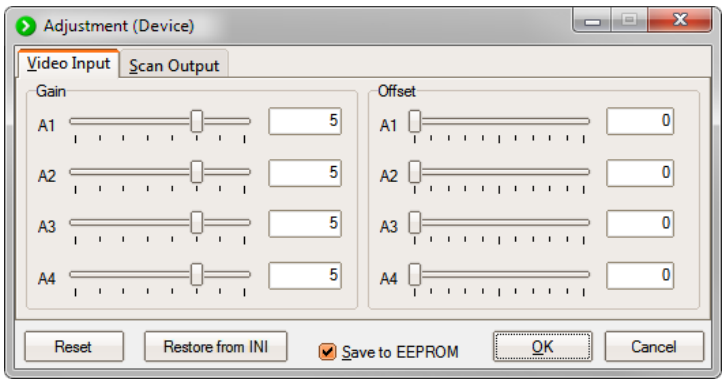
Complete the following steps before starting to adjust the DISS 5 unit:

1. Open the "DISS 5" application.
2. Press Ctrl+Alt+A.
   ⇒ The **Adjustment** window opens
3. Start a Live Scan.

Adjustment

Complete the following steps to adjust the DISS 5 unit:

1. Adjust brightness and contrast in the **Video Input** tab:

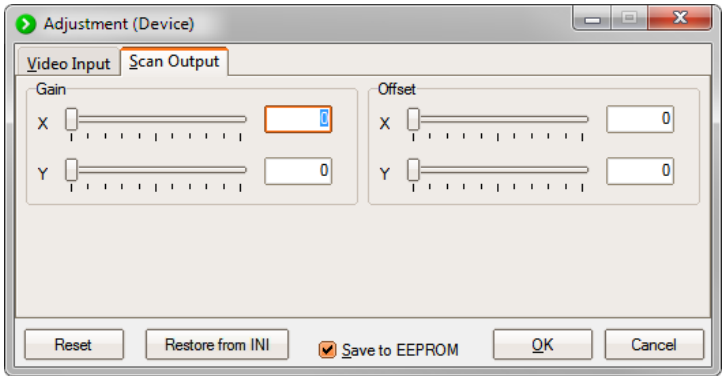


By adjusting the input A1, A2, A3 or A4 used by **Gain** (contrast) and **Offset** (brightness), the analog inputs are adapted to the image signals. The inputs A3 and A4 are only included as options.

Continued on next page ...

... Continuation: Adjustment of the DISS 5 Unit

2. Adjust the image dimension in the **Scan Output** tab:



With the sliders, image position (**Gain**) and image dimensions (**Offset**) can be adapted to the SEM in **X** direction (line) and **Y** direction (frame).

If the image is mirrored horizontally or vertically, the scan polarity needs to be modified. (see „Set-up of Scan Polarity“ on Page 2-8)

3. Verify the set-up in a Slow Scan mode.

Saving and Restoring the Set-up

If the **Save to EEPROM** checkbox is activated, the set-up settings of your DISS 5 device will be saved within the device (EEPROM).

Additionally, the adjustment settings will be saved in the .ini file of the DISS 5 software.

Click the **| Restore from INI |** button to copy the adjustment settings from the .ini file to your DISS 5 device. This might for instance be necessary when you need to copy customized settings to an exchange unit.

Reset Adjustment

Click the **| Reset |** button to reset adjustment settings to default.

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3 Image Acquisition

Chapter overview

Purpose This chapter gives information on the image acquisition of DISS 5. It contains descriptions on structure and function of the image acquisition.

Contents This chapter contains the following sections:

› 3.1 Structure 3-2

› 3.2 Functions in the File Menu 3-16

› 3.3 Functions in the Info Menu 3-35

› 3.4 Functions in the Image Acquisition Bar 3-38

3.1 Structure

Overview

Purpose This section contains descriptions on the structure and function of the image acquisition software.

Contents This section contains the following information:

- Context Menu 3-3
- User Interface 3-5
- Menu Bar 3-7
- Toolbars 3-9
- Image Acquisition Window 3-11
- Image Preview 3-14
- Hint 3-15

Context Menu

Description The context menu can be opened with a right-click. Depending on the area in which the right-click is executed, the menu contains varying functions.

Image Acquisition Window The following figure shows the context menu for the Image Acquisition window

The following table contains information on the context menu of the Image Acquisition window:

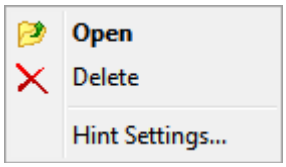
Component	Function
Hair Cross Ctrl+A	Shows a hair cross for adjustment of the grid in the center of the image
Draw Circle ⇧+Ctrl+A	Shows and hides a circle centered on the hair cross The radius of the circle can be modified on the axes of the hair cross.
Interpolation Ctrl+I	Activates or deactivates the interpolation in Full Screen mode
Clear Comment Histories	Deletes all comments entered so far from the memory of the comment line

Continued on next page ...

... Continuation: Context Menu

Image Preview

The following figure shows the context menu for the thumbnails in the Image Preview:

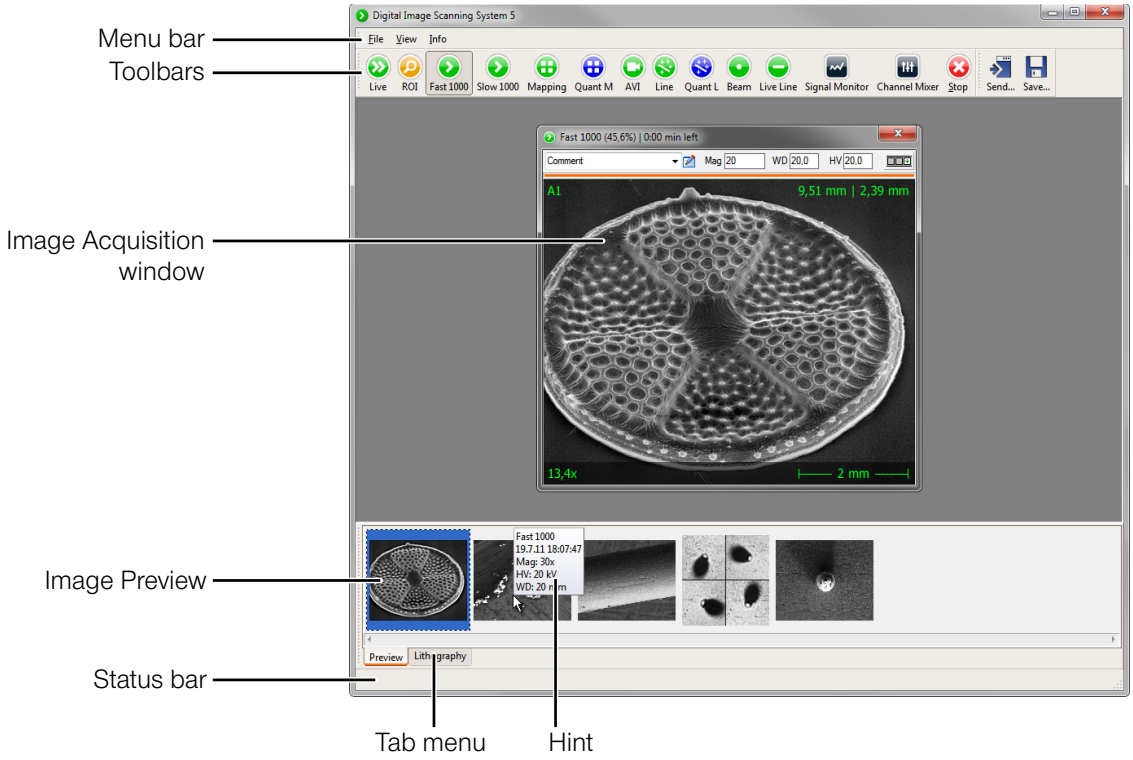


The following table contains information on the context menu of the thumbnails in the Image Preview:

Component	Function
Open	Opens the image in the Image Acquisition window.
Delete	Deletes the image.
Hint Settings...	Opens a dialog window for setting up the Hint Settings (see Page 3-15).

User Interface

Structure The following figure shows the Image Acquisition user interface with its main components:



Functions The following table contains information on the main components of the user interface:

Main Component	Function
Menu bar (Page 3-7)	Global settings
Toolbars (Page 3-9)	– Initializes or stops different scan modes – Starts Signal Monitor – Starts Report Generator – Saves acquired images
Image Preview (Page 3-14)	Clipboard of acquired images
Hint (Page 3-15)	Displays selected metadata of images

Continued on next page ...

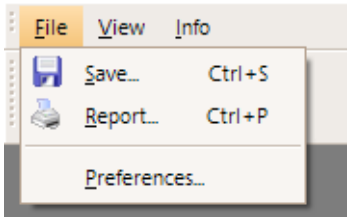
... Continuation: User Interface

Main Component	Function
Status bar	Shows current oversampling and frame averaging during Live Scan, Region Scan and Center Scan The values can be modified by using the arrow keys on the keyboard as follows: – Oversampling: ← and → – Frame Averaging: ↑ and ↓

Menu Bar

File Menu

The following figure shows the File menu with its components:

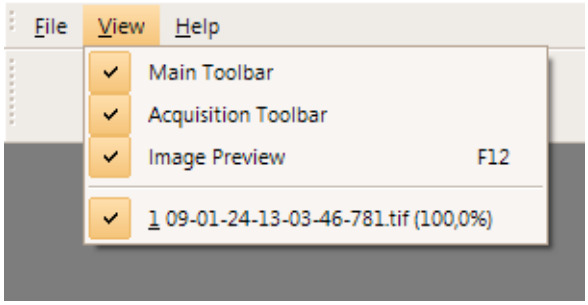


The following table contains information on the components of the File menu:

Component	Function
Save/Send to DIPS Ctrl+S	Saves the current image (Page 3-17)
Report... (optional) Ctrl+P	Opens the Report Generator (Page 3-19)
Preferences... (Page 3-22)	Opens the **Preferences** window for global preferences to save and name the images

View Menu

The following figure shows the View menu with its components:



The following table contains information on the components of the View menu:

Component	Function
Main toolbar	Activates or deactivates the toolbar with the functions Save and Report
Acquisition Toolbar	Activates or deactivates the toolbar with scan functions

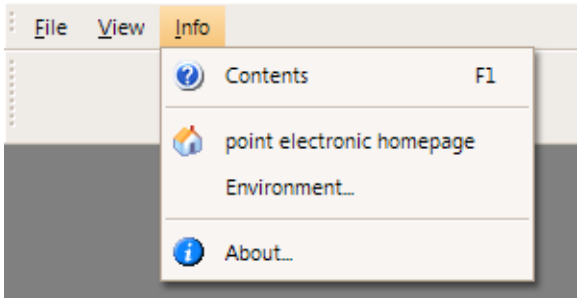
Continued on next page ...

... Continuation: Menu Bar

Component	Function
Image Preview F12	Activates or deactivates the Image Preview
File name	Shows the name of the current image

Info Menu

The following figure shows the Info menu with its components:



The following table contains information on the components of the Info menu:

Component	Function
Contents F1	Opens the online help
point electronic homepage	– Establishes a connection to the internet – Opens the homepage www.pointelectronic.de in a web browser window
Environment... (Page 3-37)	Opens a dialog window that shows the saving location of the configuration files
About... (Page 3-36)	Opens a dialog window with information on the installed software version

Toolbars

Image Acquisition Bar

The following figure shows the Image Acquisition bar with its buttons:

The following table contains information on the buttons of the Image Acquisition bar:

Button	Function	Description
	Live Scan (Page 3-39)	Starts a continuous live preview
	Region Scan (Page 3-42)	Starts a Region Scan
	Slow Scan (Page 3-45)	Starts a Slow Scan
	Mapping (Page 3-49)	Starts a mapping
	Line Scan/ Point Measurement (Page 3-53)	Opens a dialog window for set-up and operation of line and point measurements
	Beam Positioning (Page 3-71)	For positioning the electron beam on the sample
	Center Scan (Page 3-72)	Activates an adjustable scan area in an acquired Live Scan or Slow Scan image
	AVI (Page 3-75)	Opens a dialog window for recording video sequences
	Live Line (Page 3-84)	Initializes a continuous line scan in an acquired Slow Scan image
	Signal Monitor (Page 3-86)	Opens the Signal Monitor
	Channel Mixer (Page 3-91)	Opens a dialog window for live mixing of image signals

Continued on next page ...

... Continuation: Toolbars

Button	Function	Description
	Stop (Page 3-95)	Cancels a running scanning process

Main Toolbar

The following figure shows the Main toolbar bar with its buttons:

The following table contains information on the buttons of the Main toolbar:

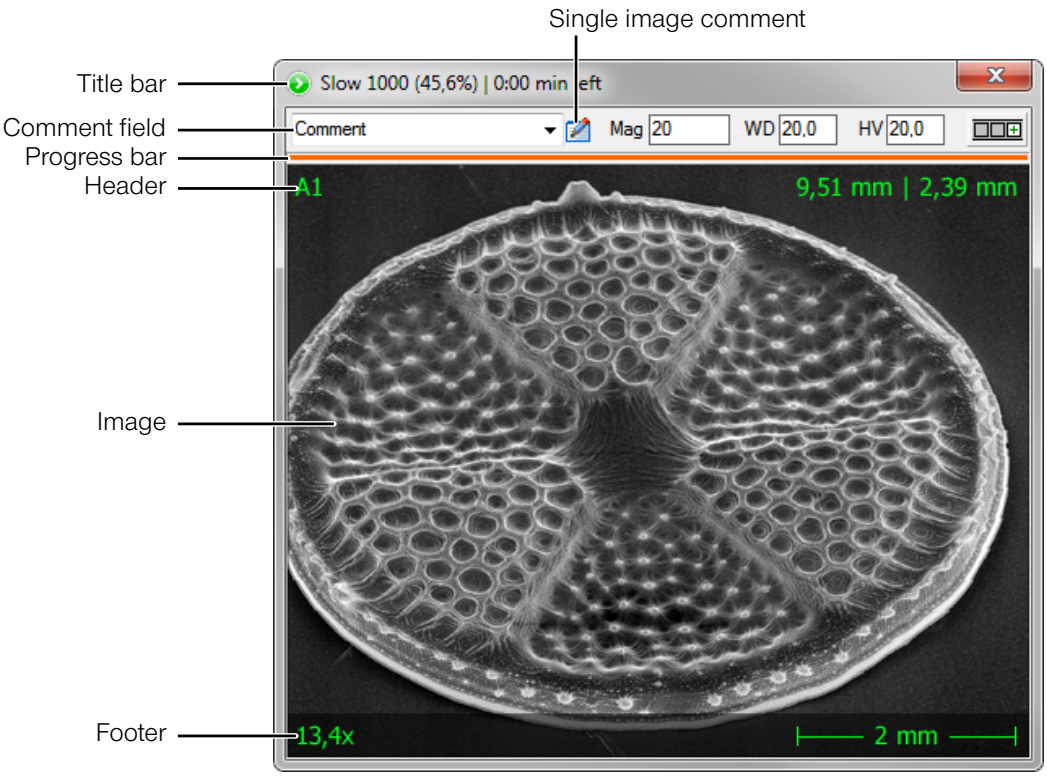
Button	Function	Description
	Save (Page 3-17)	Saves current image or layout
	Send	Transfers the current image or layout to the image processing software DIPS
	Report (optional) (Page 3-19)	Opens the Report Generator

The DIPS Digital Image Processing System must be running to activate the Send function. Otherwise, every Send button looks like a normal Save button.

Keeping the Shift key ⇧ pressed switches between Save and Send function. Thus, a Save button becomes a Send button and vice versa.

Image Acquisition Window

Structure The following figure shows the Image Acquisition window with its components:

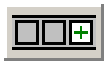
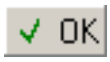


Function The following table contains information on the components of the Image Acquisition window:

Component	Function
Title bar	– Shows the name of the current scan mode – Shows the remaining time of the current scan (percentage and time)
Comment field	For entering an image comment Previously entered comments can be chosen from a history.
| Single image comment |	Activates an input field on the bottom of the Image Acquisition window In the input field, the default signal name can be replaced by individual inputs.
Mag	For entering the magnification used during the scan

Continued on next page ...

... Continuation: Image Acquisition Window

Component	Function
WD	For entering the working distance used during the scan in mm
HV	For entering the high voltage used during the scan in kV
	Deposits the scanned image in the Image Preview bar
	Confirms the entered parameters
Progress bar	Shows scanning progress graphically
Image	Shows current scanning process
Header (Page 3-29)	Shows values of several parameters that can be set in the Live Overlay Settings window
Footer (Page 3-29)	– Shows values of several parameters that can be set in the Live Overlay Settings window – On the bottom right in the footer, the Micron Bar showing the scale of the image will always be displayed

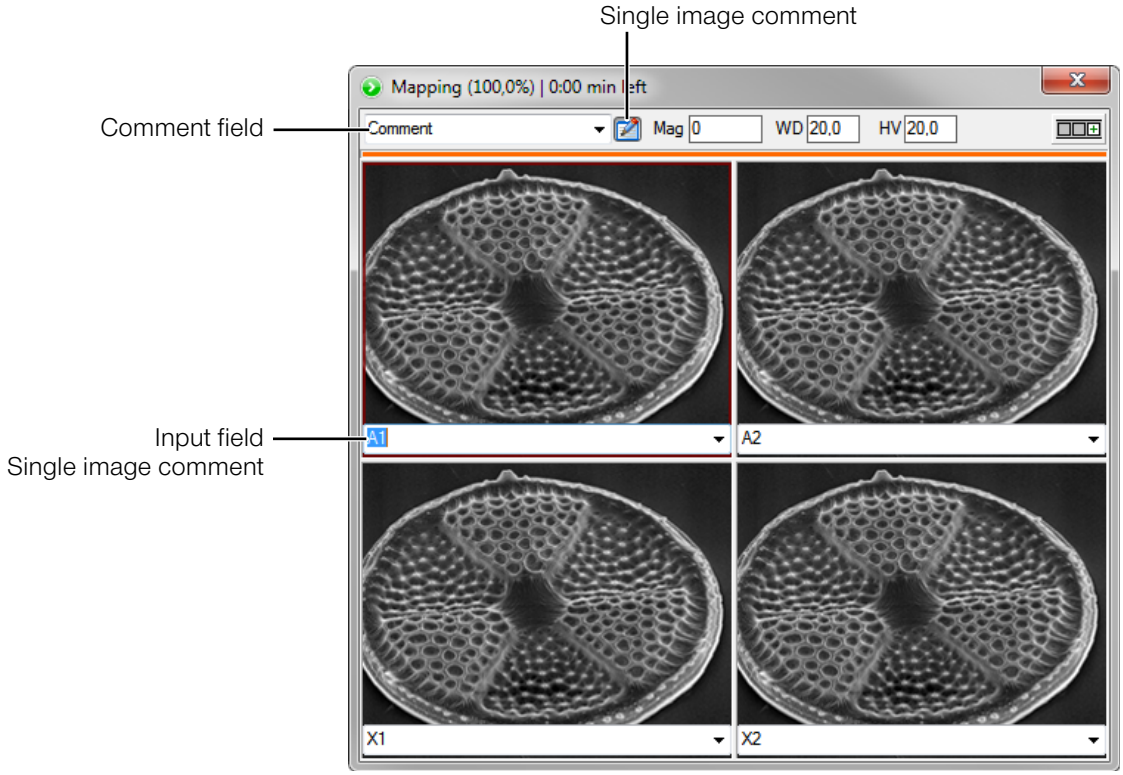
Continued on next page ...

... Continuation: Image Acquisition Window

Multiple Signal Sources

Depending on the scan settings, multiple (analog and digital) signal sources can be acquired and displayed in the Image Acquisition window.

The following figure shows the Image Acquisition window with multiple signal sources:



The following table contains information on further components of the Image Acquisition window with multiple signal sources:

Component	Function
Comment field	For entering or selecting a global comment The global comment refers to all signal sources.
| Single image comment |	Activates separate input fields for each signal source In the input fields, the default signal name can be replaced by individual inputs.
Input field single image comment	For entering or selecting a comment for each signal source

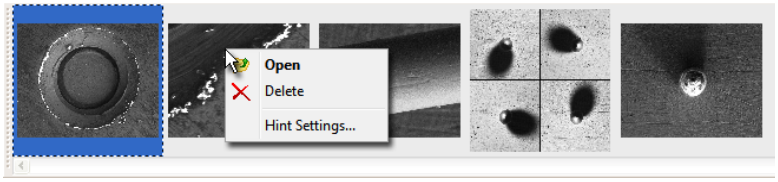
Image Preview

Description The images acquired with DISS 5 are temporarily saved in the Image Preview and will be shown there as thumbnails.

By clicking on a thumbnail, the corresponding image opens up within the workspace. The selected thumbnail is highlighted in blue.

A right-click on a thumbnail opens a context menu with options to open or delete the relevant image and to set up the Hint settings (see Page 3-15).

Structure The following figure shows the Image Preview with the context menu:

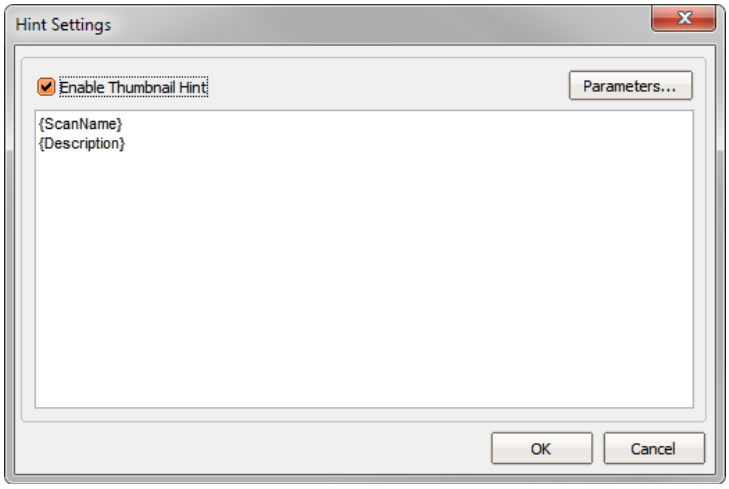


Hint

Description The Hint field shows image data of an image in the Image Preview. Image hints will be displayed as soon as the mouse cursor is placed on that image.

The information shown is saved as metadata in XMP format with the acquired image. Such metadata can for instance contain image comments, acquisition date or magnification.

Hint Settings Use the right mouse button to click on an image in the Image Preview and choose **Hint Settings ...** from the context menu to open the **Hint Settings** window:



The following table contains information on the components of the **Hint Settings** window:

Component	Function
Enable Thumbnail Hint	Activates/deactivates the display of hints in the Image Preview.
| Parameters ... | (Page 3-33)	Opens the **Parameters** window for setting and inserting global parameters for hints display.
Parameter field	In the Parameter field, parameters are inserted and arranged. Parameters are displayed symbolically as parameter name in curly brackets. Between parameters, any text (including special characters or breaks) can be inserted.
| OK |	Closes the dialog window. The preset settings are saved.
| Cancel |	Closes the dialog window. The preset settings are rejected.

3.2 Functions in the File Menu

Overview

Purpose This section contains descriptions on the structure and function of the File menu components.

Contents This section contains the following information:

› Save/Send 3-17

› Report (optional) 3-19

› Preferences 3-22

› Configuring Save Buttons 3-25

› Configuring Live Overlay 3-29

› Configuring Parameters 3-33

Save/Send

Description With the Save/Send function, the active image or layout can be saved directly or can be transferred to the image processing system DIPS.

The current function of a Save button is visible by the way the button looks.

Whether a Save button uses the Save or Send function can be determined with the **Send Image to DIPS** checkbox in the **Save Settings** window (see Page 3-22).

By keeping the ⇧ key pressed, the function of the Save buttons can be changed from "Save" to "Send" and vice versa. For this, the image processing software must be opened.

If the image processing software is not open, the Save function will always be active.

Function The following table contains information on the look and function of the two conditions of Save/Send buttons:

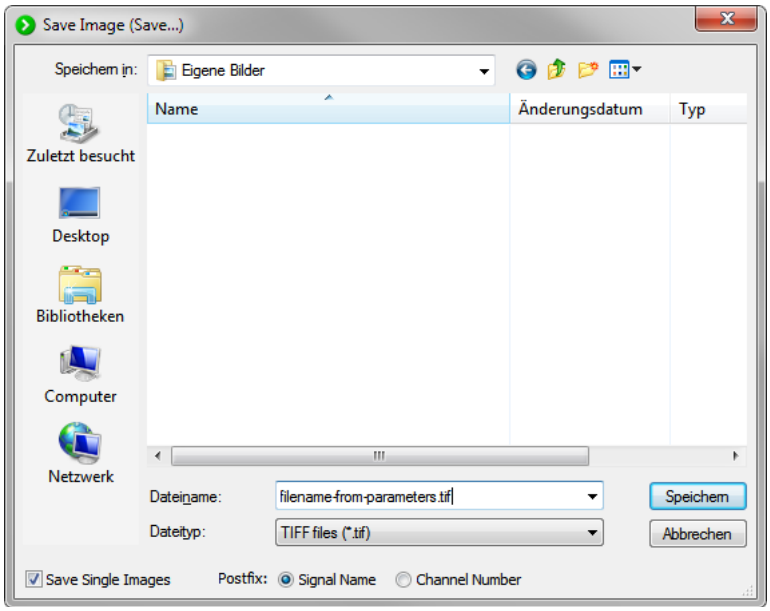
Look	Function
	Opens the **Save Image** window for saving the current image or layout
	Transfers the current image or layout to the image processing software DIPS

Continued on next page ...

... Continuation: Save/Send

"Save Image" Window

The following figure shows the **Save Image** window with its components:



The following table contains information on the components of the **Save Image** window:

Component	Function
Save Single Images	Saves the images acquired from multiple signal sources as single images
Postfix	
– **Signal Name**	Adds the channel name to the file name
– **Channel Number**	Adds the channel number as two-digit number to the file name

Report (optional)

Description With the Report function, acquired images or layouts and their properties can be displayed as tables in a DOC file. For the design of the doc files, either predefined templates can be used.

Or specific templates can be defined by the user.

The Report function opens the **Report Generation** window with two tabs for the selection of design templates and the definition of file name and report headline.

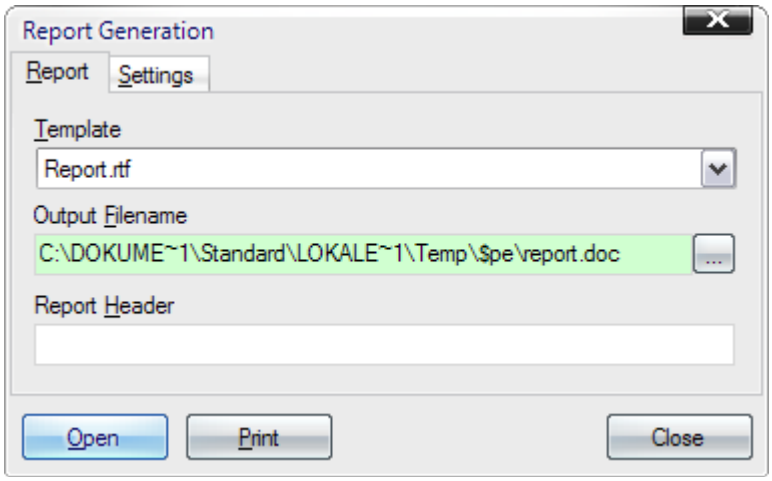
Button Pressing the following button opens the Report Generator:

Continued on next page ...

... Continuation: Report (optional)

"Report" Tab

The following figure shows the **Report Generation** window with the **Report** tab:



The following table contains information on the components of the **Report** tab:

Component	Function
Template	Contains a template list with available design templates for a report
Output Filename	Chooses saving location and file name of the report
Report Header	For entering a report headline
| Open |	Generates a report with the selected settings The report will be opened in a word processing application (e.g. Microsoft Word).
| Print |	Generates a report with the selected settings The report will be printed with a word processing application.
| Close |	Closes the dialog window No report is generated.

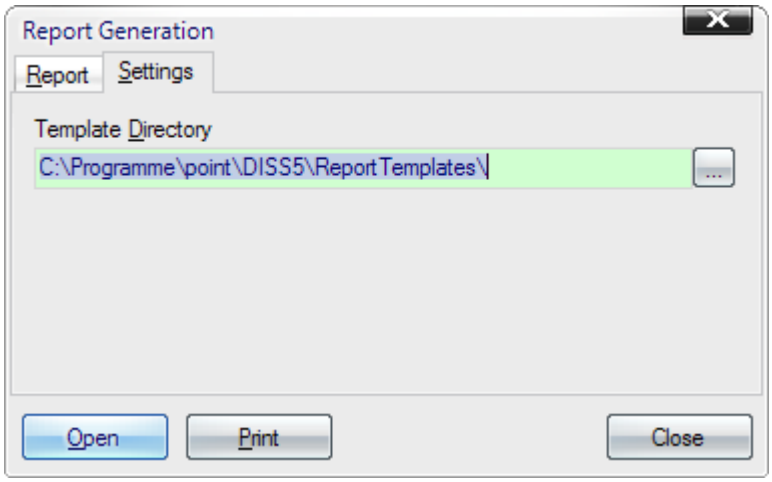
Continued on next page ...

... Continuation: Report (optional)

"Settings" Tab

In the **Settings** tab, the directory of the design templates can be selected.

The following figure shows the **Report Generation** window with the **Settings** tab:



The following table contains information on the components of the **Settings** tab:

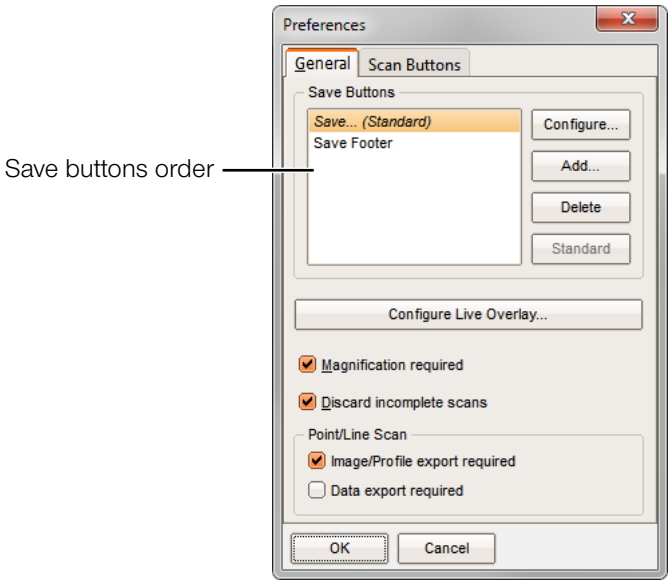
Component	Function
Template Directory	Determines the directory with design templates

Preferences

Description The Preferences function sets the global preferences for DISS 5.

"General" Tab In the **General** tab, general settings for DISS 5 can be found.

The following figure shows the **Preferences** window with the **General** tab:



The following table contains information on the components of the **General** tab:

Component	Function
Save buttons order	Preview of the Save buttons order in the Main toolbar. Save buttons can be selected by clicking on them.
| Configure... | (Page 3-25)	Configures the selected Save button Opens the **Save Settings** window.
| Add... |	For adding Save buttons Opens the **Save Settings** window.
| Delete |	For deleting selected Save buttons from the Save buttons list
| Standard |	For defining the selected Save button as default The default Save button will be used: – for the **| Save Image... |** function in the channel mixer – for the **| Image Export... |** function in Line Scan / Point Measurement

Continued on next page ...

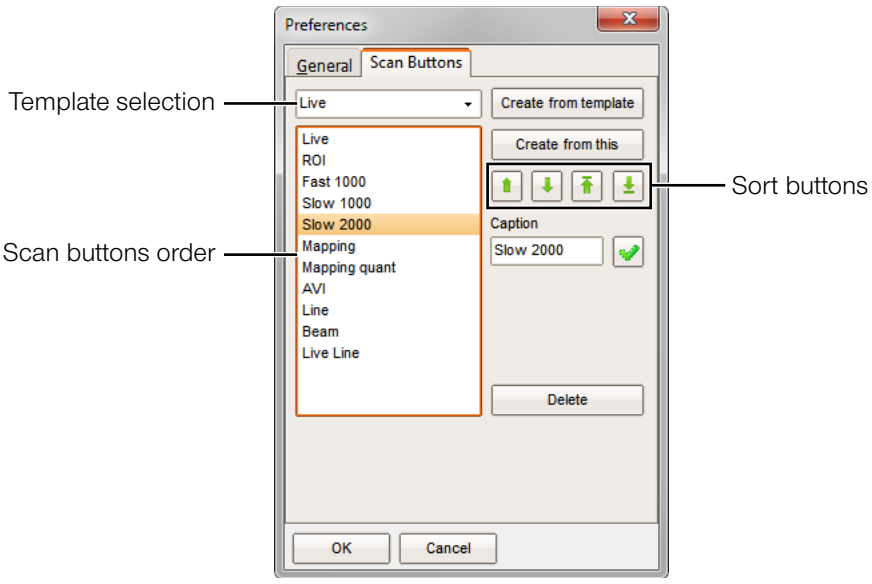
... Continuation: Preferences

Component	Function
| Configure Live Overlay... | (Page 3-29)	Configures header and footer of the Image Acquisition window Opens the **Live Overlay Settings** window.
Magnification required	Activates a warning if no value is entered in the **Mag** field
Discard incomplete scans	Activates automatic deletion of incomplete image acquisitions
Point/Line scan – **Image/Profile export required** – **Data export required**	Activates warnings when closing the **Point/Line Measurement** window Activates a warning if no image or diagram is exported Activates a warning if no data is exported
| OK |	Closes the dialog window The settings are applied.
| Cancel |	Closes the dialog window All settings are rejected.

"Scan Buttons" Tab

The **Scan Buttons** tab contains functions for configuring the Scan buttons.

The following figure shows the **Preferences** window with the **Scan Buttons** tab:



Continued on next page ...

... Continuation: Preferences

The following table contains information on the components of the **Scan Buttons** tab:

Component	Function
Template selection	For selecting a Scan button template (preconfigured Scan button template)
| Create from template |	For creating a Scan button from the selected template The Scan button will be inserted underneath the selected Scan button within the Scan buttons list. If no Scan button is selected, the new Scan button will be inserted on top of the list.
Scan buttons order	Preview of the Scan buttons order in the Image Acquisition bar. Scan buttons can be selected by clicking on them.
| Create from this |	Duplicates the selected Scan button
Sort buttons	Selected Scan button up Selected Scan button down Selected Scan button to top Selected Scan button on bottom
Caption	For entering a caption for the selected Scan button
	Accept the inserted Scan button caption
| Delete |	Deletes the selected Scan button from the Scan buttons list
| OK |	Closes the dialog window The settings are applied. After creating new Scan buttons and clicking **| OK |**, a warning tells you that you have to close and restart the software. Without restarting the software, new Scan buttons will not be displayed, and all changes to existing Scan buttons settings from this point on will be lost.
| Cancel |	Closes the dialog window All settings are rejected.

Configuring Save Buttons

Description In the **Save Settings** window, Save buttons with different functions can be created or configured.

The **Save Settings** window opens after a right-click on a Save button or after clicking the **| Configure... |** or **| Add... |** buttons in the **Preferences** window in the **General** tab.

General Settings The general settings in the **Save Settings** window can be entered regardless of the chosen tab.

The following table contains information on the general settings in the **Save Settings** window:

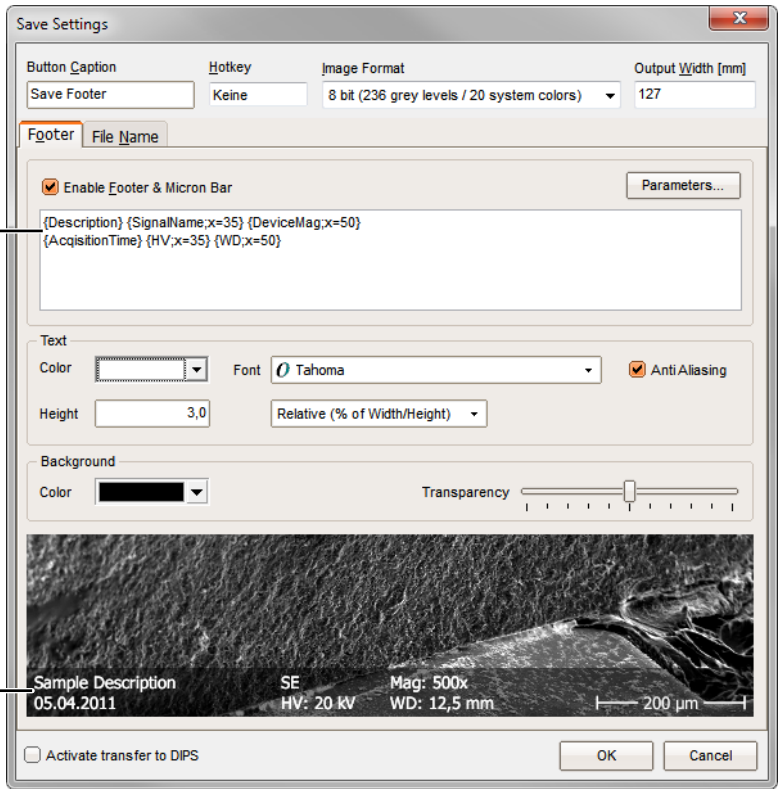
Component	Function
Button Caption	For entering the Save button caption
Hotkey	For entering a Save button hotkey For recording a hotkey, place the cursor in the **Hotkey** text field and press the particular key or key combination.
Image Format	Sets the color depth with which acquired images are saved In the "16 bit (65536 gray levels / raw data)" setting, only the raw data of the captured image is saved. A footer is not possible with this format.
Output Width [mm]	Sets the width in millimeters in which acquired images are saved
Activate transfer to DIPS	If this checkbox is activated, the acquired image will not be saved when clicking the Save button but will instead be transfered to the image processing software. If this function is active, the icon of the button changes. Image transfer only works when the image processing software is open. When the image processing software is open, the function of the Save buttons can be switched between instant saving and image transfer by keeping the Shift key ⇧ pressed.
| OK |	Closes the dialog window The settings are applied.
| Cancel |	Closes the dialog window All settings are rejected.

Continued on next page ...

... Continuation: Configuring Save Buttons

"Footer" Tab

The following figure shows the **Save Settings** window with the **Footer** tab:



The following table contains information on the components of the **Footer** tab:

Component	Function
Enable Footer & Micron Bar	Activates/deactivates footer during the saving of images If the footer is activated, the **Micron Bar** (image scale) will always be visible next to the adjustable parameters on the bottom right. With **Image Format** "16 bit (65536 gray levels / raw data)", it is not possible to activate the footer.
| Parameters ... | (Page 3-33)	Opens the **Parameters** window for selecting, setting and inserting the footer parameters.

Continued on next page ...

... Continuation: Configuring Save Buttons

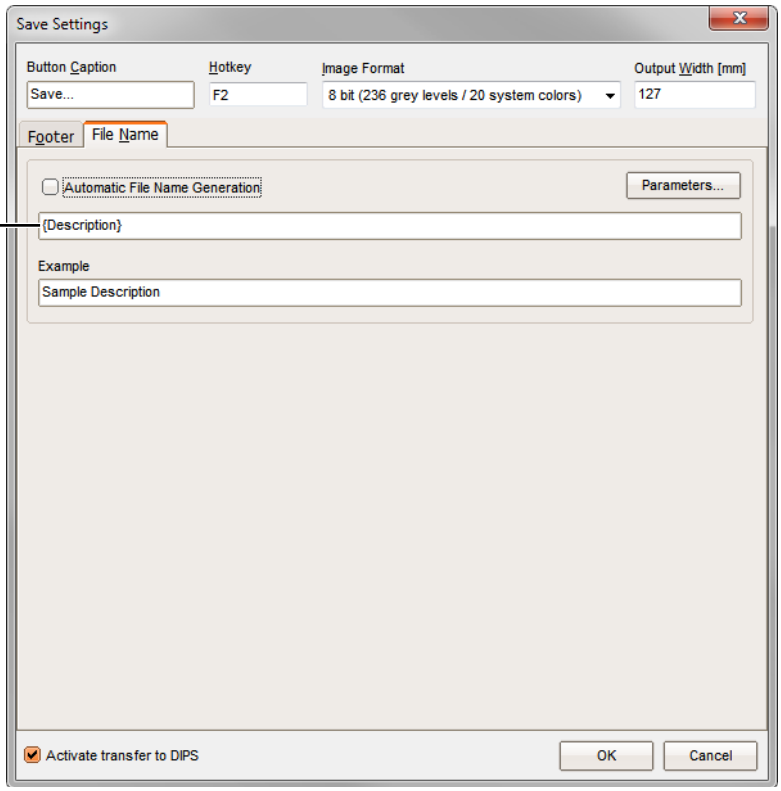
Component	Function
Parameter order	For inserting and arranging the parameters in the footer. Parameters are displayed symbolically as parameter name in curly brackets. After the parameter name, within the curly brackets, the percentage of the parameter indentation (from left) can be inserted separated by a semicolon, e.g.: – {Description;x=35} – This parameter would be indented to the left by 35% of the total image width in the footer. – {Description;x=100} – This parameter would be aligned in the footer to the right-hand margin of the image. Between parameters, any text (including special characters or breaks) can be inserted.
Text	
– **Color**	For setting the font color in the footer
– **Font**	For setting the font in the footer
– **Anti-Aliasing**	For activating/deactivating anti-aliasing
– **Height**	For setting font size
– **Height selection field**	For setting the font size unit – **Relative (% of Width/Height)** – Font size as percentage relative to image width and image height – **Relative (% of Height)** – Font size as percentage relative to image height – **Absolute (dots)** – Font size as absolute value in pixels
Background	
– **Color**	For setting the background color in the footer
– **Transparency**	For setting the transparency of the background color in the footer
Preview	Preview of the footer with the selected settings

Continued on next page ...

... Continuation: Configuring Save Buttons

"File Name" Tab

The following figure shows the **Save Settings** window with the **File Name** tab:



The following table contains information on the components of the **File Name** tab:

Component	Function
Automatic File Name Generation	For activating/deactivating the automatic generation of file names The chosen file name is automatically suggested when images are saved.
| Parameters ... | (Page 3-33)	Opens the **Parameters** window for selecting, setting and inserting the global parameters of the automatic generation of file names during saving images.
Parameter order	For inserting and arranging the parameters in the automatically generated file name. Parameters are displayed symbolically as parameter name in curly brackets. Between parameters, text (including spaces or delimiters) can be inserted.
Example	Shows a preview of the possible file name

Configuring Live Overlay

Description Live Overlay shows parameters in the header and/or footer of the Image Acquisition window. The parameters displayed and the formatting of header and footer can be configured.

Live Overlay Settings For opening the **Live Overlay Settings** window:

1. Click **Preferences...** in the **File Menu**
2. Click **| Configure Live Overlay... |** in the **General** tab

General Settings The general settings in the **Live Overlay Settings** window can be entered regardless of the chosen tab.

The following table contains information on the general settings in the **Live Overlay Settings** window:

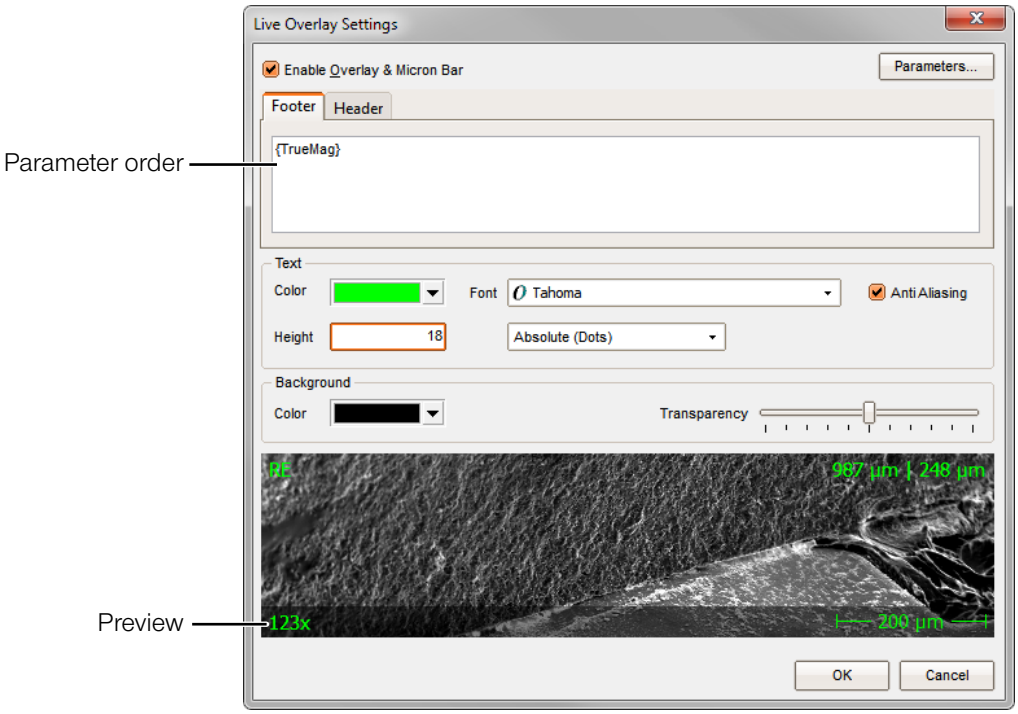
Component	Function
Enable Overlay & Micron Bar	Activates / deactivates Live Overlay If Live Overlay is active, the Micron Bar (image scale) will always be visible next to the adjustable parameters on the bottom right in the footer.
| Parameters ... |	Opens the **Parameters** window for selecting, setting and inserting the global parameters for Live Overlay entries (header and footer).
Text	
– **Color**	For setting the Live Overlay font color (header and footer)
– **Font**	For setting the Live Overlay font (header and footer)
– **Anti-Aliasing**	For activating/deactivating anti-aliasing
– **Height**	For setting font size
– **Height selection field**	For setting the font size unit – **Relative (% of Width/Height)** – Font size as percentage relative to image width and image height – **Relative (% of Height)** – Font size as percentage relative to image height – **Absolute (dots)** – Font size as absolute value in pixels
Background	
– **Color**	For setting the Live Overlay background color (header and footer)
– **Transparency**	For setting the Live Overlay background color transparency (header and footer)
Preview	In the preview, the selected settings for Live Overlay are displayed

Continued on next page ...

... Continuation: Configuring Live Overlay

Component	Function
| OK |	Closes the dialog window The settings are applied.
| Cancel |	Closes the dialog window All settings are rejected.

"Footer" Tab The following figure shows the **Live Overlay Settings** window with the **Footer** tab:



Continued on next page ...

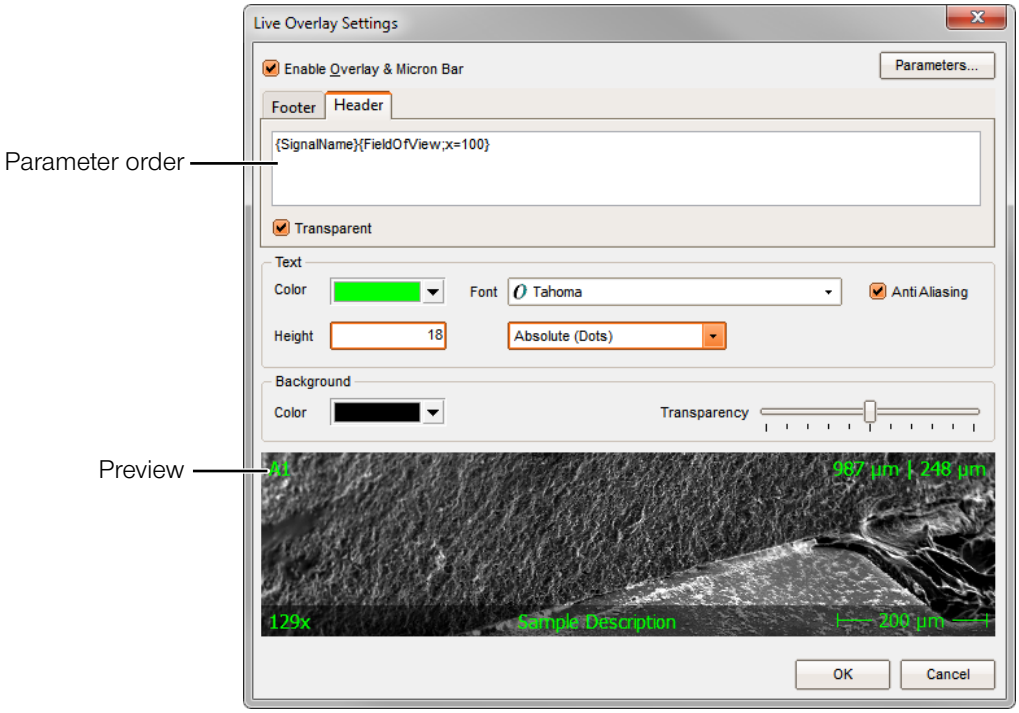
... Continuation: Configuring Live Overlay

The following table contains information on the components of the **Footer** tab:

Component	Function
Parameter order	For inserting and arranging the parameters in the footer Parameters are displayed symbolically as parameter name in curly brackets. After the parameter name, within the curly brackets, the percentage of the parameter indentation (from left) can be inserted separated by a semicolon, e.g.: – {Description;x=35} – This parameter would be indented to the left by 35% of the total image width in the footer. – {Description;x=100} – This parameter would be aligned in the footer to the right-hand margin of the image. Between parameters, any text (including special characters or breaks) can be inserted. On the bottom right in the footer, the Micron Bar showing the scale of the image will always be displayed.

"Header" Tab

The following figure shows the **Live Overlay Settings** window with the **Header** tab:



Continued on next page ...

... Continuation: Configuring Live Overlay

The following table contains information on the components of the **Header** tab:

Component	Function
Parameter order	For inserting and arranging the parameters in the header Parameters are displayed symbolically as parameter name in curly brackets. After the parameter name, within the curly brackets, the percentage of the parameter indentation (from left) can be inserted separated by a semicolon, e.g.: – {Description;x=35} – This parameter would be indented to the left by 35% of the total image width in the header. – {Description;x=100} – This parameter would be aligned in the header to the right-hand margin of the image. Between parameters, any text (including special characters or breaks) can be inserted.
Transparent	Activates / deactivates the background color of the header If the checkbox is activated, the header background color is turned off (100% transparent).

Configuring Parameters

Description

In addition to the image data, metadata in XMP format will be saved with each image acquired in DISS 5. Such metadata can for instance contain image comments, acquisition date or magnification.

Metadata in XMP format can be displayed and processed with XMP-compatible software like Adobe Photoshop. It will not be lost when saving the edited image in Adobe Photoshop.

The metadata can be displayed live in the Image Acquisition window, as footer in the saved image and as hint in the Image Preview. It will also be used for the automatic generation of file names.

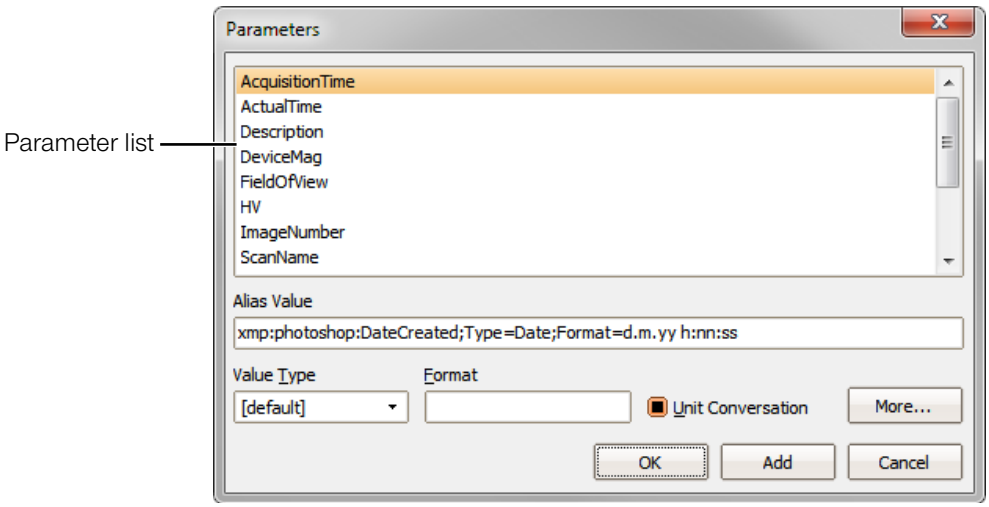
In the **Parameters** window, the parameters to be displayed and their format can be configured.

"Parameters" Window

The **Parameters** window can be opened via the following windows:

- **Live Overlay Settings** (see Page 3-29)
- **Hint Settings** (see Page 3-15)
- **Save Settings** (see Page 3-25)
- **Scan Settings AVI** (see Page 3-80)

The following figure shows the **Parameters** window with its components:



Continued on next page ...

... Continuation: Configuring Parameters

The following table contains information on the components of the **Parameters** window:

Component	Function
Parameter list	– Contains all available preconfigured parameters – Parameters can be selected by clicking them – By double-clicking, parameters can be inserted in the parameter list.
Alias Value	Shows name and attributes of the selected parameter in XMP format. Name and each single attribute will be separated by semicolons.
Value Type	Changes the default data type of the selected parameter Default maintains the default data type of the selected parameter Usually, the default for the **Value Type** can be used.
Format	Changes the display format of the parameter For example: The display of the Acquisition Time is to be changed from the preconfigured default format (d.m.yy h:nn:ss) including date and time to only display the date. Choose the parameter "AcquisitionTime" in the parameter list and enter the following value in the **Format** field: dd.mm.yyyy ⇒ Thus, only the date will be displayed. Days and months will alway be displayed with two digits, years with four digits, for instance 01.05.2011.
Unit Conversation	Sets the automatic conversion of units – Maintain default – Enable unit conversion – Disable unit conversion
| More... |	Opens a dialog window for displaying and adapting the changed parameter properties
| OK |	Closes the dialog window, the settings for the selected parameter are applied The selected parameter will not be inserted in the parameter list.
| Add |	Inserts the selected parameter into the parameter list
| Cancel |	Closes the dialog window, the settings for the selected parameter are rejected

3.3 Functions in the Info Menu

Overview

Purpose This section contains descriptions on the structure and function of the Info menu components.

Contents This section contains the following information:

› About.... 3-36

› Environment.... 3-37

About...

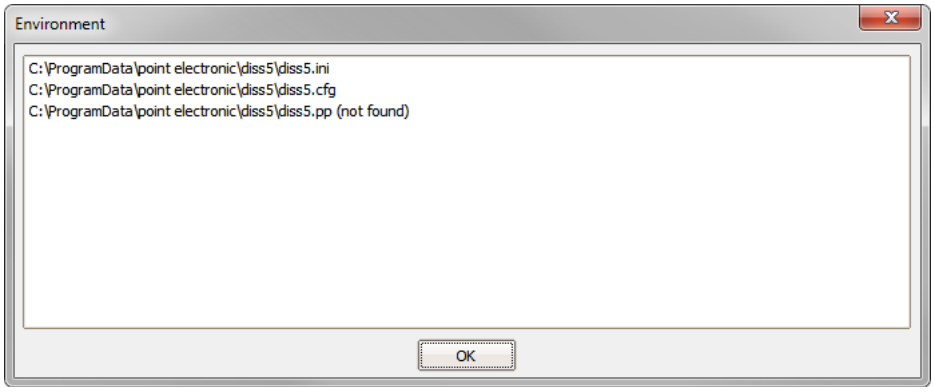
Description The About function opens a dialog window with two tabs. These tabs contain details on the installed software version and the activated add-on modules.

"Product" Tab The **Product** tab contains information on the version of the installed image acquisition software and the connected image acquisition hardware.

The following figure shows the **About** window with the **Product** tab:

Environment...

Description The Environment function opens a dialog window that shows the saving location of the configuration files on the hard disk.



The saving location of the configuration files depends on the operating system. In the **Environment** window, the path of the directory in which the configuration files are saved is displayed.

Additionally, the configuration files can be opened for editing, or the folder with the configuration files can be opened in Windows Explorer.
For this, use the left mouse button to click on an entry in the list of configuration files to activate it. Afterwards, use the right mouse button to click this entry and choose the particular function in the context menu.

When backing up the system, please make sure to always back-up the configuration files as well. All important DISS 5 settings are saved in the configuration files.

3.4 Functions in the Image Acquisition Bar

Overview

Purpose This section contains descriptions on the structure and function of the Image Acquisition bar elements.

Contents This section contains the following information:

› Live Scan 3-39

› Region Scan 3-42

› Slow Scan..... 3-45

› Mapping 3-49

› Line Scan/Point Measurement 3-53

› Measurement Tools in Line Scan/Point Measurement 3-64

› Beam Positioning 3-71

› Center Scan..... 3-72

› AVI 3-75

› Live Line 3-84

› Signal Monitor 3-86

› Video Amplifier (optional)..... 3-90

› Channel Mixer 3-91

› Stop..... 3-95

Live Scan

Description Live Scan is a fast, continuous scan exclusively intended for image preview.

The images displayed in the Live Scan cannot be saved.

The display size of the image can be rescaled by changing the frame with the mouse or via Scan Settings.

In the Live Scan, the amount of pixels of the displayed image corresponds to the amount of scanned pixels.

Full Screen Mode Full screen mode can be activated by double-clicking the Live Scan image. In this mode, the image is only scanned with half the displayed pixels.

Example: Screen resolution 1024×768:
If the Full Screen mode is activated, the image will be scanned with a resolution of 512x384 pixels.

For smoothing the image, use the key combination Ctrl+I to switch to an interpolated display.

Button Pressing the following button starts a Live Scan:

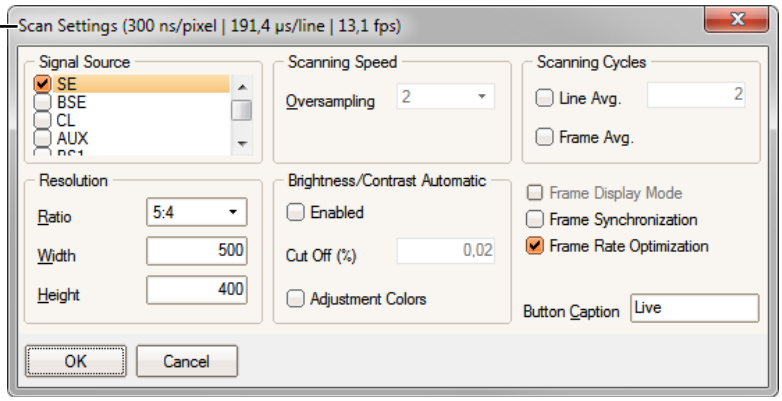
Cancel Live Scan will be canceled when the Stop button or another scan button is pressed.

Continued on next page ...

... Continuation: Live Scan

Configuring Live Scan A right-click on the Live Scan button opens the **Scan Settings** window to set up the relevant parameters.

Scan Settings The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel, per line and per frame based on the scan settings
Signal Source	Contains the checkboxes A1 (SE), A2 (BSE), A3 and A4 (optional) for selecting an analog signal source
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved. Oversampling can be modified with the arrow keys ← and →.
Scanning Cycles – **Line Avg.** – **Frame Avg.**	Contains functions to improve image quality Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged. Activates Frame Averaging This means that images are shown averaged by a preset frame rate. Frame Averaging can be modified with the ↑ and ↓ arrow keys.

Continued on next page ...

... Continuation: Live Scan

Component	Function
Resolution	Contains functions for image dimensions set-up
– **Ratio**	Sets the aspect ratio of the displayed image The available values are 1:1, 5:4, 4:3 and Any.
– **Width**	Sets the width of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Width field leads to an automatic change of the **Height** value.
– **Height**	Sets the height of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Height field leads to an automatic change of the **Width** value.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog image signals
– **Analog**	Activates the Brightness/Contrast Automatic
– **Cut Off (%)**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
– **Adjustment Colors**	When the checkbox is activated, all completely white pixels of the current image are displayed in red color. All completely black pixels of the current image are displayed in green color.
Frame Display Mode	Activates "Frame Display Mode" New images are always refreshed completely, not in parts.
Frame Synchronization	Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Frame Rate Optimization	Activates "Frame Rate Optimization" This means that oversampling is adapted to an image rate of 12.5 frames per second, if possible. This value can be altered in the configuration file.
Button Caption	For entering a name to be displayed below the Live Scan button.
| OK |	Closes the dialog window The preset settings are saved.
| Cancel |	Closes the dialog window The preset settings are rejected.

Region Scan

Description Region Scan is a fast continuous scan of a selected image area. It is suitable for setting the focus.

Region Scan can be started in an acquired Live or Slow Scan image.

By pressing the Region Scan button, a scan will be started within the size of the displayed selection box.

The size of the selection box can be rescaled by changing its frame with the mouse or via Scan Settings.

Zoom Function Region Scan contains a Zoom function.

The image in the selected area can be zoomed in and out with the mouse wheel.

Button Pressing the following button initializes a Region Scan:

Cancel Region Scan will be canceled when the Stop button or another scan button is pressed.

Continued on next page ...

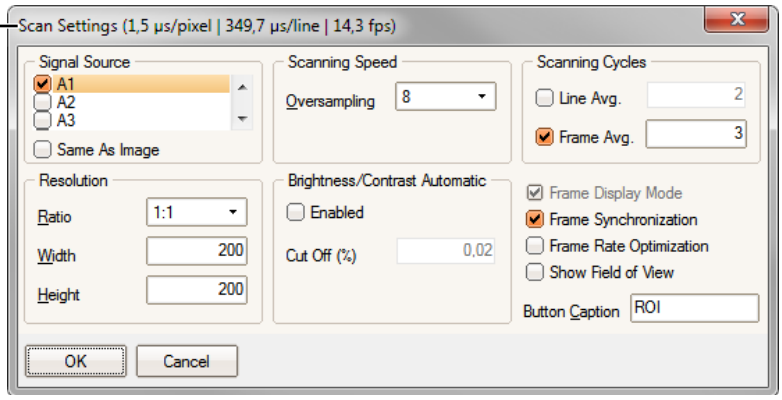
... Continuation: Region Scan

Configuring Region Scan

A right-click on the Region Scan button opens the **Scan Settings** window to set up the relevant parameters.

Scan Settings

The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel, per line and per frame based on the scan settings
Signal Source – **Same As Image**	Contains the checkboxes A1 (SE), A2 (BSE) and A3/A4 (optional) for selecting an analog signal source The input channel of the ROI (region of interest) uses the input of the image on which it is applied.
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved. Oversampling can be modified with the arrow keys ← and →.
Scanning Cycles – **Line Avg.** – **Frame Avg.**	Contains functions to improve image quality Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged. Activates Frame Averaging This means that images are shown averaged by a preset frame rate. Frame Averaging can be modified with the ↑ and ↓ arrow keys.

Continued on next page ...

... Continuation: Region Scan

Component	Function
Resolution	Contains functions for image dimensions set-up
– **Ratio**	Sets the aspect ratio of the displayed image The available values are 1:1, 5:4, 4:3 and Any.
– **Width**	Sets the width of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Width field leads to an automatic change of the **Height** value.
– **Height**	Sets the height of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Height field leads to an automatic change of the **Width** value.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog image signals
– **Analog**	Activates the Brightness/Contrast Automatic
– **Cut Off (%)**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
Frame Display Mode	Activates "Frame Display Mode" New images are always refreshed completely, not in parts. In the Region Scan, Frame Display Mode is always active.
Frame Synchronization	Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Frame Rate Optimization	Activates "Frame Rate Optimization" This means that oversampling is adapted to an image rate of 12.5 frames per second, if possible. This value can be altered in the configuration file.
Show Field of View	Activates the display of the size of the scan area
Button Caption	For entering a name to be displayed below the Region Scan button
| OK |	Closes the dialog window The preset settings are saved.
| Cancel |	Closes the dialog window The preset settings are rejected.

Slow Scan

Description Slow Scan is used for the simultaneous image acquisition from up to 4 analog signal sources.

The images acquired in Slow Scan can be transferred to the image processing software for further processing.

The display size of the images can be rescaled by changing the frame with the mouse.

The image resolution is set in Scan Settings. The number of scanning cycles can also be set in Scan Settings.

Images simultaneously acquired from several sources are displayed in a multi-divided window.

Button Pressing the following button starts a Slow Scan:

Exit The following table contains information on finishing the Slow Scan and the corresponding actions:

Exit	Action
At the end of a scan	When the preset amount of scans is reached
At the end of the current image rolling	After repeated pressing of the Slow Scan button

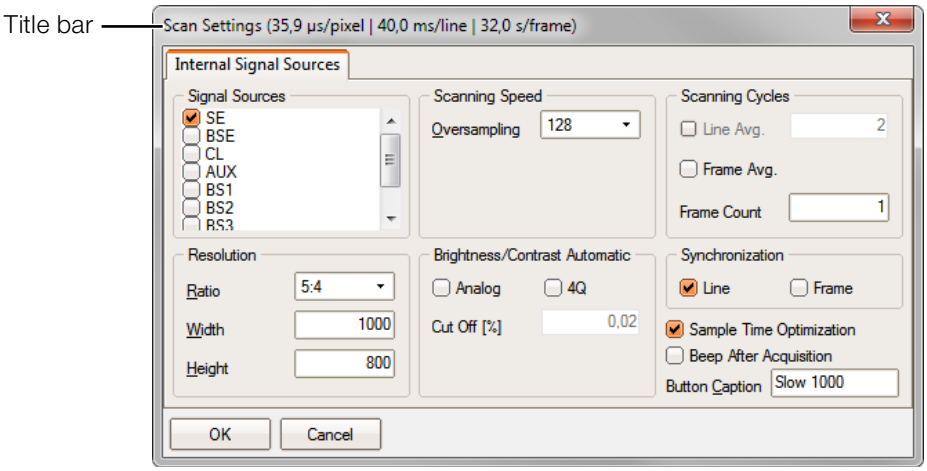
Cancel Slow Scan will be canceled when the Stop button or another scan button is pressed.

Continued on next page ...

... Continuation: Slow Scan

Configuring Slow Scan A right-click on the Slow Scan button opens the **Scan Settings** window to set up the relevant parameters.

Scan Settings The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel, per line and per frame based on the scan settings
Signal Source	Contains the checkboxes A1 (SE), A2 (BSE) and A3/A4 (optional) for selecting up to four analog signal sources
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved.
Scanning Cycles – **Line Avg.**	Contains functions to improve image quality Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged. With activated Line Synchronization, it is not possible to use the Line Averaging function.
– **Frame Avg.**	Activates Frame Averaging This means that images are shown averaged by a preset frame rate.
– **Frame Count**	Sets the frame count

Continued on next page ...

... Continuation: Slow Scan

Component	Function
Resolution	Contains functions for image dimensions set-up
– **Ratio**	Sets the aspect ratio of the displayed image. The available values are 1:1, 5:4, 4:3 and Any.
– **Width**	Sets the width of a displayed image in pixels. Depending on the aspect ratio selected in the **Ratio** field, any entry in the Width field leads to an automatic change of the **Height** value.
– **Height**	Sets the height of a displayed image in pixels. Depending on the aspect ratio selected in the **Ratio** field, any entry in the Height field leads to an automatic change of the **Width** value.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog image signals
– **Analog**	Activates the Brightness/Contrast Automatic
– **4Q**	If the **4Q** checkbox is activated, the contrast will be adapted to the global minimum and maximum of all activated images. The brightness will not be changed. This option is useful for the capturing of four-quadrant SEM images that will be processed into a 3D model.
– **Cut Off**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
Synchronization	Contains functions to synchronize the scan to the mains voltage
– **Line**	Activates Line Synchronization With every new line, the scan is synchronized to the mains voltage in order to reduce interferences. With activated Line Averaging, it is not possible to use the Line Synchronization function.
– **Frame**	Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Sample Time Optimization	Activates "Sample Time Optimization" (STO) If Line Synchronization is enabled, STO minimizes idle time at line beginning because oversampling and ADC clock will be increased. This leads to image optimization without influencing scanning speed.
Beep After Acquisition	Activates an acoustic signal at the end of the scanning process
Button Caption	For entering a name to be displayed below the Slow Scan button

Continued on next page ...

... Continuation: Slow Scan

Component	Function
| OK |	Closes the dialog window All preset parameters are saved and used for the next scanning process.
| Cancel |	Closes the dialog window The preset settings are rejected.

Mapping

Description The mapping is used for image acquisition of digital mapping images and analog signal sources. It is possible to acquire images simultaneously from up to 12 digital and up to 4 analog signal sources (optional).

The display size of the images can be rescaled by changing the frame with the mouse or via Scan Settings.

Image resolution and measure time can be set in Scan Settings.

Images simultaneously acquired from several sources are displayed in a multi-divided window.

The acquired images can be transferred to the image processing software for further processing.

Button Pressing the following button starts a mapping:

Exit The following table contains information on finishing the mapping and the corresponding actions:

Exit	Action
At the end of a scan	When the preset amount of scans is reached
At the end of the current image rolling	By repeated pressing of the Mapping button

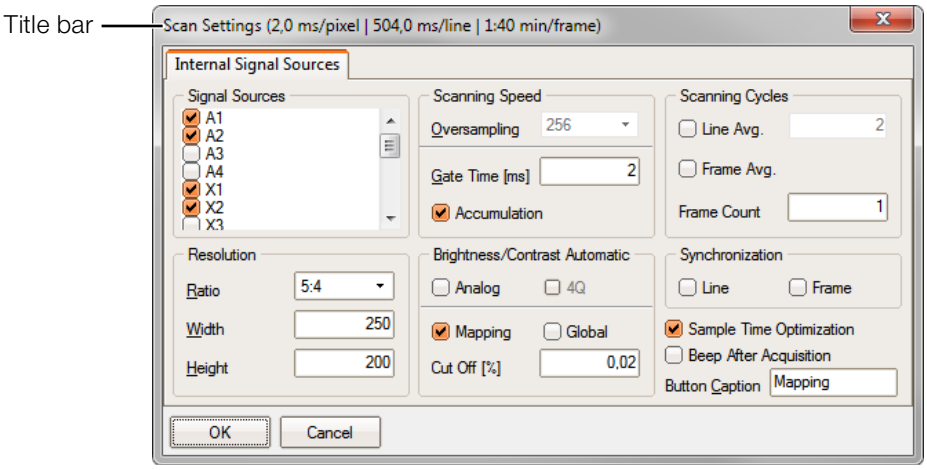
Cancel The mapping will be canceled if Stop or another scan button is pressed.

Continued on next page ...

... Continuation: Mapping

Set-up of Mapping A right-click on the Mapping button opens the **Scan Settings** window to set up the parameters of the mapping.

Scan Settings The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel, per line and per frame based on the scan settings
Signal Source	Contains the checkboxes A1 (SE), A2 (BSE) and A3/A4 (optional) for selecting up to four analog signal sources. It also contains the checkboxes X1 to X12 for selecting up to twelve digital signal sources.
Scanning Speed – **Oversampling** – **Gate Time** – **Accumulation**	 Sets the amount of A/D conversions per pixel Thus, the signal-to-noise ratio (SNR) can be improved. Sets the gate time of the mapping counters During that time, digital image signals for each pixel are accumulated. Activates Accumulation The mapping impulses on each pixel are accumulated for the number of image repetitions set in the Frame Count field.

Continued on next page ...

... Continuation: Mapping

Component	Function
Scanning Cycles	Contains functions to improve image quality
– **Line Avg.**	Activates Line Averaging Using this function, each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged. With activated Line Synchronization, it is not possible to use the Line Averaging function.
– **Frame Avg.**	Activates Frame Averaging Using this function, images are shown averaged by a preset frame rate (with Frame Count=0).
– **Frame Count**	Sets the frame count
Resolution	Contains functions for image dimensions set-up
– **Ratio**	Sets the aspect ratio of the displayed image The available values are 1:1, 5:4, 4:3 and Any.
– **Width**	Sets the width of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Width field leads to an automatic change of the **Height** value.
– **Height**	Sets the height of a displayed image in pixels Depending on the aspect ratio selected in the **Ratio** field, any entry in the Height field leads to an automatic change of the **Width** value.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog and/or digital image signals
– **Analog**	Activates Brightness/Contrast Automatic for analog image signals
– **Mapping**	Activates Brightness/Contrast Automatic for digital image signals
– **4Q**	If the **4Q** checkbox is activated, the contrast will be adapted to the global minimum and maximum of all activated images. The brightness will not be changed.
– **Cut Off**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
– **Global**	If the **Global** checkbox is activated, brightness and contrast will be adapted to the global minimum and maximum of all activated images.

Continued on next page ...

... Continuation: Mapping

Component	Function
Synchronization – **Line** – **Frame**	Contains functions to synchronize the scan to the mains voltage Activates Line Synchronization With every new line, the scan is synchronized to the mains voltage in order to reduce interferences. With activated Line Averaging, it is not possible to use the Line Synchronization function. Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Sample Time Optimization	Activates "Sample Time Optimization" (STO) The dwell time per pixel is adapted to the entered gate time of the counting channels by altering oversampling and ADC clock. This leads to image optimization without influencing scanning speed.
Beep After Acquisition	Activates an acoustic signal at the end of the scanning process
Button Caption	For entering a name to be displayed below the Mapping button
| OK |	Closes the dialog window All preset parameters are saved and used for the next scanning process.
| Cancel |	Closes the dialog window The preset settings are rejected.

Line Scan/Point Measurement

Description The Line Scan/Point Measurement function scans any line or point on the sample.

Thus captured signals can be displayed graphically or exported as table.

Before a line scan can be started, a Slow Scan image has to be acquired and the magnification of the microscope has to be entered. Entering the magnification is not necessary for devices with automatic parameter transfer controlled by image acquisition.

Button Pressing the following button opens the **Point/Line Measurement** window to set up and to do line scans and/or point measurements:

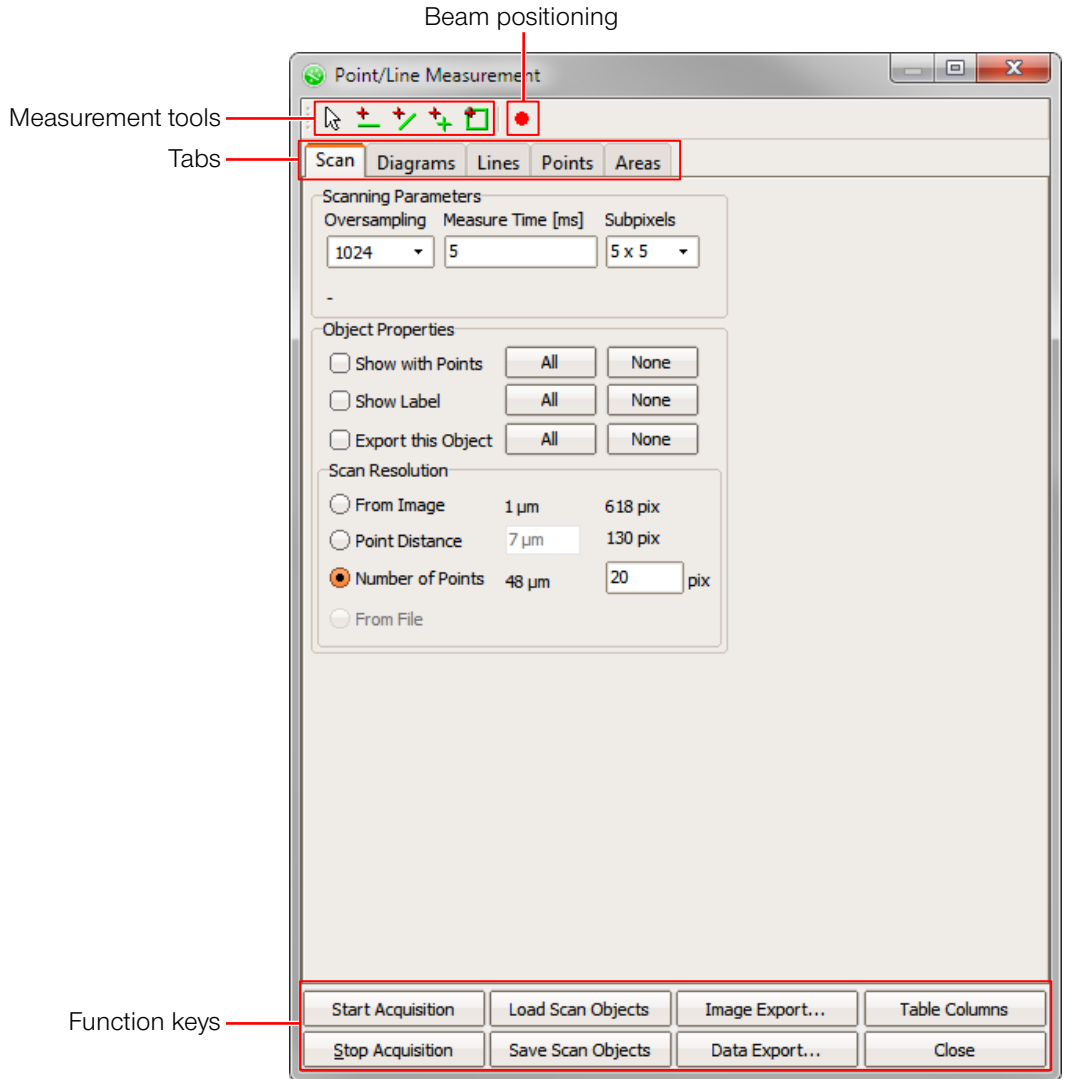
No other scan function can be processed during activity of the Line Scan/Point Measurement function.

Exit Function will be ended by closing the **Point/Line Measurement** window.

Continued on next page ...

... Continuation: Line Scan/Point Measurement

User Interface The following figure shows the Line Scan user interface with its main components:



Continued on next page ...

... Continuation: Line Scan/Point Measurement

The following table contains information on the main components of the Line Scan user interface:

Component	Function
Measurement tools	Buttons for setting: – horizontal measurement lines – free measurement lines – measurement points – measuring areas see „Measurement Tools in Line Scan/Point Measurement“ on Page 3-64
Beam Positioning	Button for positioning the electron beam on the sample see „Beam Positioning“ on Page 3-71
Tabs	
– **Scan**	Contains functions to set up the scan (see Page 3-57)
– **Diagrams**	Contains functions to set up the Diagram view (see Page 3-59)
– **Lines**	– Shows the values of the created measurement lines in a table – Modification of shown values – Contains checkboxes for activating/deactivating single measurement lines for the **| Data Export |** function
– **Points**	– Shows the values of the created measurement points in a table – For changing of the displayed values and deletion of the applied measurement points – Contains checkboxes for activating/deactivating single measurement points for the **| Data Export |** function
– **Areas**	– Shows the values of the created measurement areas in a table – For changing of the displayed values and deletion of the applied measurement areas – Contains checkboxes for activating/deactivating single measurement areas for the **| Data Export |** function

Continued on next page ...

... Continuation: Line Scan/Point Measurement

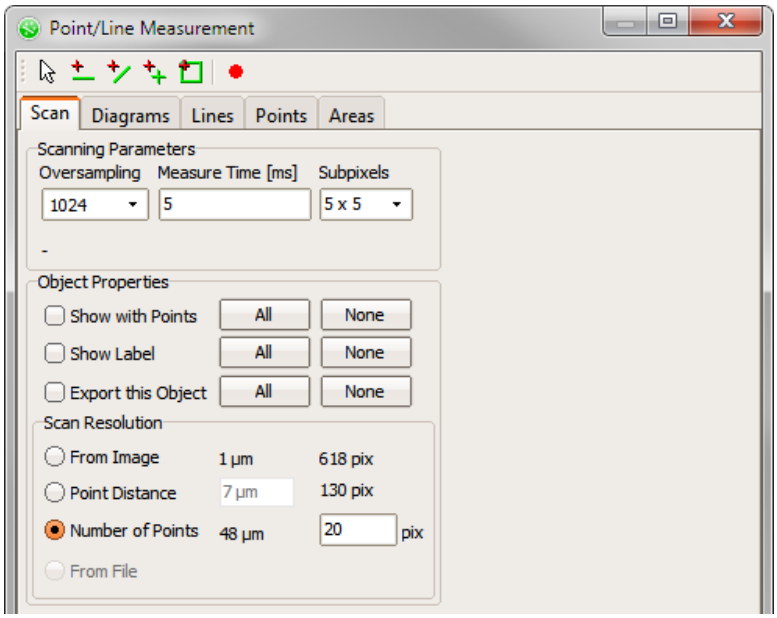
Component	Function
Function Keys	
– **| Start Acquisition |**	Starts scanning process with preset values
– **| Stop Acquisition |**	Stops scanning process
– **| Load Scan Objects |**	Loads saved measuring objects with their preferences (position and scan resolution)
– **| Save Scan Objects |**	Saves all created measuring objects with their preferences (position and scan resolution) in a TXT file
– **| Image Export |**	– Opens the **Image Export** window – Exports the acquired image including measurement lines, measurement points and diagrams to a TIFF file Additionally, data export can be activated. Thus, image data is saved as XLS or CSV file with the same file name.
– **| Data Export |**	Exports line, point and area table as XLS or CSV file
– **| Table Columns |**	– Hides and unhides columns in the line and point table – Only active with the **Points** or **Lines** tab
– **| Close |**	Closes the dialog window The scan is canceled, all settings are rejected.

Continued on next page ...

... Continuation: Line Scan/Point Measurement

"Scan" Tab

The following figure shows the **Scan** tab with its components



The following table contains information on the components of the **Scan** tab:

Component	Function
Scanning Parameters	– Contains global settings for Line Scan/Point Measurement – Shows the calculated scan time according to preferences
– **Oversampling**	Sets the amount of A/D conversions per pixel for analog signal sources. Thus, the signal-to-noise ratio (SNR) can be improved
– **Measure Time**	Sets the measure time of the mapping counters. During that time, digital image signals for each pixel are accumulated
– **Subpixels**	Contains a selection of possible subpixel ranges that can additionally be measured around each measuring point If a subpixel range larger than 1 × 1 is selected, the measuring points will be displayed as squares instead of crosses if the **Show with Points** function is activated.
Object Properties	Contains settings of the currently selected measuring object

Continued on next page ...

... Continuation: Line Scan/Point Measurement

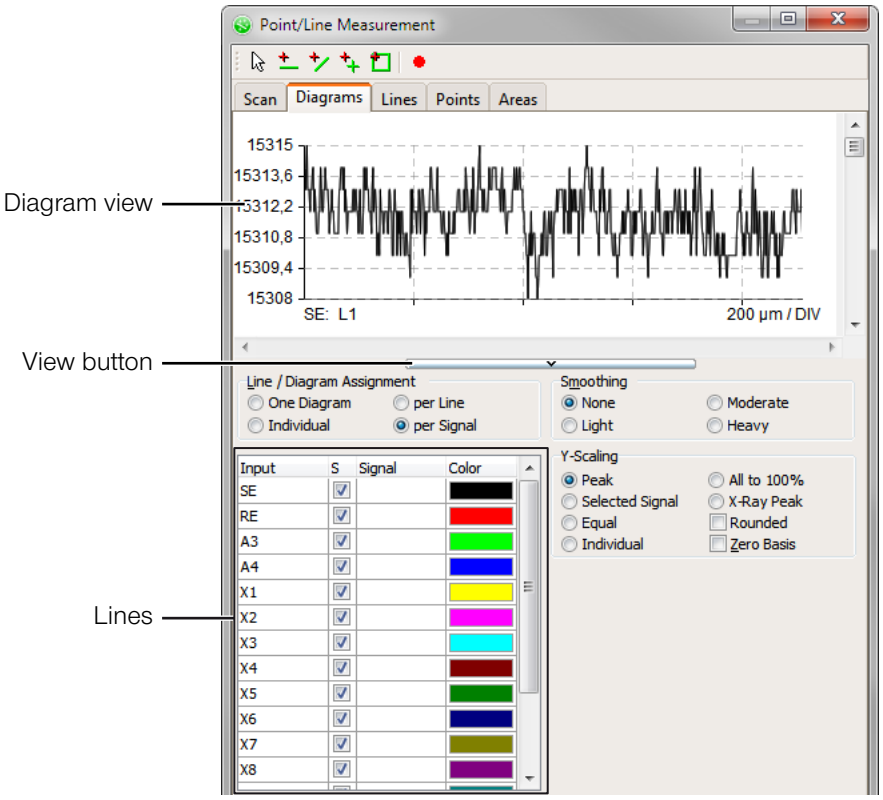
Component	Function
– **Show with Points**	Activates or deactivates the display of measurement points on the selected measuring object – **| All |** activates the display for all measuring objects created. – **| None |** deactivates the display for all measuring objects created. If the display is activated, the measuring points will be displayed as crosses.
– **Show Label**	Activates or deactivates the display of the numbering of the selected measuring object – **| All |** activates the display for all measuring objects created. – **| None |** deactivates the display for all measuring objects created.
– **Export this Object**	Activates or deactivates the Data Export function of the selected measuring object – **| All |** activates the export for all measuring objects created. – **| None |** deactivates the export for all measuring objects created.
Scan Resolution	– Contains functions for scan resolution set-up within the **Object Properties** – The scan resolution is defined by the amount of measurement points for the currently selected measuring object
– **From Image**	The scan resolution for the currently selected measuring object conforms with the resolution of the current image in pixels
– **Point Distance**	Direct input (in µm) of the distance between the measurement points of the currently selected measuring object
– **Number of Points**	Direct input of the amount of measurement points for the currently selected measuring object
– **From File**	Only activated directly after saved measuring objects have been loaded via the **| Load Scan Objects |** button

Continued on next page ...

... Continuation: Line Scan/Point Measurement

"Diagrams" Tab

The following figure shows the **Diagrams** tab with its components



The following table contains information on the components of the **Diagrams** tab:

Component	Function
Diagram view	Shows diagrams for created measurement lines on the basis of values set in the **Diagrams** tab
View button	Enlarges or reduces the Diagram view
Line/Diagram assignment	Contains functions to display signal sources in one or multiple diagrams
– **One Diagram**	All signal sources will be displayed in one diagram
– **per Line**	For each created measurement line, a diagram which shows all contained signal sources will be generated
– **Individual** (Page 3-61)	Individual display of the signal sources in one or multiple diagrams In the **Lines** field, the signal sources can be attributed to the diagrams.
– **per Signal**	Each signal source will be displayed as individual diagram

Continued on next page ...

... Continuation: Line Scan/Point Measurement

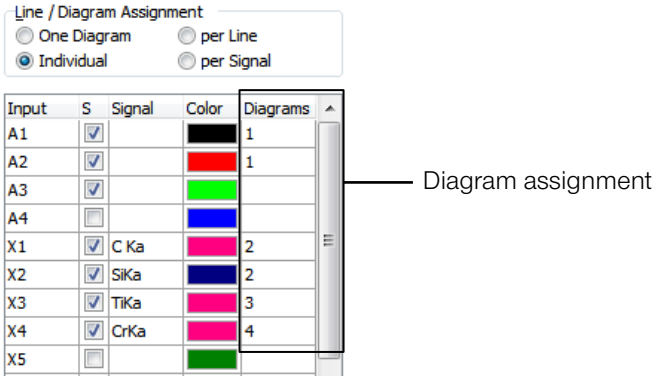
Component	Function
Lines	– Contains specifications for all created measurement lines – Spreads signal sources to different diagrams
– **L**	– Activates or deactivates measurement lines – Only shown if several measurement lines were applied
– **Line**	Contains the created measurement lines and the corresponding signal sources
– **S**	Activates or deactivates signal sources
– **Signal**	Contains the elements of the signal sources as comment
– **Color**	– Shows the current color for each measurement line – Sets a color for each measurement line
Smoothing	Contains functions to smooth the signal curve(s) in the diagram
– **None**	No smoothing of the signal curve(s)
– **Moderate**	Normal smoothing of the signal curve(s)
– **Light**	Light smoothing of the signal curve(s)
– **Heavy**	Intense smoothing of the signal curve(s)
Y-Scaling	Contains functions on setting the diagram scaling in Y direction
– **Zero Basis**	If checkbox is activated, scaling of all diagrams starts at zero
– **Peak**	The scaling of individual diagrams ends at the maximum value of the contained signal source
– **Equal** (Page 3-62)	Manual setting of scaling for all displayed diagrams The lowest and the highest value of the y-axis can be set. The sectioning of the y-axis will be calculated automatically.
– **Signal** (Page 3-62)	The scaling of all displayed diagrams corresponds to one signal source The preferred signal source can be selected.
– **Individual** (Page 3-63)	Manual setting of scaling for each displayed diagram For each diagram, the lowest and the highest value of the y-axis can be set. The sectioning of the y-axis will be calculated automatically.

Continued on next page ...

... Continuation: Line Scan/Point Measurement

Line/Diagram Assignment "Individual"

The following figure shows a detail of the **Diagrams** tab with the components of the **Line/Diagram Assignment** – **Individual** function:



The following table contains information on the components of the **Line/Diagram Assignment** – **Individual** function:

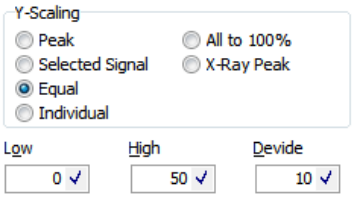
Component	Function
Diagram assignment	Allows distribution and/or combination of the signal sources in different diagrams

Continued on next page ...

... Continuation: Line Scan/Point Measurement

Y-Scaling – Equal

The following figure shows a detail of the **Diagrams** tab with the components of the **Y-Scaling** – **Equal** function:

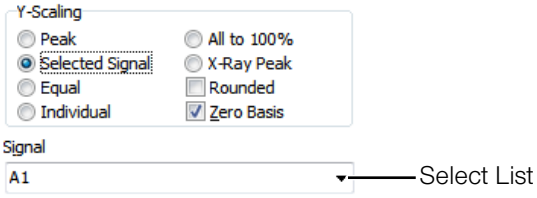


The following table contains information on the components of the **Y-Scaling** – **Equal** function:

Component	Function
Low	Sets the lowest scale interval for all diagrams
High	Sets the highest scale interval for all diagrams
Divide	Sets the scale divider for all diagrams

Y-Scaling – Selected Signal

The following figure shows a detail of the **Diagrams** tab with the components of the **Y-Scaling** – **Selected Signal** function:



The following table contains information on the components of the **Y-Scaling** – **Selected Signal** function:

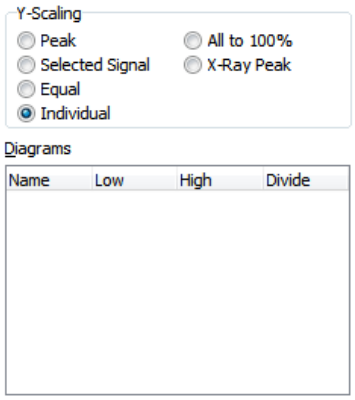
Component	Function
Select List	Defines the preferred signal source to whose amplitude the scaling of all displayed diagrams will conform

Continued on next page ...

... Continuation: Line Scan/Point Measurement

Y-Scaling – Individual

The following figure shows a detail of the **Diagrams** tab with the components of the **Y-Scaling** – **Individual** function:



The following table contains information on the components of the **Scaling** – **Individual** function:

Component	Function
Diagrams	Contains functions on setting the diagram scaling in Y direction
– **Name**	– Contains all created measurement lines when the function "Line/Diagram Assignment – per Line" is activated – Contains all signal sources when the function "Line/Diagram Assignment – per Signal" is activated
– **Low**	Sets the lowest scale interval for each measurement line or signal source
– **High**	Sets the highest scale interval for each measurement line or signal source
– **Divide**	Sets the scale divider for every diagram

Measurement Tools in Line Scan/Point Measurement

Description

In a captured Slow Scan image, different measurement points, measurement lines and measurement areas can be determined.

After clicking the **| Start Acquisition |** button, the scan will be carried out on exactly these determined positions.

Measurement Tools

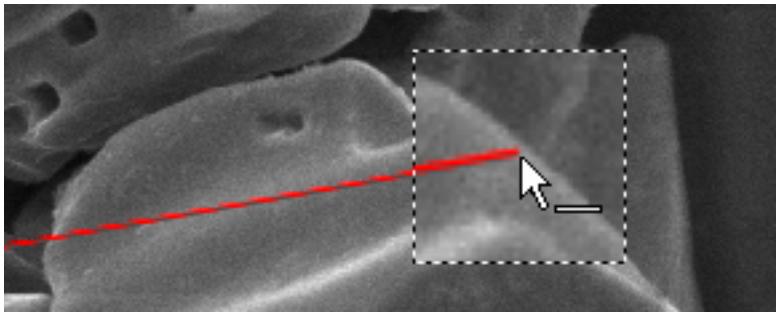
The following table contains an overview of the measurement tools in the **Point/Line Measurement** window:

Component	Function
	Selection of created measurement lines, measurement points and measuring areas
	Creation of horizontal measurement lines in an acquired image (see Page 3-65)
	Creation of free measurement lines in an acquired image (see Page 3-66)
	Creation of measurement points in an acquired image (see Page 3-68)
	Creation of rectangular measurement areas in an acquired image (see Page 3-69)

Zoom Function

Use the mouse to set and change measurement points, lines and areas in the Image Acquisition window.

By keeping the Shift key ⇧ pressed, a square area around the mouse cursor will be displayed with a larger scale to allow for more precise working.

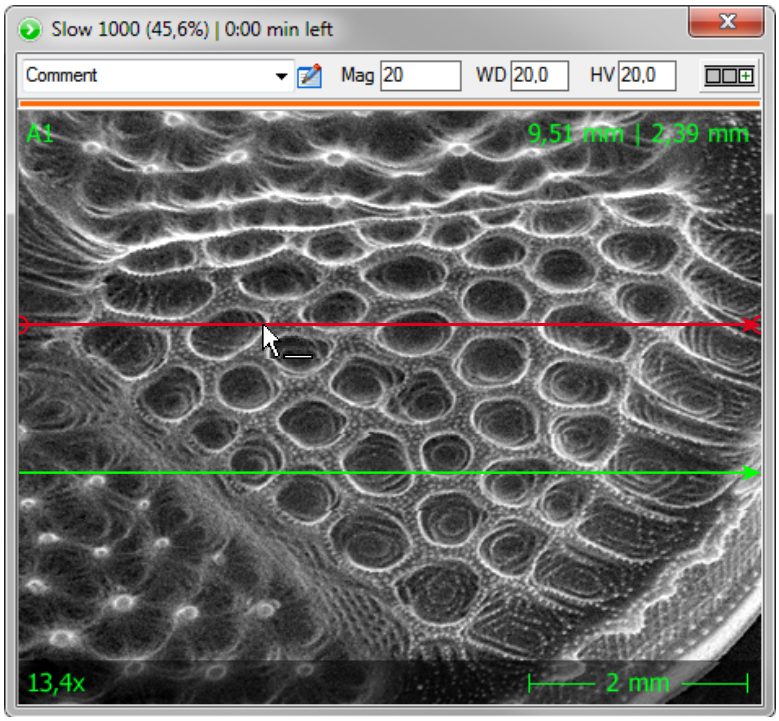


Continued on next page ...

... Continuation: Measurement Tools in Line Scan/Point Measurement

Create horizontal Measurement Lines

In the Image Acquisition window, horizontal lines that cross the whole scan with a 0° angle from left to right will be generated. The arrow indicates the measurement direction.



The following table contains an overview on the options for creating and changing horizontal measurement lines:

Measurement Line	Steps
Generate	– Click the tool for horizontal measurement lines in the **Point/Line Measurement** window. – Click into the Image Acquisition window. ⇒ A horizontal measurement line will be created.
Select	Use the selection tool to click the particular measurement line in the Image Acquisition window. ⇒ The measurement line is selected and highlighted in red.
Move	– Select the particular measurement line. – Click the selected measurement line and keep the mouse button pressed while moving the line.
Copy	– Select the particular measurement line. – Keep the Ctrl key pressed, click the selected measurement line and keep the mouse button pressed while moving the line. ⇒ During moving, the measurement line will be copied.

Continued on next page ...

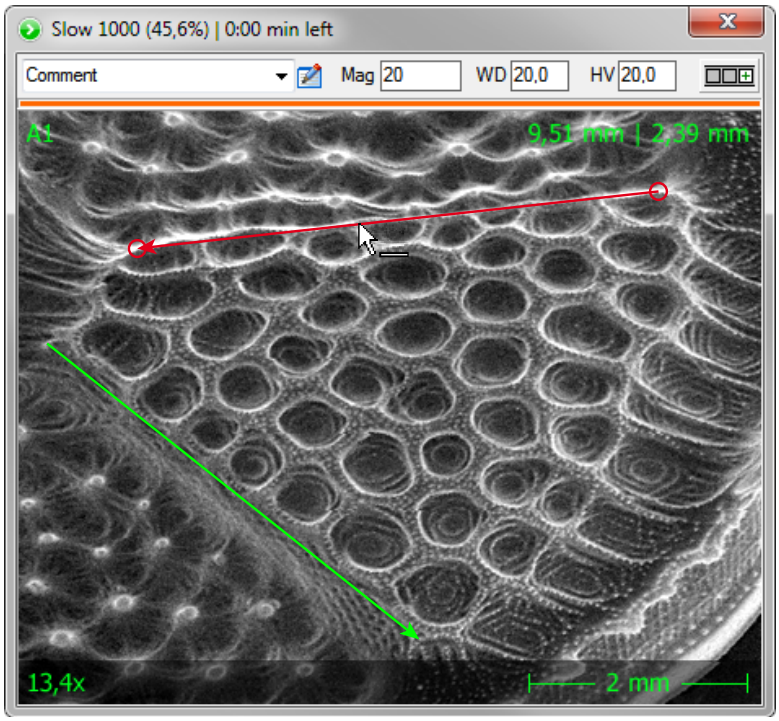
... Continuation: Measurement Tools in Line Scan/Point Measurement

Measurement Line	Steps
Delete	– Select the particular measurement line. – Press the Del key. ⇒ The selected measurement line will be deleted.

The values of the created measurement lines (e.g. coordinates, length, angle) can be read and changed in the **Lines** tab in the **Point/Line Measurement** window. In this tab, several measurement lines can also be selected by clicking them while keeping the Ctrl or ⇧ key pressed and can then be deleted with the Del key.

Create free Measurement Lines

In the Image Acquisition window, free measurement lines of any length, direction and angle can be created. The arrow indicates the measurement direction.



Continued on next page ...

... Continuation: Measurement Tools in Line Scan/Point Measurement

The following table contains an overview on the options for creating and changing free measurement lines:

Measurement Line	Steps
Generate	– Click the tool for free measurement lines in the **Point/Line Measurement** window. – Click into the Image Acquisition window to set the zero point of the free measurement line. – Click again into the Image Acquisition window to set the final point of the free measurement line. ⇒ The free measurement line is generated. Measurement direction will be indicated by an arrow. Measurement will always take place from zero to final point.
Select	Use the selection tool to click the particular measurement line in the Image Acquisition window. ⇒ The measurement line is selected and highlighted in red.
Change	– Select the particular measurement line. – Click zero or final point of the selected measurement line and keep the mouse button pressed while moving it. Zero and final points of selected measurement lines will be highlighted with little circles when moving the mouse cursor over them.
Generate with determined angle	Keep the Ctrl key pressed to lock the line angle in 45° steps while completing one of the following actions: – determining the final point of a free measurement line – moving the zero point or final point of a selected free measurement line
Move	– Select the particular measurement line. – Click the selected measurement line and keep the mouse button pressed while moving the line.
Copy	– Select the particular measurement line. – Keep the Ctrl key pressed, click the selected measurement line and keep the mouse button pressed while moving the line. ⇒ During moving, the measurement line will be copied.
Delete	– Select the particular measurement line. – Press the Del key. ⇒ The measurement line will be deleted.

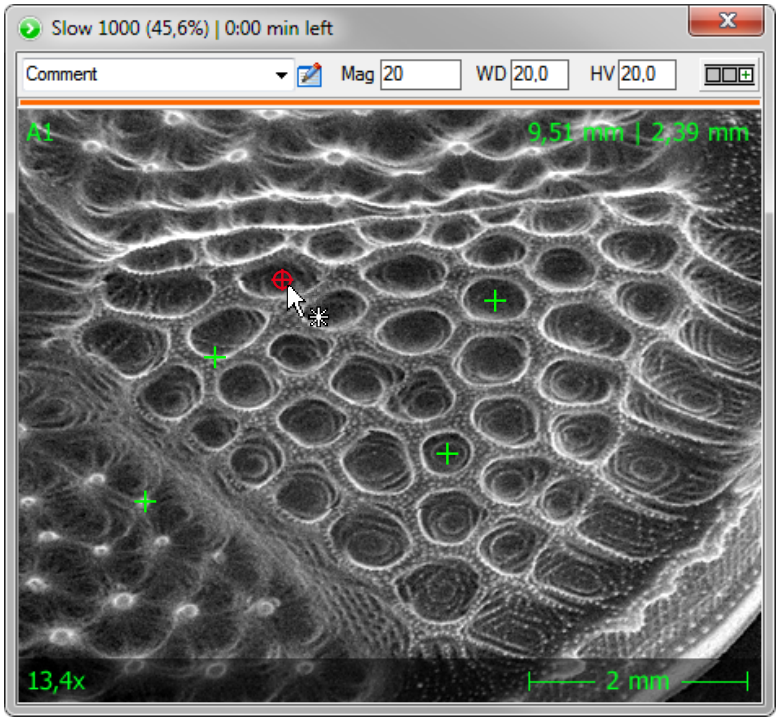
Continued on next page ...

... Continuation: Measurement Tools in Line Scan/Point Measurement

The values of the created measurement lines (e.g. coordinates, length, angle) can be read and changed in the **Lines** tab in the **Point/Line Measurement** window. In this tab, several measurement lines can also be selected by clicking them while keeping the Ctrl or ⇧ key pressed and can then be deleted with the Del key.

Create Measurement Points

Generates measurement points in the Image Acquisition window.



The following table contains an overview on the options for creating and changing measurement points:

Measurement Point	Steps
Generate	– Click the tool for measurement points in the **Point/Line Measurement** window. – Click into the Image Acquisition window. ⇒ A measurement point will be created.
Select	Use the selection tool to click the particular measurement point in the Image Acquisition window. ⇒ The measurement point is selected and highlighted in red.

Continued on next page ...

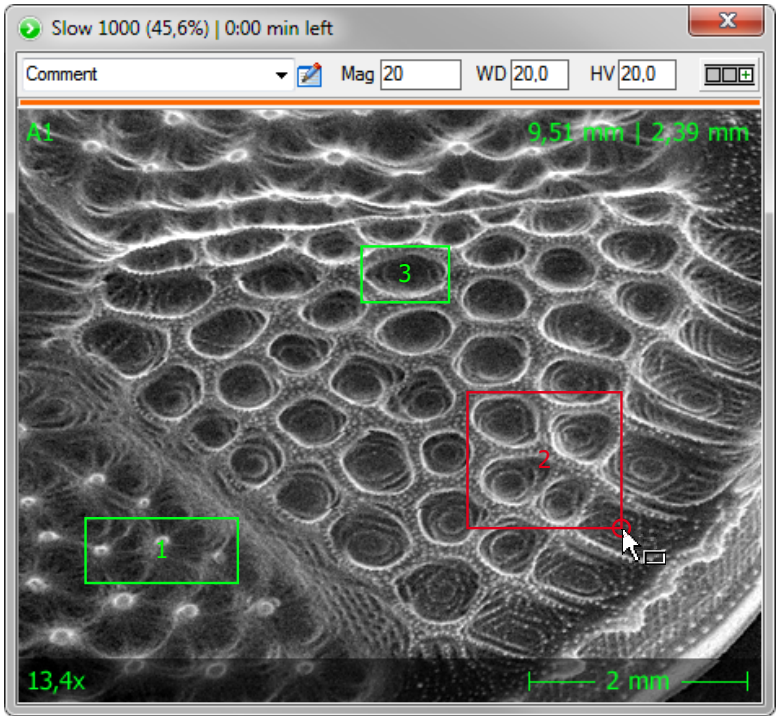
... Continuation: Measurement Tools in Line Scan/Point Measurement

Measurement Point	Steps
Move	– Select the particular measurement point. – Click the selected measurement point and keep the mouse button pressed while moving it.
Delete	– Select the particular measurement point. – Press the Del key. ⇒ The measurement point will be deleted.

The values of the created measurement points (e.g. coordinates) can be read and changed in the **Points** tab in the **Point/Line Measurement** window. In this tab, several measurement lines can also be selected by clicking them while keeping the Ctrl or ⇧ key pressed and can then be deleted with the Del key.

Create rectangular Measuring Areas

Generates rectangular measuring areas of any size in the Image Acquisition window.



Continued on next page ...

... Continuation: Measurement Tools in Line Scan/Point Measurement

The following table contains an overview on the options for creating and changing rectangular measuring areas:

Measuring Area	Steps
Generate	– Click the tool for rectangular measuring areas in the **Point/Line Measurement** window. – Click into the Image Acquisition area to determine the upper left corner of the measuring area. – Click again into the Image Acquisition area to determine the bottom right corner of the measuring area. ⇒ The rectangular measuring area will be generated.
Select	Use the selection tool to click the particular measuring area in the Image Acquisition window. ⇒ The measuring area is selected and highlighted in red.
Change	– Select the particular measuring area. – To change height and width at the same time, click one of the corners of the selected measuring area. Keep the mouse button pressed while moving the corner. – To change either height or width, click one of the edges (between 2 corners) of the selected measuring area. Keep the mouse button pressed while moving the edge. The corners of the selected measuring area will be highlighted with little circles when moving the mouse cursor over them.
Delete	– Select the particular measuring area. – Press the Del key. ⇒ The measuring area will be deleted.

The values of the applied measuring areas (e.g. coordinates) can be read and changed in the **Area** tab in the **Point/Line Measurement** window. In this tab, several measuring areas can also be selected by clicking them while keeping the Ctrl or ⇧ key pressed and can then be deleted with the Del key.

Beam Positioning

Description Beam Positioning allows to position the electron beam on the sample.

Buttons Beam Positioning can be started and ended with the following buttons:

Button	located ...
	... in the **Image Acquisition bar**
	... in the **Point/Line Measurement** window

Using Beam Positioning Complete the following steps to position the electron beam on the sample:

1. Carry out a Slow Scan.
2. Click on the button in the **Image Acquisition bar** or in the **Point/Line Measurement** window to start beam positioning.
   ⇒ The mouse cursor will change when placed in the Image Acquisition window.
3. Click on any position in the Image Acquisition window.
   ⇒ The electron beam will be placed on the corresponding position on the sample.

Cancel Beam positioning will be canceled when the button in the **Image Acquisition bar** or the **Point/Line Measurement** window, the stop button or any other scan button is pressed.

Center Scan

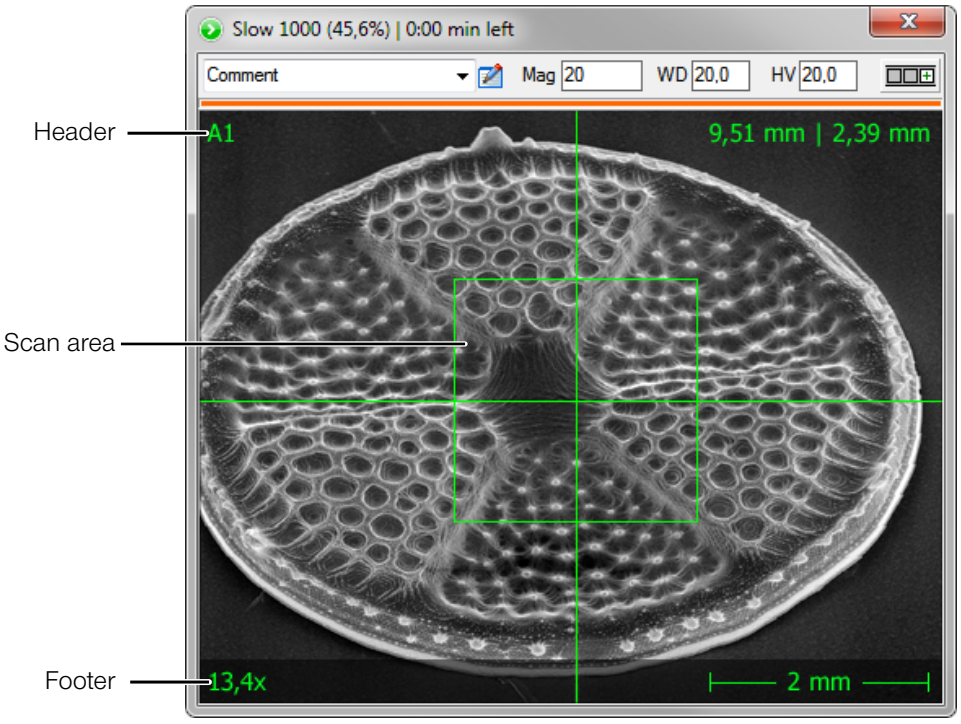
Description Center Scan is a continuous scan within an adjustable area. It can be started in an acquired Live Scan or Slow Scan image.

This function is useful for analyses that require a centered scan area (e.g. EDX analyses).

By pressing the Center Scan button, a scan will be started in the middle of the image with the size of the displayed frame.

The size of the scan area can be changed with the mouse wheel. If the scan area is scaled down to a size of one pixel, the reticle in the Image Acquisition window will be displayed in red. Pressing the space bar immediately reduces the scan area to one pixel.

The following figure shows the Image Acquisition window with a Center Scan:



Continued on next page ...

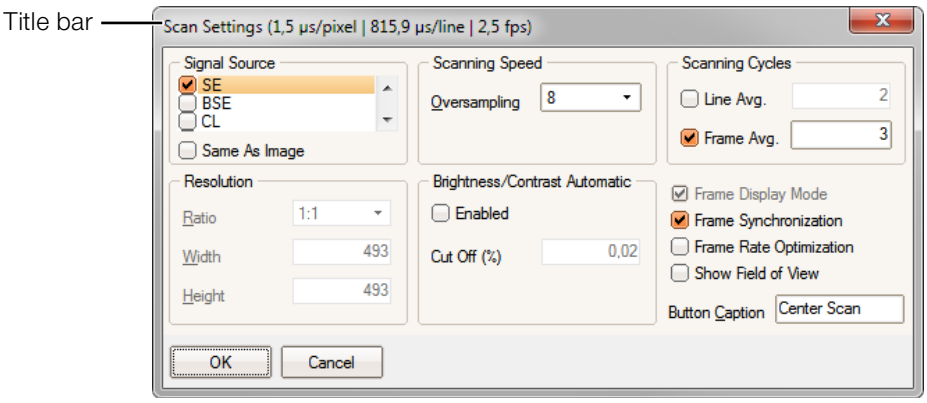
... Continuation: Center Scan

Button Pressing the following button activates the Center Scan:

Cancel Center Scan will be canceled when the Stop button or another scan button is pressed.

Set-up of Center Scan A right-click on the Center Scan button opens the **Scan Settings** window to set up the relevant parameters.

Scan Settings The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel and per frame based on the scan settings
Signal Source – **Same As Image**	Contains the checkboxes **A1** (SE), **A2** (BSE) and **A3/A4** (optional) for selecting an analog signal source The input channel of the Center Scan uses the input of the image on which it is applied.
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved. Oversampling can be modified with the arrow keys ← and →.

Continued on next page ...

... Continuation: Center Scan

Component	Function
Scanning Cycles	Contains functions to improve image quality
– **Line Avg.**	Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged.
– **Frame Avg.**	Activates Frame Averaging This means that images are shown averaged by a preset frame rate. Frame Averaging can be modified with the ↑ and ↓ arrow keys.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog image signals
– **Analog**	Activates the Brightness/Contrast Automatic
– **Cut Off (%)**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
Frame Display Mode	Activates "Frame Display Mode" New images are always refreshed completely, not in parts. In the Center Scan, the Frame Display mode is always active.
Frame Synchronization	Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Frame Rate Optimization	Activates "Frame Rate Optimization" This means that oversampling is adapted to an image rate of 12.5 frames per second, if possible. This value can be altered in the configuration file.
Show Field of View	Activates the display of the size of the scan area
Button Caption	For entering a name to be displayed below the Center Scan button
| OK |	Closes the dialog window The preset settings are saved.
| Cancel |	Closes the dialog window The preset settings are rejected.

AVI

Description The AVI function allows to record video sequences on a microscope with adjustable image rate and time-lapse.

The resolution of video sequences and image rate can be set in Scan Settings.

In a configurable footer, information like recording time and image number can be displayed. The footer will be saved in the video.

Button Pressing the following button opens the AVI Acquisition window:

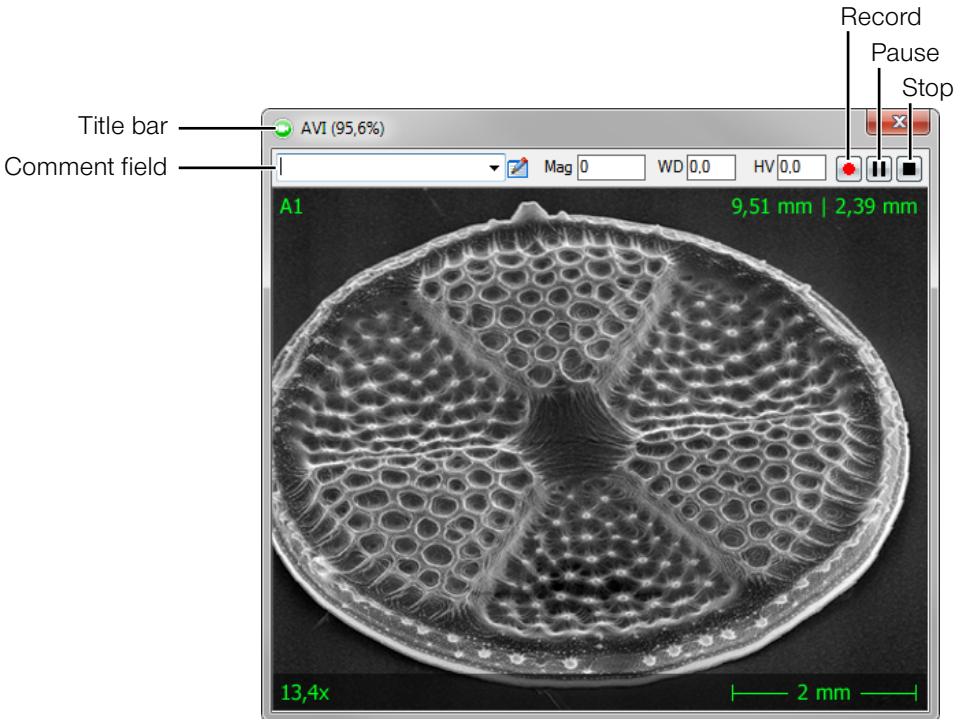
Cancel The AVI function will be canceled when Stop or another scan button is pressed.

Continued on next page ...

... Continuation: AVI

AVI Acquisition Window

The following figure shows the AVI Acquisition window with its components:



The following table contains information on the components of the AVI Acquisition window:

Component	Function
Title bar	– Shows the file name – Shows the remaining time until the end of the scanning process
Comment field	Allows entering of a comment
| Record |	Starts recording of a video sequence
| Pause |	Pauses recording of a video sequence Press the button again to continue the recording.
| Stop |	Stops recording of a video sequence The recorded video will be saved as AVI file.

Set-up of AVI Acquisition

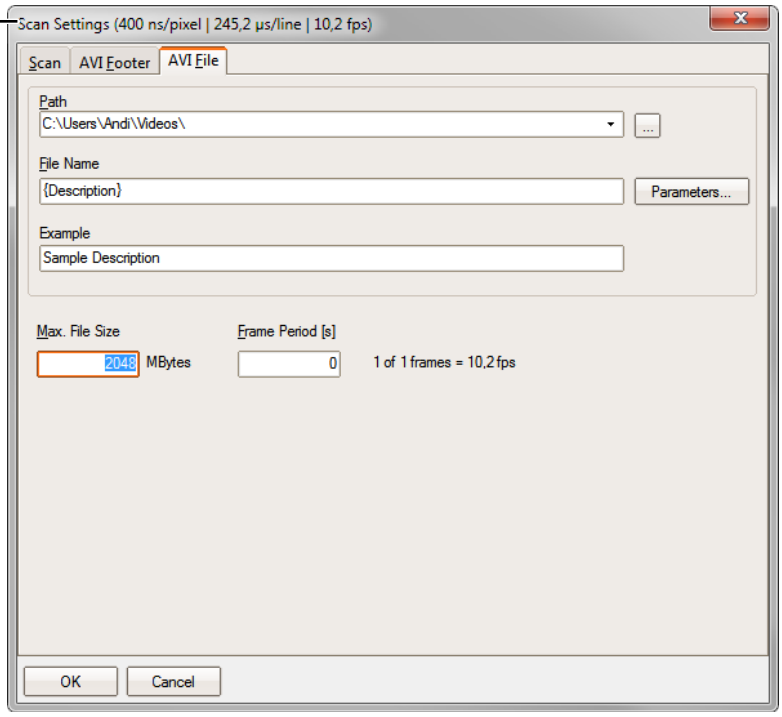
A right-click on the AVI button opens the **Scan Settings** window to set up the AVI parameters.

Continued on next page ...

... Continuation: AVI

Scan Settings

The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel and per frame based on the scan settings
Tabs – **Scan** (Page 3-78) – **AVI Footer** (Page 3-80) – **AVI File** (Page 3-82)	 Set-up of the AVI acquisition parameters Setting the comment line Defining the file name with which recorded video sequences can be saved automatically. The chosen file name is automatically suggested when images are saved.

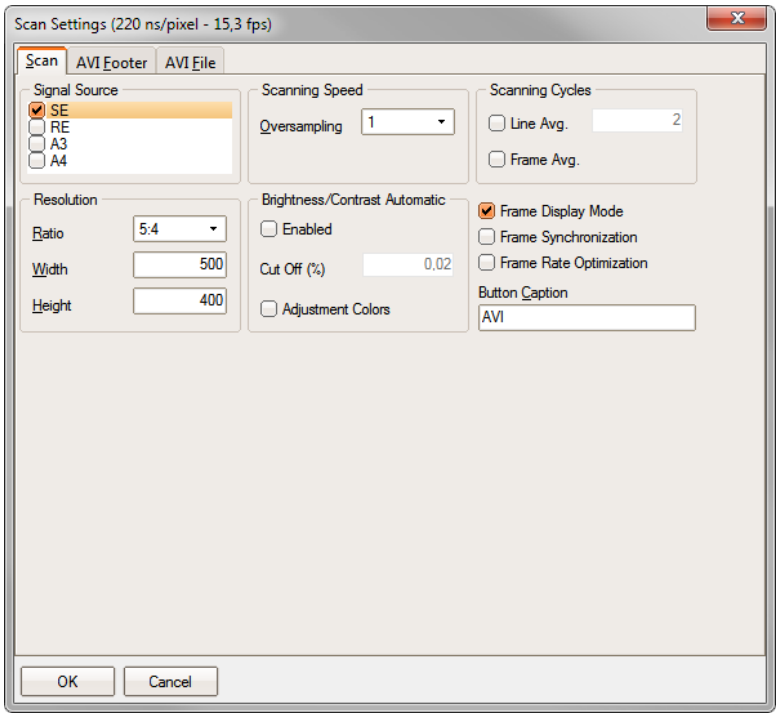
Continued on next page ...

... Continuation: AVI

Component	Function
| OK |	Closes the dialog window All preset parameters are saved and used for the next recording process.
| Cancel |	Closes the dialog window The preset settings are rejected.

"Scan" Tab

The following figure shows the **Scan Settings** window with the **Scan** tab:



The following table contains information on the components of the **Scan** tab:

Component	Function
Signal Source	Contains the checkboxes A1 (SE), A2 (RE), A3 and A4 (optional) for selecting an analog signal source
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved.

Continued on next page ...

... Continuation: AVI

Component	Function
Scanning Cycles	Contains functions to improve image quality
– **Line Avg.**	Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged.
– **Frame Avg.**	Activates Frame Averaging This means that images are shown averaged by a preset frame rate.
Resolution	Contains functions for image dimensions set-up
– **Ratio**	Sets the aspect ratio of the displayed image. The available values are 1:1, 5:4, 4:3 and Any.
– **Width**	Sets the width of a displayed image in pixels. Depending on the aspect ratio selected in the **Ratio** field, any entry in the Width field leads to an automatic change of the **Height** value.
– **Height**	Sets the height of a displayed image in pixels. Depending on the aspect ratio selected in the **Ratio** field, any entry in the Height field leads to an automatic change of the **Width** value.
Brightness/Contrast Automatic	Regulates the ratio of brightness and contrast of analog image signals
– **Analog**	Activates the Brightness/Contrast Automatic
– **Cut Off (%)**	The percentage of the brightest and darkest pixels set in the **Cut Off** field will not be included in the calculation of brightness and contrast to ignore outliers.
– **Adjustment Colors**	When the checkbox is activated, all completely white pixels of the current image are displayed in red color. All completely black pixels of the current image are displayed in green color.
Frame Display Mode	Activates "Frame Display Mode" New images are always refreshed completely, not in parts.
Frame Synchronization	Activates Frame Synchronization With every new image, the scan is synchronized to the mains voltage in order to reduce interferences.
Frame Rate Optimization	Activates "Frame Rate Optimization" This means that oversampling is adapted to an image rate of 12.5 frames per second, if possible. This value can be altered in the configuration file.
Button Caption	For entering a name to be displayed below the AVI button.

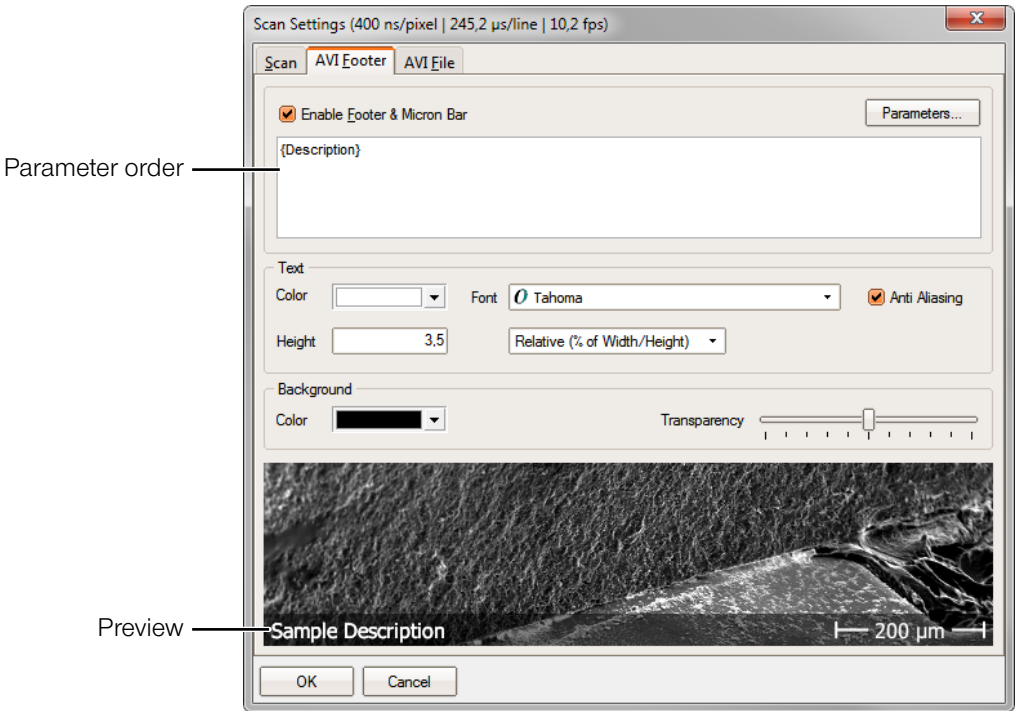
Continued on next page ...

... Continuation: AVI

"AVI Footer" Tab

In the **AVI Footer** tab, a footer can be activated and configured. The footer will be shown and saved in the video.

The following figure shows the **Scan Settings** window with the **AVI Footer** tab:



The following table contains information on the components of the **AVI Footer** tab:

Component	Function
Enable Footer & Micron Bar	Activates/deactivates footer during the recording of videos. If the footer is activated, the **Micron Bar** (image scale) will always be visible next to the adjustable parameters on the bottom right.
| Parameters ... |	Opens the **Parameters** window for selecting, setting and inserting the global parameters for the optional footer during the recording of videos.

Continued on next page ...

... Continuation: AVI

Component	Function
Parameter order	For inserting and arranging the parameters in the footer. Parameters are displayed symbolically as parameter name in curly brackets. After the parameter name, within the curly brackets, the percentage of the parameter indentation (from left) can be inserted separated by a semicolon, e.g.: – {Description;x=35} – This parameter would be indented to the left by 35% of the total image width in the footer. – {Description;x=100} – This parameter would be aligned in the footer to the right-hand margin of the image. Between parameters, any text (including special characters or breaks) can be inserted.
Text	
– **Color**	For setting the font color in the footer
– **Font**	For setting the font in the footer
– **Anti-Aliasing**	For activating/deactivating anti-aliasing
– **Height**	For setting font size
– **Height selection field**	For setting the font size unit – **Relative (% of Width/Height)** – Font size as percentage relative to image width and image height – **Relative (% of Height)** – Font size as percentage relative to image height – **Absolute (dots)** – Font size as absolute value in pixels
Background	
– **Color**	For setting the background color in the footer.
– **Transparency**	For setting the transparency of the background color in the footer.
Preview	In the preview, the selected settings of the footer will be displayed.

Continued on next page ...

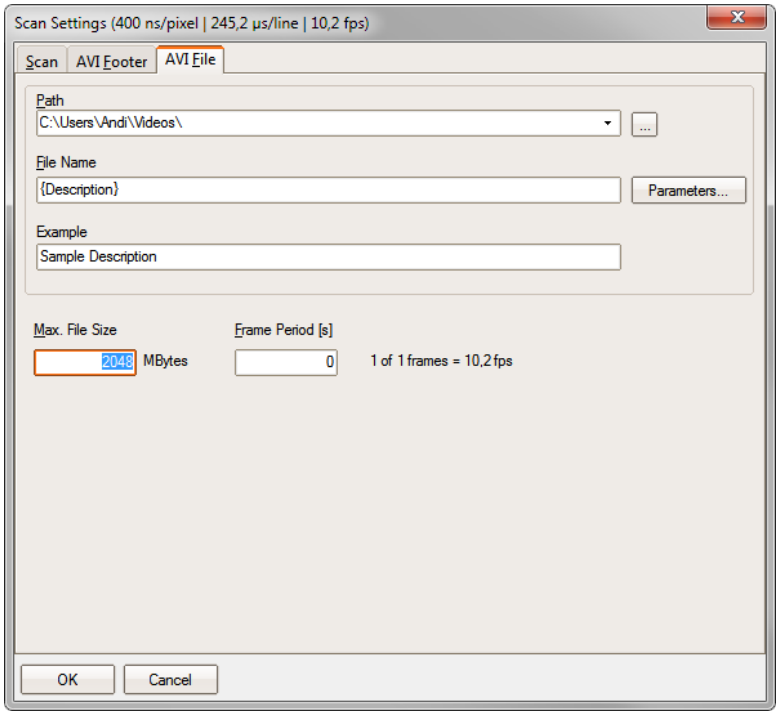
... Continuation: AVI

"AVI File" Tab

In the **AVI File** tab, the automatic file name generation can be activated and configured. With the help of different parameters (e.g. comment, date), the image file name is generated.

In the **Frame Period** field, the time after which a single image of the current scan is saved for the video can be set. This allows time-lapse recordings.

The following figure shows the **Scan Settings** window with the **AVI File** tab:



Continued on next page ...

... Continuation: AVI

The following table contains information on the components of the AVI File tab:

Component	Function
Path	Selection and display of the saving location for video sequences
File Name	For inserting and arranging the parameters in the automatically generated file name. Parameters are displayed symbolically as parameter name in curly brackets. Between parameters, text (including spaces or delimiters) can be inserted.
| Parameters ... | (Page 3-33)	Opens the **Parameters** window for selecting, setting and inserting the global parameters of the automatic generation of file names during saving videos.
Example	Displays a preview of the file name
Max. File Size	Sets the maximum file size in MB (MegaByte) for video sequences
Frame Period [s]	Sets the time (in seconds) after which the next single image for the video is saved "0" – all single images will be saved

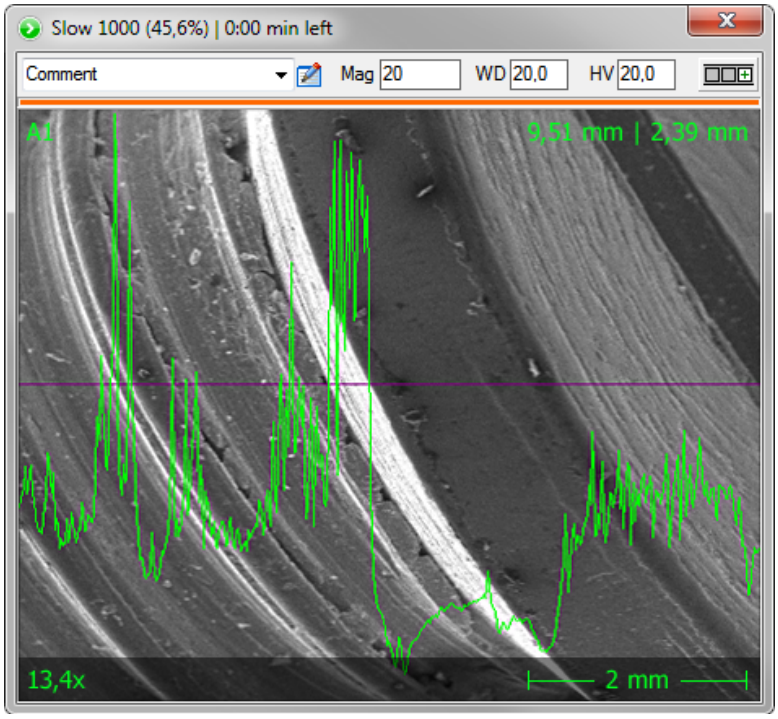
Live Line

Description Live Line is a continuous scan on a horizontal line in an acquired Slow Scan image. The position of the line in the image can be changed with the mouse.

Button After a click into the Image Acquisition window, the Live Line scan mode will be started upon pressing the following button:

Cancel Live Line will be canceled when the Stop button or another scan button is pressed.

Image Acquisition Window The following figure shows the Image Acquisition window with active Live Line:

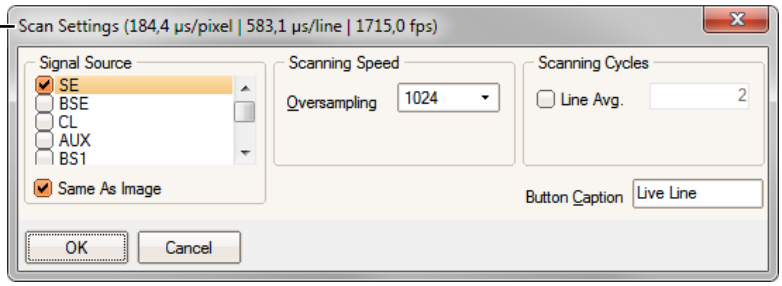


Continued on next page ...

... Continuation: Live Line

Set-up of Live Line A right-click on the Live Line button opens the **Scan Settings** window to set up the relevant parameters.

Scan Settings The following figure shows the **Scan Settings** window with its components:



The following table contains information on the components of the **Scan Settings** window:

Component	Function
Title bar	Displays the calculated scan time per pixel and per frame based on the scan settings
Signal Source – **Same As Image**	Contains the checkboxes A1 (SE), A2 (BSE) and A3/A4 (optional) for selecting an analog signal source The input channel of Live Line uses the input of the image on which it is applied.
Scanning Speed	Contains the **Oversampling** function This function sets the amount of A/D conversions per pixel. Thus, the signal-to-noise ratio (SNR) can be improved. Oversampling can be modified with the arrow keys ← and →.
Scanning Cycles – **Line Avg.**	Contains functions to improve image quality Activates Line Averaging This means that each line is repeatedly scanned with a preset amount of scans. Image signals per line are shown averaged.
Button Caption	For entering a name to be displayed below the Live Line button
| OK |	Closes the dialog window The preset settings are saved.
| Cancel |	Closes the dialog window The preset settings are rejected.

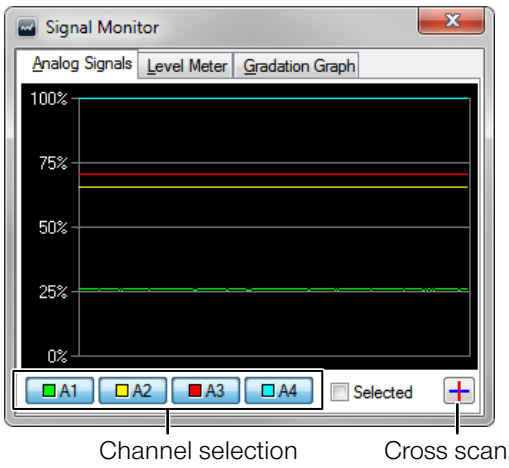
Signal Monitor

Description Pressing the Signal Monitor button causes the levels of the analog signals during the scanning process to be displayed in a separate window.

Additionally, it is also possible to change the min and max values of the image signals as well as the gamma value during a scan.

Button Pressing the following button opens the Signal Monitor window with three tabs:

"Analog Signals" Tab The following figure shows the Signal Monitor with the **Analog Signals** tab:



The following table contains information on the components of the **Analog Signals** tab:

Component	Function
Channel Selection	Showing and hiding of the levels of up to four different analog signal sources The four signal sources can also be displayed simultaneously.
Selected	Shows the level of the channel selected in the Image Acquisition window. The number of the selected channel will also be displayed in the Signal Monitor's title bar (e.g. A1).

Continued on next page ...

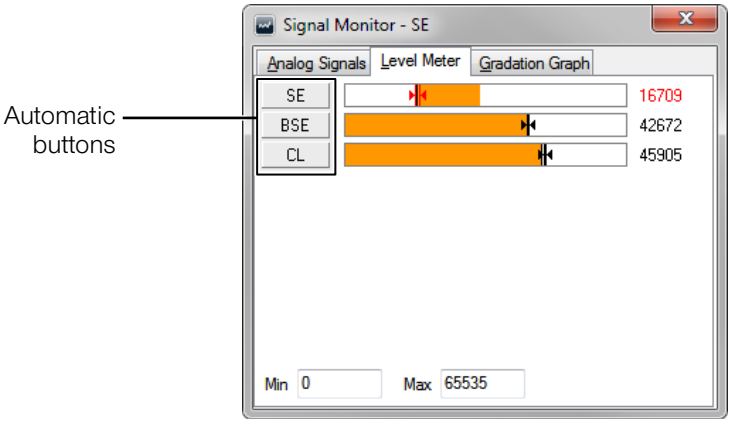
... Continuation: Signal Monitor

Component	Function
Cross scan	Shows the level in horizontal and vertical direction during the first rolling

"Level Meter" Tab

The values shown in the Level Meter tab are only valid for the current image acquisition or the just acquired images. The currently selected channel is marked red. To choose a channel, it can be selected in the Image Acquisition window or by clicking on the bar in the Level Meter.

The following figure shows the Signal Monitor with the **Level Meter** tab:



The following table contains information on the components of the **Level Meter** tab:

Component	Function
Automatic buttons	Set the thresholds of the detected minimum and maximum values of the image signal
Orange strip	Shows the signal range during an image rolling
Icon	Sets the value of the lower limit By dragging the mouse, the value can be modified manually. The exact minimum value can be read and modified in the Min field.

Continued on next page ...

... Continuation: Signal Monitor

Component	Function
Icon	Sets the value of the upper limit By dragging the mouse, the value can be modified manually. The exact maximum value can be read and modified in the Max field.
Black line between the symbols and the value next to the bar	Shows the current value

"Gradation Graph" Tab

The gradation graph is a function to transform digital brightness values of the image data. The brightness values are converted with a graphically displayed transfer function. In this function, source and target values are seen as x- and y-axes of a coordinate system. Between the axes, an area is available in which intersection points can be inserted with the mouse. For each value on the x-axis (original value), a corresponding value on the y-axis (corrected value) will be associated.

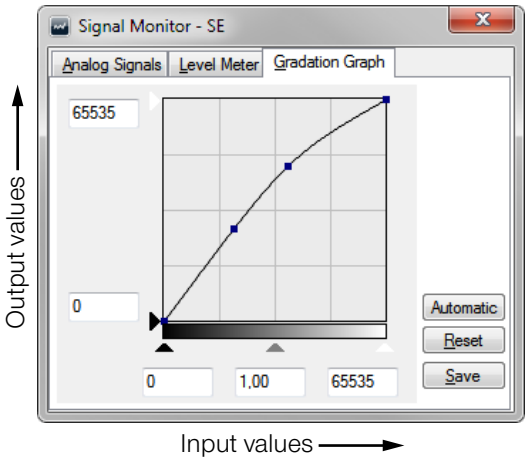
The settings are applied to the selected channel and are maintained until Reset is pressed or the automatic buttons in the level meter are activated.

To select a channel, it must be clicked in the Image Acquisition window.

Continued on next page ...

... Continuation: Signal Monitor

The following figure shows the **Gradation Graph** tab with its components



The following table contains information on the components of the **Gradation Graph** tab:

Component	Function
Output values	Showing and modifying the output spectrum between the darkest and the brightest pixel By moving the triangles, the input output spectrum can be adapted. An exact value can be read or modified in the corresponding fields.
Input values	Showing and modifying the input spectrum between the darkest and the brightest pixel By moving the triangles, the input spectrum can be adapted. The middle triangle symbolizes the gamma value (luminosity). Moving the triangle changes the ratio between dark and bright pixels. An exact value can be read or modified in the corresponding fields.
Reset	Resets the function of the selected channel back to linear

Video Amplifier (optional)

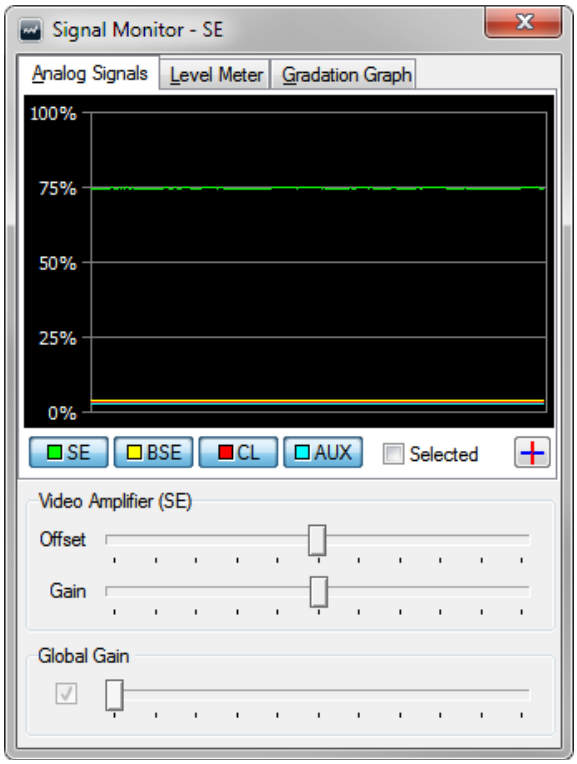
Description Video Amplifier amplifies video signals. Only when a video multiplexer is connected, the video amplifier is shown with the Signal Monitor.

The video multiplexer is a hardware option which makes 8 analog inputs available. These can be allocated to the 4 inputs of the Image Acquisition.

With the Video Amplifier, it is possible to set Gain and Offset for the selected signal source. To select a signal source, click the particular image in the Image Acquisition window.

With the **Global Gain** control, the amplification of several inputs can be changed together.

Structure The following figure shows the Signal Monitor window with the Video Amplifier:



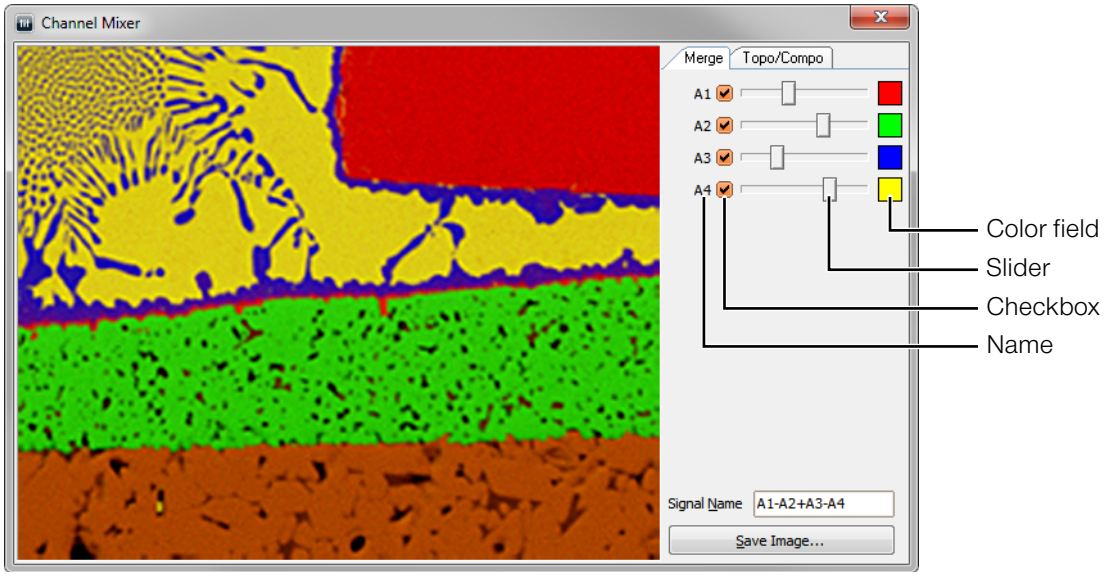
Channel Mixer

Description Channel Mixer allows to live-mix image signals. All image signals of the current active scan can be mixed. Each image signal can be allocated a color.

Button Pressing the following button opens the Channel Mixer window with two tabs:

"Merge" Tab In the **Merge** tab, all image signals of the active scan can be dyed and mixed.

The following figure shows the **Channel Mixer** window with the **Merge** tab:



The following table contains information on the components of the **Merge** tab:

Component	Function
Color field	Shows the color that symbolizes a channel in the mixer By clicking the color, b/w and color mode can be switched. In color mode, a right-click opens a dialog window for choosing colors.
Slider	Sets channel intensity
Checkbox	Activates or deactivates channel

Continued on next page ...

... Continuation: Channel Mixer

Component	Function
Name	Name of the channel
Image	Shows the result of mixed images Double-clicking the image activates the Full Screen mode. A right-click on the image opens a context menu with the following functions: – **Hair Cross** (Page 3-3) – **Draw Circle** (Page 3-3) – **Interpolation** (Page 3-3)
Signal Name	The text entered into the **Signal Name** text field determines the parameter "SignalName"
| Save Image... | / **| Send Image to DIPS |**	The Save button set as default (see Page 3-25) determines the function of this button: – **| Save Image... |** opens the **Save Image** window to save the mixed image as calibrated TIFF – **| Send Image to DIPS |** sends the mixed image as calibrated TIFF to the image processing software By keeping the Shift ⇧ key pressed, you can switch between the functions.

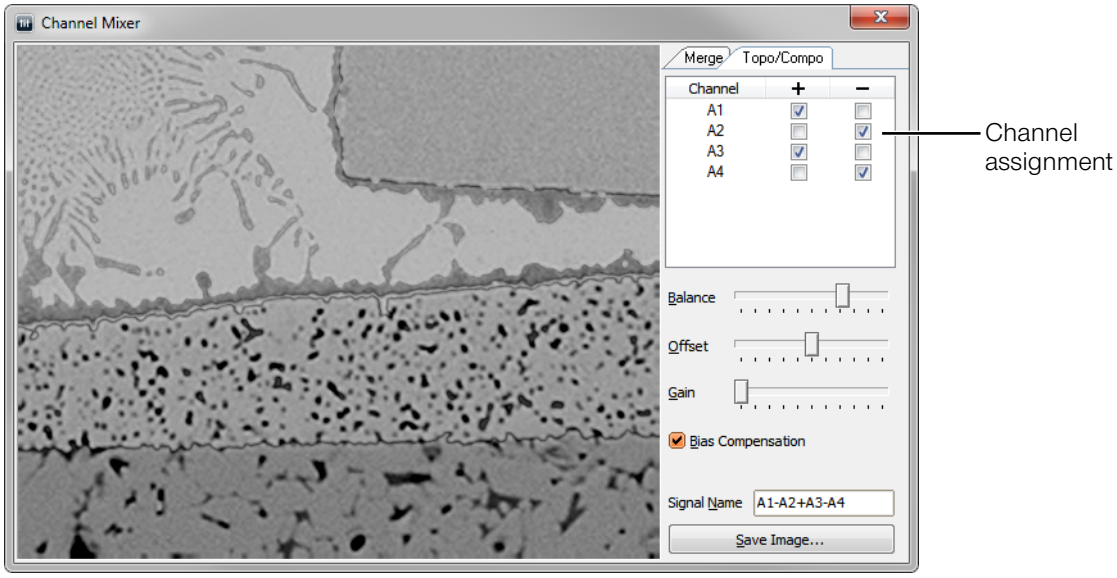
Continued on next page ...

... Continuation: Channel Mixer

"Topo/Compo" Tab

In the **Topo/Compo** tab, up to 4 image signals of analog signal sources can be added or subtracted. In the Topo mode (subtraction), the balance of subtracted signals can be changed with a slider. With opposite BSE detectors the material contrast can be minimized to a degree that only the topography of the sample is visible.

The following figure shows the **Channel Mixer** window with the **Topo/Compo** tab:



The following table contains information on the components of the **Topo/Compo** tab:

Component	Function
Channel assignment	– Displays the available BSE signal sources – Defines which channel (-) is subtracted from which channel (+)
Balance	Sets the ratio between the channels to be combined
Offset	Sets the brightness of the mixed image
Gain	Sets the contrast of the mixed image
Bias Compensation	Activates or deactivates the automatic brightness adaptation
Signal Name	The text entered into the **Signal Name** text field determines the parameter "SignalName"

Continued on next page ...

... Continuation: Channel Mixer

Component	Function
| Save Image... | / **| Send Image to DIPS |**	The Save button set as default (see Page 3-25) determines the function of this button. – **| Save Image... |** opens the **Save Image** window to save the mixed image as calibrated TIFF – **| Send Image to DIPS |** sends the mixed image as calibrated TIFF to the image processing software By keeping the Shift ⇧ key pressed, you can switch between the functions. For the footer, the settings of the Save button set as default will be applied.

Reference Image

Reference images are used to compare image acquisition results. After completed image acquisition, an image can be added by drag & drop as reference image. It will be archived as "Ref" in the channel mixer.

The images (channels) of the next scan will be added to the reference image.

After completed image acquisition, the reference image can be deleted with the key Esc.

Stop

Description With the Stop function, the diverse scan modes can be canceled.

Button The scanning process can immediately be canceled by pressing the following button:

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4 Lithography (optional)

Chapter overview

Purpose This chapter gives information on the Lithography function of DISS 5. It contains descriptions on process and function of the lithography.

Contents This chapter contains the following information:

› Description....4-2

› Working with Inkscape....4-3

› Lithography Interface....4-8

› Working with the Lithography Interface....4-10

Description

Introduction The Lithography function enables an electron/ion beam lithography on a sample. Within this function, the ion beam deflection for image acquisition is congruent with the deflection in Lithography mode.

Process The open-source software "Inkscape", included in the installation medium of DISS 5, is used to create the layout of the lithography masks. DISS 5 lithography processes the files created with "Inkscape".

This results in the following procedure:

- Creation of a lithography mask within Inkscape
  - Start Inkscape
  - Open a template with the preferred resolution
  - Draw the mask
  - Enter the lithography parameters with Inkscape's XML editor
- Processing the lithography mask in the Lithography interface of DISS 5
  - Load Inkscape file
  - Set global lithography parameters
  - Write lithography mask

Working with Inkscape

Make sure to only use the software version delivered within DISS 5.

Introduction

Inkscape is an open-source software that can be freely used for private as well as commercial purposes. This graphics application creates files in the "SVG" XML file format. "SVG" means "Scalable Vector Graphics" and describes scalable vector graphics by means of open XML syntax.

You can find more detailed information on Inkscape, SVG and XML on the internet.

Starting Inkscape and opening a Template

Complete the following steps to start Inkscape and open the preferred template file:

1. Start Inkscape via the Start menu or the desktop shortcut

   ⇒ A new Inkscape document in A4 standard size will open in a new window

2. Open one of the templates for the creation of lithography masks from the → **File** → **New** menu within Inkscape →
   - Template 1024x1024
   - Template 2048x2048
   - Template 4096x4096
   - Template 8192x8192
   - Template 16384x16384

   ⇒ A new Inkscape document in the size of the selected template will open

3. Each new Inkscape document will open in a new window. Thus, you can close the first window containing the standard A4 document.

Continued on next page ...

... Continuation: Working with Inkscape

The template selection determines the size of the bitmap file to be generated by processing the Inkscape file. The maximum resolution amounts to 16384 × 16384 pixels.

The larger the resolution, the longer it will take to process the file within the Lithography function.

4096 × 4096 pixels can be considered a good compromise between resolution and the required processing time.

Drawing a Lithography Mask

For drawing a mask, any drawing function within Inkscape may be used. Fill color and line color of the objects drawn with Inkscape are of no importance for the processing of the lithography mask.

Inkscape features an extensive help function including detailed entry-level tutorials to get acquainted with the software. Besides, multiple instructions are available on the internet.

Lithography Parameters

For each object drawn in Inkscape, it is possible to determine differing parameters for exposure time per pixel, dot density and output repetition. If the lithography parameters of an object are not defined manually, the global parameters set within the Lithography interface of DISS 5 apply to this object.
If no object is supplied with individual lithography parameters, the global parameters apply to all objects.

The following table contains information on the lithography parameters that can be defined for objects in Inkscape:

Parameter	Description
litpixtime	– Dwell time per pixel – Value range between 0.24 and 1310.78µs, in 0.02µs steps – In combination with the **Time Scale** value entered in the Lithography interface of DISS 5, the dwell time value results in the exposure time per pixel: litpixtime × Time Scale = exposure time per pixel

Continued on next page ...

... Continuation: Working with Inkscape

Parameter	Description
litstep	– Reduction of pixel density – Value range between 1 and 16 (integer) – In combination with the **Pixel Step** value entered in the Lithography interface of DISS 5, the reduction of pixel density results in the pixel density value of the object: Number of pixels depending on the template/litstep/Pixel Step=object pixel density
litrepeat	– Repetitions of object's write cycle – Value range between 0 and 15 (integer) – Zero means single write cycle without repetition – In combination with the **Frame Loop** value entered in the Lithography interface of DISS 5, the repetition value results in the number of write cycles: (1+litrepeat)×Frame Loop=amount of write cycles per object

Entering Lithography Parameters

Use the XML editor of Inkscape to enter lithography parameters for single objects. The internal data structure of documents can be displayed and modified in the XML editor.

Open the XML editor via the Inkscape menu → **Edit** → **XML editor**.

On the left-hand side, the XML editor will display all objects of the document as tree structure. Grouped objects are combined in branches that can be collapsed and expanded. Branches or single objects can be selected by clicking on them. Attributes of selected branches or objects are displayed on the right-hand side. These attributes may for instance describe the appearance of drawn objects. Use the XML editor to modify or add attributes. For entering lithography parameters, attributes have to be added.

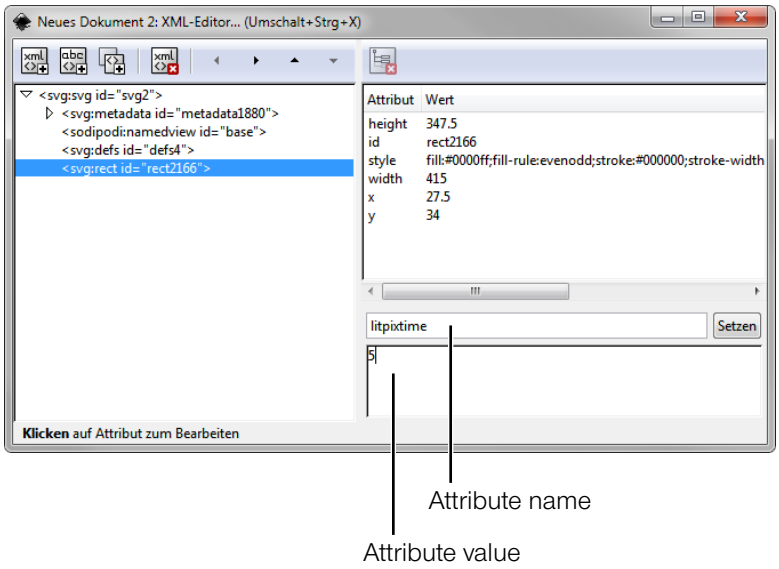
Continued on next page ...

... Continuation: Working with Inkscape

Complete the following steps to enter a lithography parameter in the XML editor:

1. Click on an object in the tree structure on the left-hand side of the XML editor.

   ⇒ The object is marked and selected on the Inkscape work area. The object's attributes are displayed on the right-hand side of the XML editor.



2. Enter the particular parameter name in the field **Attribute name** (see table), e.g. "litpixtime".
3. Enter the particular parameter value in the field **Attribute value** (see table), e.g. "5".
4. Click the **| Set |** button.

   ⇒ The parameter will be added to the object as an attribute.

Continued on next page ...

... Continuation: Working with Inkscape

Creation of accurately-fitting Lithography Masks

Complete the following steps to create masks that accurately fit an existing structure:

1. Use DISS 5 to acquire a Slow Scan image with the resolution of the mask to be created and save the image in your preferred directory.

   If an ion beam system is used for image acquisition, use the lowest possible beam current to prevent writing on the sample.

2. Start Inkscape and open a template (see „Starting Inkscape and opening a Template“ on Page 4-3).
3. In the Inkscape menu, choose → **File** → **Import...** and select the saved Slow Scan image.

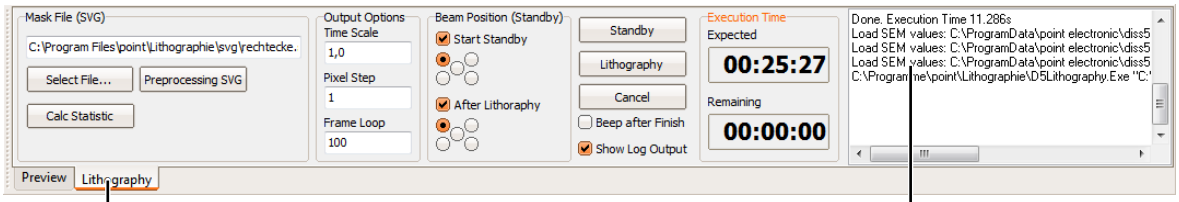
   ⇒ The Slow Scan image is placed in the Inkscape document.

4. Scale the placed image to the size of the work area of the Inkscape document
5. On the placed image, draw the objects of the lithography mask as accurate fit.
6. Delete the placed image from the Inkscape work area and save the document.

Lithography Interface

Description Load SVG files created with Inkscape in the Lithography interface of DISS 5. These files are processed as lithography masks and written on the sample.

Structure The following figure shows the Lithography interface of DISS 5:



Tab menu

Log output

Function The following table contains information on the components of DISS 5's Lithography interface:

Component	Function
Tab menu	Switching between Image Preview and Lithography function
Mask File (SVG)	Contains functions for selecting the SVG file
– **Text field**	Displays the path of the selected SVG file
– **| Select File ... |**	Opens a standard dialog window for selecting the SVG file
| Preprocessing SVG |	Converts the selected SVG file to a lithography mask that can be processed by the Lithography function of DISS 5
| Calc Statistic |	Calculates the expected duration of the lithography depending on the loaded lithography mask and the preset values entered in the **Output Options** field
Output Options	Contains the global lithography parameters
– **Time Scale**	Factor for the exposure time per pixel during lithography
– **Pixel Step**	Value for the reduction of pixel density of the lithography mask: Amount of pixels of the lithography mask/Pixel Step=pixel density
– **Frame Loop**	Factor for the number of write cycles during lithography

Continued on next page ...

... Continuation: Lithography Interface

Component	Function
Beam Position (Standby)	Contains functions for determining the electron beam position on the sample before and after lithography (in standby mode)
– **Start Standby**	Determines the electron beam position before lithography by the checkboxes arranged underneath
– **After Lithography**	Determines the electron beam position after lithography by the checkboxes arranged underneath
| Standby |	Switching to standby mode
| Lithography |	Carrying out a lithography with the selected lithography mask and the selected settings
| Cancel |	Canceling the lithography
Beep after Finish	Activates/deactivates a tone alert after finishing a lithography
Show Log Output	Displays/hides **Log Output**. The log output contains status messages of the Lithography function
Execution Time	Shows the expected duration of the lithography
– **Expected**	Calculated total duration of the lithography
– **Remaining**	Remaining time during lithography

Working with the Lithography Interface

Steps Complete the following steps to write a SVG file created in Inkscape as lithography mask on a sample:

1. In the **tab menu**, click on **Lithography** to switch to the Lithography interface of DISS 5.
2. In the **Mask File (SVG)** area, click on the **| Select File ... |** button.

   ⇒ A standard dialog window opens for selection of the lithography mask as Inkscape SVG file.
3. Select the particular Inkscape SVG file and click on **| Open |**.

   ⇒ The Inkscape SVG file is loaded as lithography mask. The file path is displayed in the text field within the **Mask File (SVG)** area.

   If the SVG file is modified in Inkscape after loading it on the Lithography interface, the lithography mask may be refreshed by clicking on the **| Preprocessing SVG |** button.
4. Define the particular lithography parameters in the **Output Options** group.

   By modifying the global lithography parameters, the duration of the lithography process will change. Click on the **| Calc Statistic |** button to display the expected lithography duration in the **Expected** field within the **Execution Time** group.

Continued on next page ...

... Continuation: Working with the Lithography Interface

5. Click the **| Standby |** button.

   ⇒ Standby mode is activated. The electron beam will stop at the determined initial position.

   During standby mode, the sample can be repositioned if necessary.

6. Click the **| Lithography |** button.

   ⇒ Lithography mode is activated. The lithography is carried out. The remaining time is displayed in the **Remaining** field in the **Execution Time** group. After completing the lithography, the electron beam moves to the determined final position, standby mode will be activated.

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5 Image Processing

Chapter overview

Purpose This chapter gives information on the image processing system DIPS. It contains descriptions of structure and function of the software.

Contents This chapter contains the following sections:

› 5.1 Structure and Function 5-2

› 5.2 Functions in the File Menu 5-19

› 5.3 Functions in the Image Menu 5-30

› 5.4 Functions in the Tools Menu 5-45

5.1 Structure and Function

Overview

Purpose This section contains descriptions on the structure and function of the image processing software DIPS.

Contents This section contains the following information:

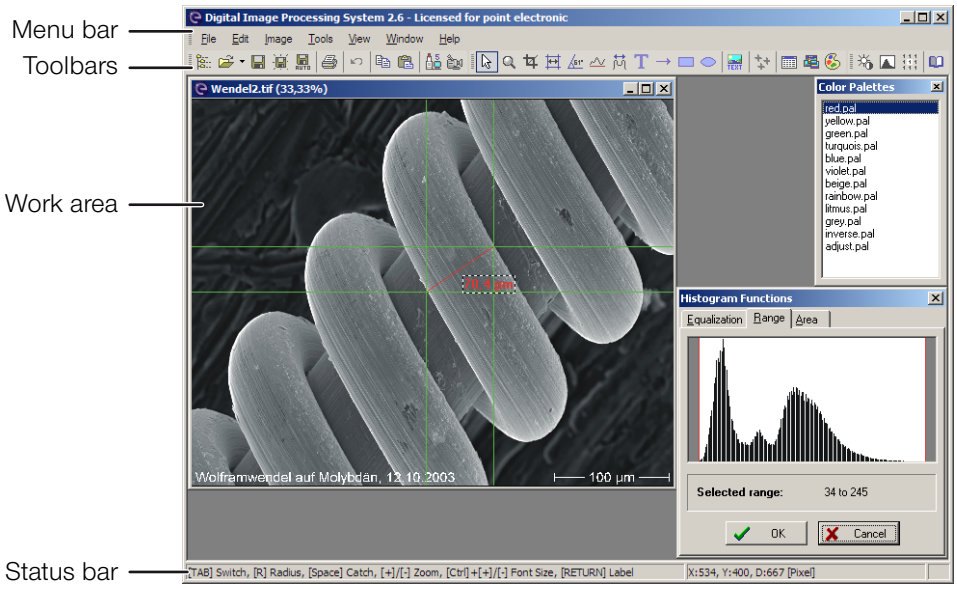
› User Interface 5-3
› Toolbars.....5-5
› File Menu 5-9
› Edit Menu.....5-11
› Image Menu 5-12
› Tools Menu 5-14
› View Menu..... 5-16
› Window Menu 5-17
› Help Menu 5-18

User Interface

Description With DIPS, the digital imaging processing system of DISS 5, digitized images can be processed, labeled, measured, printed and saved easily.

A special layout technique facilitates the processing of several related images as well as their documentation and archiving.

Structure The following figure shows the user interface of DIPS with its components:



Function The following table contains information on the user interface's components of DIPS:

Component	Function
Menu bar	Contains all DIPS functions The display of the menus can be customized. (Page 5-6)
Toolbars	Contain functions of DIPS as command buttons The content of the toolbars can be customized either via the preferences or according to user-specific requirements. (Page 5-5)
Work area	Contains all opened image windows as well as dialog windows of the active tools or functions

Continued on next page ...

... Continuation: User Interface

Component	Function
Status bar	– Displays possible functions or actions of the active tool – Displays measurement results of the active tool (e.g. size of an angle)

Toolbars

Introduction

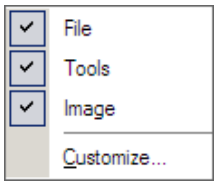
Toolbars contain some frequently used menu functions. The functions are represented in three groups. DIPS provides the following options to organize the functions according to specific requirements:

- Display or hide toolbars
- Expand existing toolbars
- Delete functions from existing toolbars
- Create user-specific toolbars
- Set-up of display options for menus

Context Menu

The context menu allows to show, hide or customize all available toolbars. The context menu can be opened by a right-click on the toolbars or menu bars.

The following figure shows the context menus of toolbars and menu bars:



Customizing Toolbars

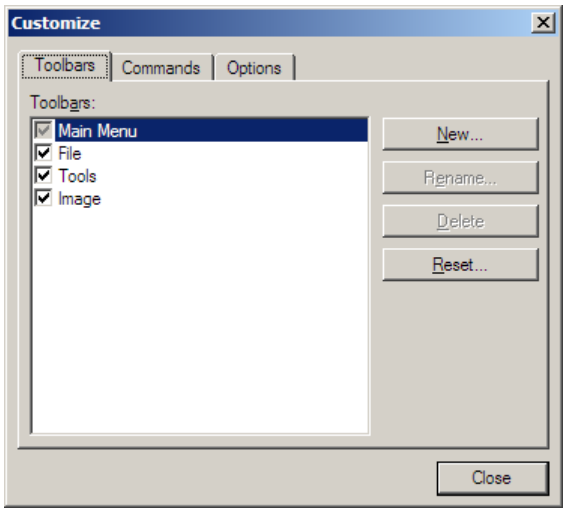
Open the **Customize** window with three tabs via the context menu to customize the toolbars.

Continued on next page ...

... Continuation: Toolbars

"Toolbars" Tab

The following figure shows the **Customize** window with the **Toolbars** tab:



The following table contains information on the components of the **Toolbars** tab:

Component	Function
Toolbars	Shows all available toolbars Each toolbar can be shown or hidden by using the checkbox.
| New... |	Opens a dialog window for creating a new toolbar
| Rename... |	Opens a dialog window for renaming the selected toolbar The standard toolbars (Main Menu, File, Tools and Image) cannot be renamed.
| Delete |	Deletes the selected toolbar The standard toolbars (Main Menu, File, Tools and Image) cannot be deleted.
| Reset... |	Resets a modified standard toolbar to default Only the standard toolbars (Main Menu, File, Tools and Image) can be reset.

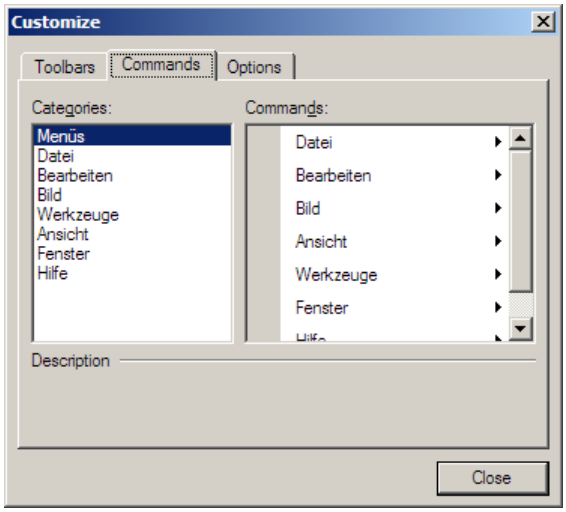
Continued on next page ...

... Continuation: Toolbars

"Commands" Tab

As soon as the **Commands** tab is opened, the edit mode for all menus and toolbars is activated. In this mode, menus and tools can be deleted or moved via Drag & Drop.

The following figure shows the **Customize** window with the **Commands** tab:



The following table contains information on the components of the **Commands** tab:

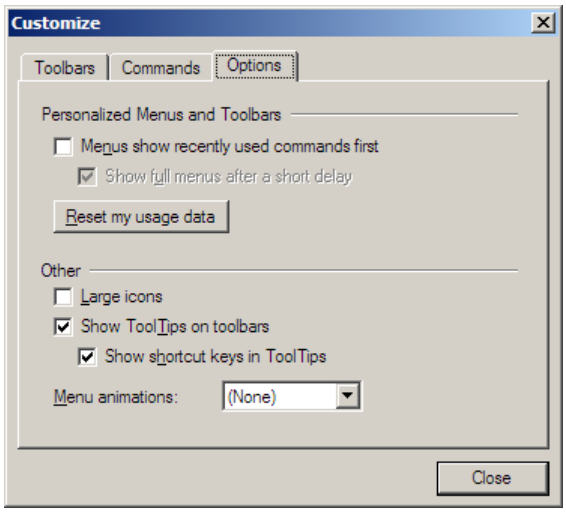
Component	Function
Categories	Displays all available menus
Commands	Displays the content of the menu which is selected in the **Categories** field

Continued on next page ...

... Continuation: Toolbars

"Options" Tab

The following figure shows the **Customize** window with the **Options** tab:

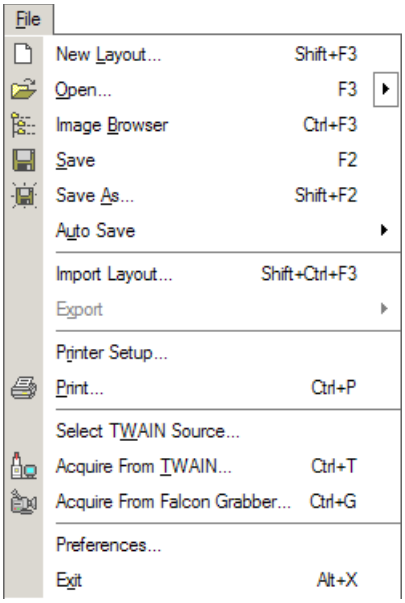


The following table contains information on the components of the **Options** tab:

Component	Function
Personalized Menus and Toolbars	
– **Menus show recently used commands first**	Displays only the most commonly used commands in the menus
– **Show full menus after a short delay**	Shows all commands in the menus after a short delay
– **| Reset my usage data |**	Deletes the personal usage data All menus will be displayed with all commands.
Other	
– **Large icons**	Shows large icons in the tool bars
– **Show ToolTips on toolbars**	Shows a tool tip if the cursor is on an icon in the toolbar
– **Show shortcut keys in ToolTips**	Shows shortcut keys in the tool tips
– **Menu animations**	Contains a list of animation effects for showing menus

File Menu

Structure The following figure shows the File menu with its components:



Function The following table contains information on the components of the File menu:

Component	Function
New Layout... ⇧+F3	Opens a dialog window for creating layout templates. (Page 5-20) A layout template consists of several empty fields in which different images can be arranged.
Open... F3	Opens the **Load Image** window to select image files or layout files and open them in DIPS. DIPS supports the following file formats: – Tagged Image File Format (.TIF) – Windows Bitmap (.BMP) – Joint Picture Expert Group (.JPG) – Portable Network Graphics (.PNG) – Graphics Interchange Format (.GIF) – DOS-DISS (.PSD)
Image Browser Ctrl+F2	Opens the visual image management where saved images are displayed in a preview. (Page 5-21)

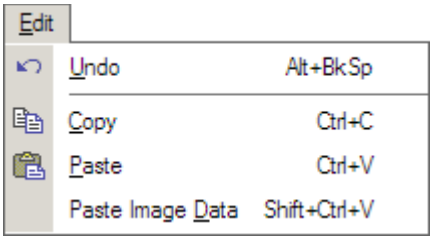
Continued on next page ...

... Continuation: File Menu

Component	Function
Save F2	Saves the active image window or layout window If the active image or layout has not previously been saved, the **Save Image** window opens.
Save As... ⇧+F2	Opens the **Save Image** window. Images and layouts can be saved with another name in specific folders. (Page 5-22) Images and layouts can be saved in one of the following file formats: – Tagged Image File Format (.TIF) – Windows Bitmap (.BMP) – Joint Picture Expert Group (.JPG) – Portable Network Graphics (.PNG) – Graphics Interchange Format (.GIF) – DOS-DISS (.PSD)
Auto Save	Opens a menu for activating or setting further options (Page 5-24)
Export	Exports point scan or linescan data acquired from the DISS 5 TWAIN source to ASCII or Excel format
Printer Setup...	Opens a dialog window for selecting or setting up the connected printers
Print... Ctrl+P	Opens the **Print** window with functions to prepare and carry out the printing of the active image or layout. (Page 5-25)
Select TWAIN Source...	Shows all available TWAIN sources. One source can be selected as standard
Acquire From TWAIN... Ctrl+T	Opens the standard TWAIN source for acquiring images or layouts
Acquire From Falcon Grabber... Ctrl+G	Opens the TWAIN source for acquiring analog video signals (e.g. from an optical microscope) with a frame grabber card
Preferences...	Opens the **Program Preferences** window for setting user-specific defaults (Page 5-27)
Exit Alt+X	Closes the application

Edit Menu

Structure The following figure shows the Edit menu with its components:

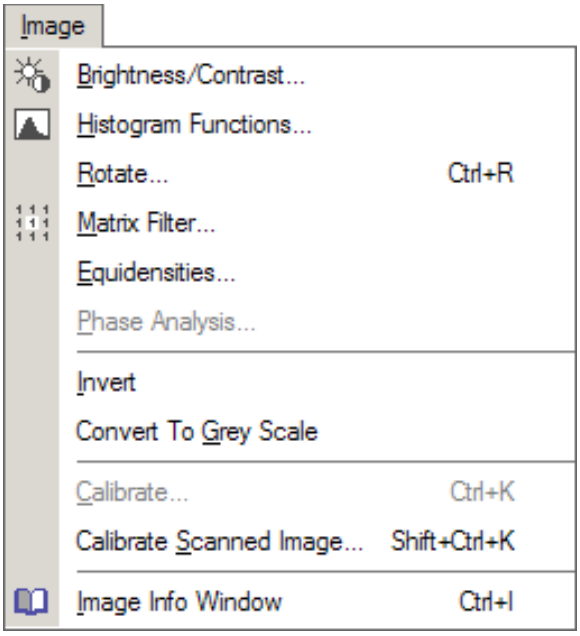


Function The following table contains information on the components of the Edit menu:

Component	Function
Undo Alt+←	Undoes the last action
Copy Ctrl+C	Copies the selected image to the clipboard of the computer
Paste Ctrl+V	Pastes an image from the clipboard into a new image window
Paste Image Data ⇧+Ctrl+V	Pastes an image acquired with another image processing software from the clipboard of the computer

Image Menu

Structure The following figure shows the Image menu with its components:



Function The following table contains information on the components of the Image menu:

Component	Function
Brightness/Contrast...	Opens a dialog window for setting up brightness and contrast (Page 5-31)
Histogram Functions...	Opens a dialog window for setting up functions for modifying the histogram (Page 5-32)
Rotate... Ctrl+R	Opens a dialog window for rotating the selected image (Page 5-34)
Matrix Filter...	Opens a dialog window for setting up different filters (Page 5-35)
Equidensities...	Opens a dialog window for setting and dyeing several gray areas of an image (Page 5-37)
Phase Analysis... (optional)	Starts an application to identify different chemical phases in elemental mapping images

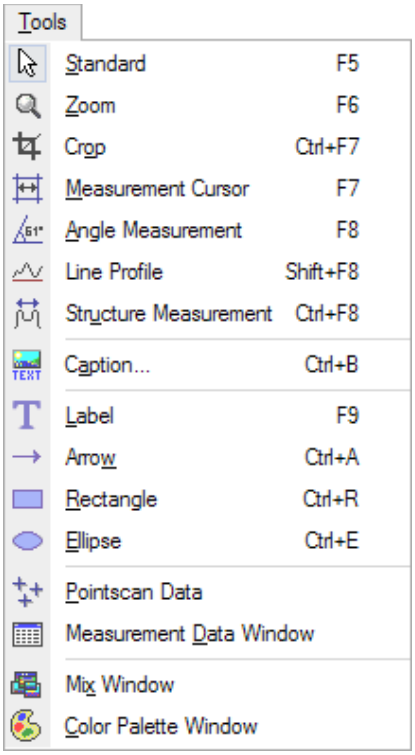
Continued on next page ...

... Continuation: Image Menu

Component	Function
Invert	Shows the selected image in the inverted mode
Convert To Gray Scale	Converts the active image to gray scales
Calibrate... Ctrl+K	Opens a dialog window for calibrating DIPS (Page 5-41) This function is only available in Measurement mode.
Calibrate Scanned Image... ⇧+Ctrl+K	Opens a dialog window for calibrating images acquired with another source (e.g. frame grabber or scanner) (Page 5-43)
Image Info window Ctrl+I	Opens a dialog window that shows information saved with the active image (Page 5-44)

Tools Menu

Structure The following figure shows the Tools menu with its components:



Function The following table contains information on the components of the Tools menu:

Component	Function
Standard F5	Switches to Standard mode Zoom mode and Measurement mode will be deactivated. Drag & Drop is only available in Standard mode
Zoom F6	Activates Zoom mode (Page 5-46)
Crop Ctrl+F7	Crops rectangular sections from the selected image (Page 5-47)
Measurement cursor F7	Activates Measurement mode (Page 5-48)

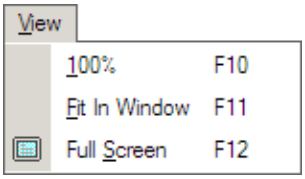
Continued on next page ...

... Continuation: Tools Menu

Component	Function
Angle Measurement F8	Activates Angle Measurement mode (Page 5-50)
Line Profile ⇧+F8	Activates Line Profile Measurement mode (Page 5-51)
Structure Measurement Ctrl+F8	Activates Structure Measurement mode (Page 5-52)
Caption... Ctrl+B	Opens a dialog window for creating an image caption (Page 5-54)
Label F9	For entering label text on any position in the image (Page 5-57)
Arrow Ctrl+A	Labeling Tool: Creates an arrow on any position in the selected image (Page 5-59)
Rectangle Ctrl+R	Labeling Tool: Creates a rectangle on any position in the selected image (Page 5-59)
Ellipse Ctrl+E	Labeling Tool: Creates an ellipse on any position in the selected image (Page 5-59)
Measurement Data Window	Opens the **Measurement Data** window in which the measured distances, radii and angles of the selected image are displayed as tables. The data can be saved either as XLS, HTML or TXT format (Page 5-65)
Mix window	Opens a dialog window for dyeing and mixing images (Page 5-66)
Color Palette window	Opens the Color Palette window Via Drag & Drop, a color palette can be assigned to an image in an image window or a layout window.

View Menu

Structure The following figure shows the View menu with its components:

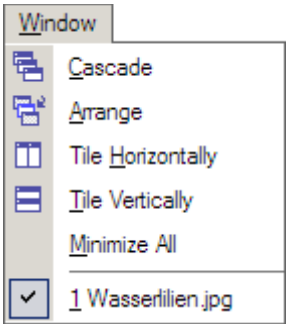


Function The following table contains information on the components of the View menu:

Component	Function
100% F10	Displays the current image or layout in standard view One screen pixel corresponds to one image pixel.
Fit in Window F11	Fits the current image or layout into the image window The aspect ratio will be maintained.
Full Screen F12	Displays the current image or layout in Full Screen mode The re-execution of this function switches back to standard view.

Window Menu

Structure The following figure shows the Window menu with its components:

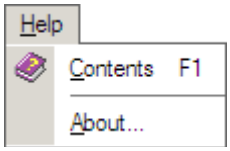


Function The following table contains information on the components of the Window menu:

Component	Function
Cascade	Cascades all opened image windows one after the other graded at an angle on the DIPS user interface
Arrange	Arranges all symbols (minimized image windows) on the lower edge of the DIPS user interface
Tile Horizontally	Arranges all opened image windows one beneath another on the DIPS user interface
Tile Vertically	Arranges all opened image windows side by side on the DIPS user interface
Minimize All	Minimizes all opened image windows to symbols (minimized image windows)

Help Menu

Structure The following figure shows the Help menu with its components:



Function The following table contains information on the components of the Help menu:

Component	Function
Contents F1	Opens the help file
About...	Opens a window with copyright information, software version and serial number

5.2 Functions in the File Menu

Overview

Purpose This section contains descriptions of selected functions in the File menu.

Contents This section contains the following information:

› New Layout 5-20

› Image Browser..... 5-21

› Save As.... 5-22

› Auto Save 5-24

› Print... 5-25

› Program Preferences 5-27

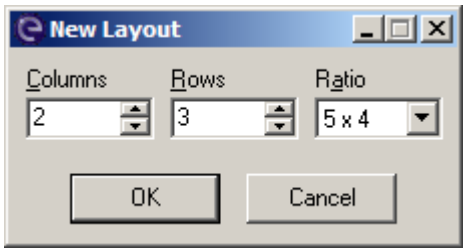
New Layout

Description With a layout, several acquired images can be arranged in one window.

This is useful e.g. for a comparison of images with different settings or a creation of print layouts.

This function opens the **New Layout** window in which new layout templates for the arrangement of several images can be created.

Structure The following figure shows the **New Layout** window with its components:



Function The following table contains information on the components of the **New Layout** window:

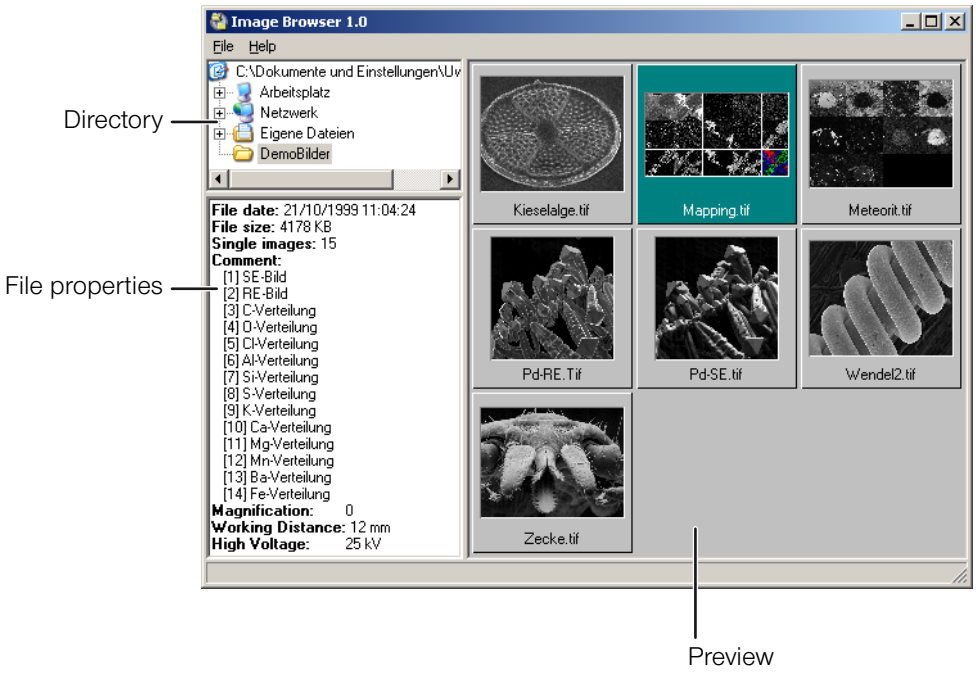
Component	Function
Columns	For entering a preferred number of columns for a layout template
Rows	For entering a preferred number of rows for a layout template
Ratio	For entering a preferred aspect ratio of a layout template
| OK |	Closes the dialog window A new layout template is generated with the given values and is displayed on the work area of DIPS.
| Cancel |	Closes the dialog window The settings are rejected. No new layout template is generated.

Image Browser

Description The Image Browser is a visual image manager integrated in DIPS. It allows a preview of saved images as thumbnails.

With a double-click on a thumbnail, the image is opened in DIPS.

Structure The following figure shows the Image Browser with its main components:



Function The following table contains information on the main components of the Image Browser:

Main Component	Function
Directory	Displays disk drives and folders of the computer
File properties	Displays information saved with a selected image
Preview	Displays thumbnails and file names of the images in a selected folder

Save As...

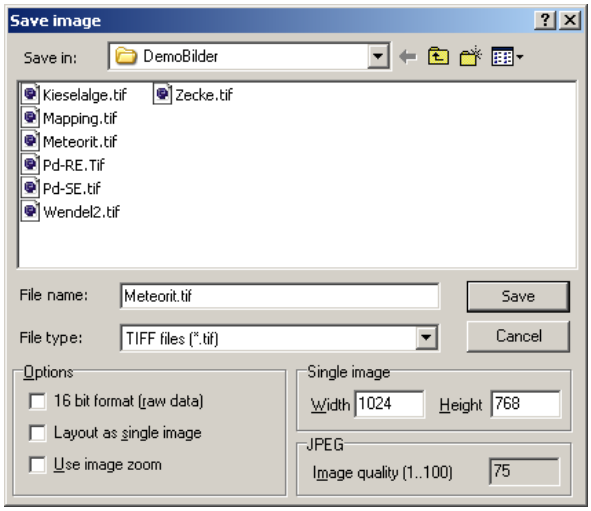
Description With the Save As... function, selected images or layouts can be saved under a different name in the following file formats:

- Tagged Image File Format (.TIF)
- Windows Bitmap (.BMP)
- Joint Picture Expert Group (.JPG)
- Portable Network Graphics (.PNG)
- Graphics Interchange Format (.GIF)

Only in a TIF file, image parameters like calibration and comment can be saved with the image.

The function opens the **Save Image** window.

Structure The following figure shows the **Save Image** window with its main components:



Continued on next page ...

... Continuation: Save As...

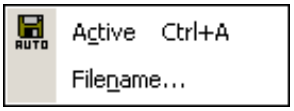
Function The following table contains information on the main components of the **Save Image** window:

Main Component	Function
Options	
– **16 bit format (raw data)**	Saves the raw data of the selected image in 16-bit format This option is only available if the image data to be saved is available in 16-bit format. If the 16-bit format (raw data) checkbox is activated, all modifications of the image will be rejected.
– **Layout as single image**	Saves a layout as single image. Such a layout can also be imported into different graphics applications. With layouts saved as single images, it becomes impossible to process the individual images of a layout afterwards.
– **Use image zoom**	Causes the layout to be saved as shown on the screen The zooming degree of the individual images of a layout is preserved.
Single image	Sets width and height of an image in pixels
JPEG	Sets the quality of the image by entering a value between 1 and 100 The higher the value, the better the quality of the saved image.

Auto Save

Description The Auto Save function allows the quick saving of several images with the same name. While saving several images, the chosen file name is extended with a four-digit number starting at 0001. The number is raised by one for any further saving.

Structure The following figure shows the Auto Save menu with its components:



Function The following table contains information on the components of the Auto Save menu:

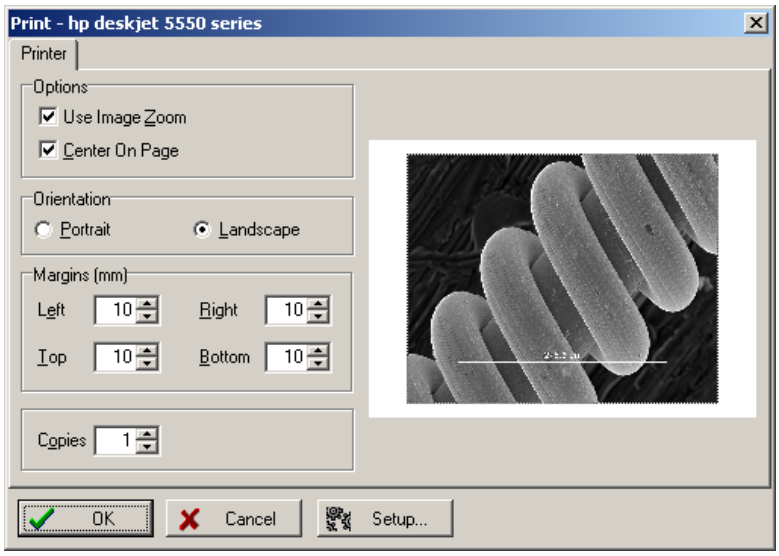
Component	Function
Active Ctrl+A	Activates the Auto Save mode
File name...	Opens the file name window for choosing a file name and to set saving options This dialog window is basically the same as the **Save Image** window (Page 5-22). In the **Options** field, a **Close image automatically** function is available. If this function is activated, the image is closed directly after the saving. The **Layout as single image** function cannot be activated.

Print...

Description With the Print function, the active image or layout can be prepared for printing and can be printed out.

The function opens the **Print** window.

Structure The following figure shows the **Print** window with its components:



Function The following table contains information on the components of the **Print** window:

Component	Function
Options	
– **Use Image Zoom**	Prints the active image or layout as shown on the screen
– **Center On Page**	Prints the active image or layout centered on the page
Orientation	Contains the options **Portrait** and **Landscape** to set the page orientation
Margins (mm)	For setting the page margins in millimeter As a default, images and layouts are aligned on the upper left edge.
Copies	For entering the number of image or layout copies to be printed

Continued on next page ...

... Continuation: Print...

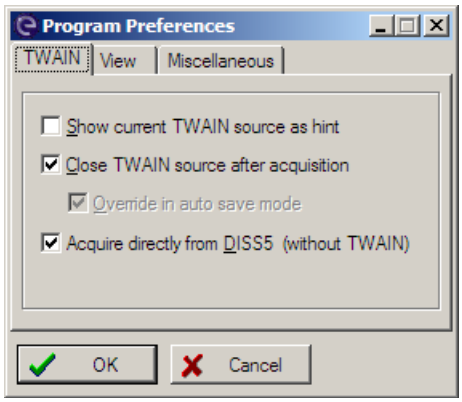
Component	Function
| OK |	Closes the dialog window The image is printed with the preset settings.
| Cancel |	Closes the dialog window The image is not printed. The preset settings are rejected.
| Setup... |	Opens a dialog window for selecting and setting up the printer

Program Preferences

Description With the Program Preferences function, user-specific defaults for DIPS can be set.

The function opens the **Program Preferences** window with three tabs.

"TWAIN" Tab The following figure shows the **Program Preferences** window with the **TWAIN** tab:



The following table contains information on the components of the **TWAIN** tab:

Component	Function
Show current TWAIN source as hint	Displays the selected TWAIN source as tool tip if the cursor is placed on the Acquire From TWAIN button
Close TWAIN source after acquisition	Closes the TWAIN source after acquisition and transfer of an image to DIPS Otherwise, the TWAIN source stays opened until the image acquisition is canceled. This mode allows to acquire several images one after another and to deliver them to DIPS without having to open the TWAIN source again.
Override in Auto Save mode	The TWAIN source is not closed in Auto Save mode

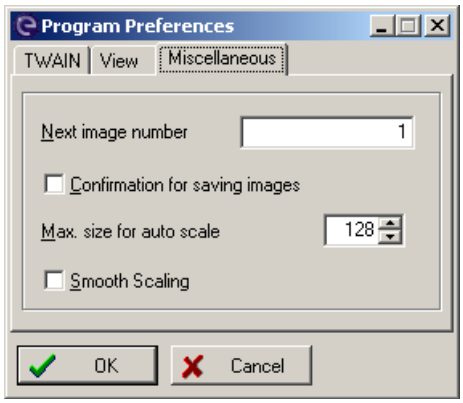
"View" Tab The **View** tab contains a function that displays the toolbar buttons in a flat style.

Continued on next page ...

... Continuation: Program Preferences

"Miscellaneous" Tab

The following figure shows the **Program Preferences** window with the **Miscellaneous** tab:



The following table contains information on the components of the **Miscellaneous** tab:

Component	Function
Next image number	For entering a number to be used for the next image saved
Confirmation for saving images	If this checkbox is activated, the saving of an existing image must always be confirmed. This prevents an original image from being overwritten. This function should always be activated.
Max. size for auto scale	When an image is acquired from the DISS 5 TWAIN source and as long as its width and/or height do not exceed the given values, the image will automatically be converted to twice its size. As this function improves the pixel resolution of an image, it is particularly well suited for layouts with small elemental mapping images if they will be provided with an image caption. The automatic scaling can be prevented if the value "0" is entered in this field.
Smooth Scaling	Activates an interpolating procedure used for automatic scaling. Otherwise, the image is scaled with a simple pixel duplication.

Continued on next page ...

... Continuation: Program Preferences

Scaling The following three images show the effect of scaling. For this purpose, an SE image was acquired with 80 x 64 pixels and labeled with a caption.

Fig. 1) No Scaling

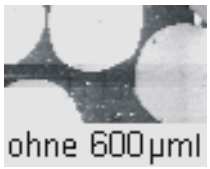


Fig. 2) Regular Scaling

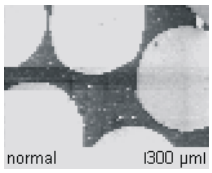
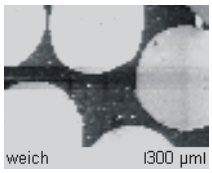


Fig. 3) Soft Scaling



5.3 Functions in the Image Menu

Overview

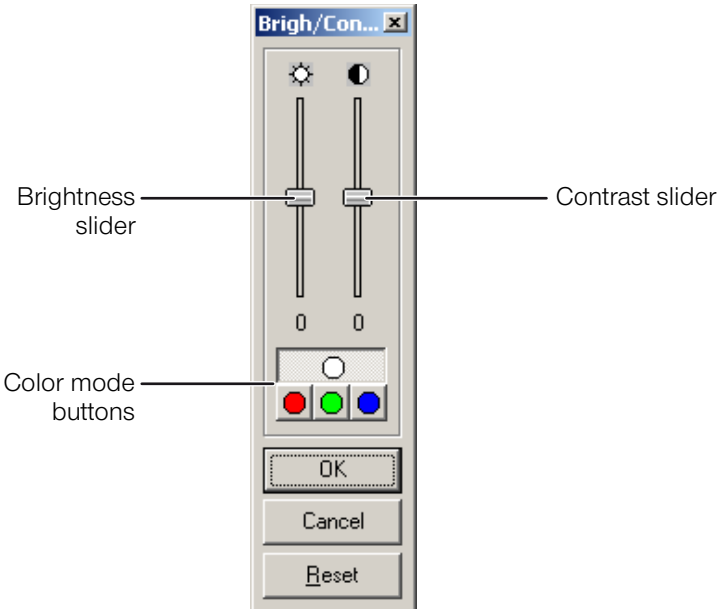
Purpose This section contains descriptions of functions in the Image menu.

Contents This section contains the following information:

- Brightness/Contrast.... 5-31
- Histogram Functions... 5-32
- Rotate... 5-34
- Matrix Filter... 5-35
- Equidensities... 5-37
- Calibrate....5-41
- Calibrate Scanned Image... 5-43
- Image Info Window 5-44

Brightness/Contrast...

Structure The following figure shows the **Brigh/Con** window with its main components:



Function The following table contains information on the main components of the **Brigh/Con** window:

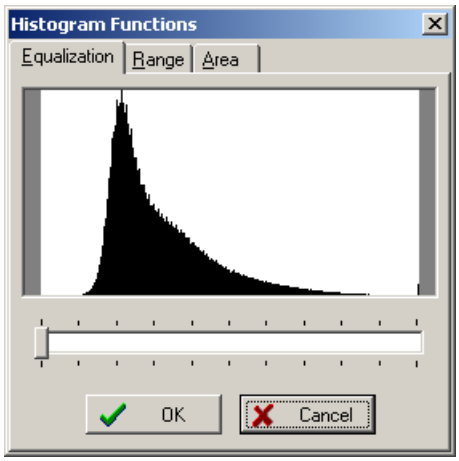
Main Component	Function
"Brightness" slider	Modifies the brightness of the selected image within a range of -100% to +100%
"Contrast" slider	Modifies the contrast of the selected image within a range of -100% to +100%
Color mode buttons	Selects a color mode (gray scales, red, green or blue) to which the values of brightness and/or contrast can be adapted
| OK |	Closes the dialog window All settings are applied.
| Cancel |	Closes the dialog window All settings are rejected.
| Reset |	Resets the sliders to the value "0" (zero)

Histogram Functions...

Description A histogram shows the frequency distribution of the gray values in an image.

This function opens the **Histogram Functions** window with three tabs containing several functions to change the histogram of a selected image.

"Equalization" Tab The following figure shows the **Histogram Functions** window with the **Equalization** tab:



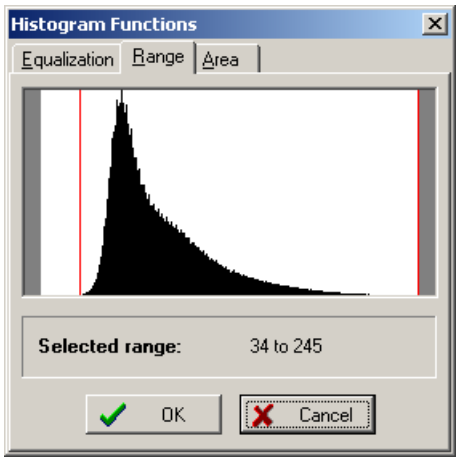
A histogram equalization often leads to an improvement of the image. During equalization, narrow gray scale ranges due to suboptimal image acquisition conditions are widened.

With the slider, the intensity of the histogram equalization can be adjusted within a range from 0% to 100%. After recalculation, these modifications will instantly be visible in the histogram as well as the image. As these recalculations might take some time with larger images, the status will be displayed in the title bar of the dialog window.

Continued on next page ...

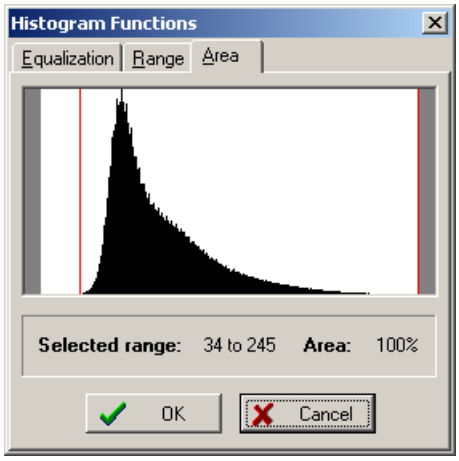
... Continuation: Histogram Functions...

"Range" Tab The following figure shows the **Histogram Functions** window with the **Range** tab:



Using the mouse, the two red bars from the right and/or left edge can be dragged over the histogram to define a certain range of gray values in the active picture. Only those pixels of the current image will be shown whose gray value lays within the two markers.

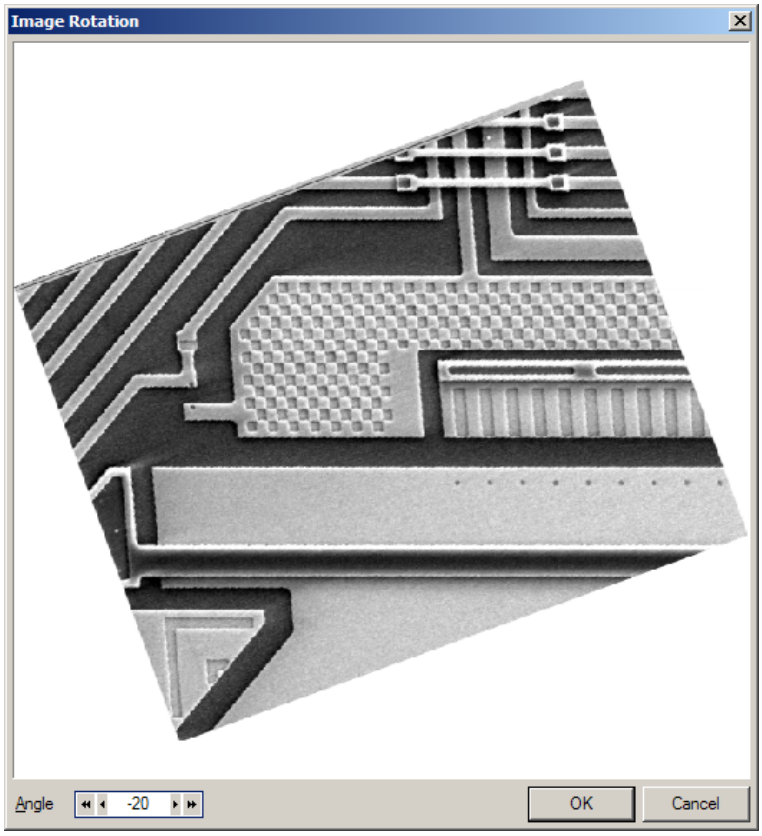
"Area" Tab The following figure shows the **Histogram Functions** window with the **Area** tab:



Using the mouse, the two red bars from the right and/or left edge can be dragged over the histogram to determine percentages of areas with a certain range of gray values. In the current image window, these areas are shown in red, and the gray value range and percentage will be displayed.

Rotate...

Structure The following figure shows the **Image Rotation** window with its components:



Function The following table contains information on the components of the **Image Rotation** window:

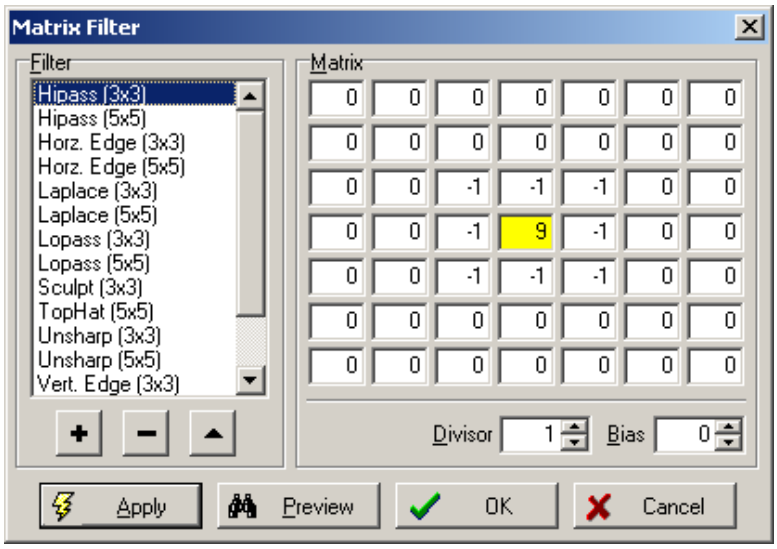
Component	Function
Angle	For entering an angle around which the image is rotated
– **Arrow buttons**	Raise or lower the value of the angle in single steps
– **Double arrow buttons**	Raise or lower the value of the angle in steps of ten
| OK |	Closes the dialog window The image is rotated with the entered value.
| Cancel |	Closes the dialog window The entered value is rejected. The image is not rotated.

Matrix Filter...

Description Matrix filters modify a pixel's intensity depending on the intensity of original and surrounding pixels. An appropriate filter matrix leads to certain filter functions, such as smoothing or sharpening of images or emphasizing edges.

With the **Matrix Filter** window, existing filters can be selected or modified, and new filters can be defined.

Structure The following figure shows the **Matrix Filter** window with its components:



Function The following table contains information on the components of the **Matrix Filter** window:

Component	Function
Filter	Displays a list of all available filters
– **| Plus |**	Adds a new filter for user-specific settings
– **| Minus |**	Deletes the selected filter from the list
– **| Arrow |**	For renaming the selected filter

Continued on next page ...

... Continuation: Matrix Filter...

Component	Function
Matrix	Displays the coefficients of the selected filter The coefficients can be modified within a range from -128 to +127.
– **Divisor**	– Standardizes the calculated intensities after the application of a matrix filter – Corresponds to the sum of the matrix coefficients
– **Bias**	Shifts the calculated intensities by the entered value
| Apply |	Closes the dialog window The selected filter is applied to the image. Modifications of the filter are saved.
| Preview |	Shows a preview of the filter on the selected image The filter is not applied to the image.
| OK |	Closes the dialog window Modified and/or newly created filters are saved but not applied to the image.
| Cancel |	Closes the dialog window Modified and/or newly created filters are not saved. Modifications are not applied to the image.

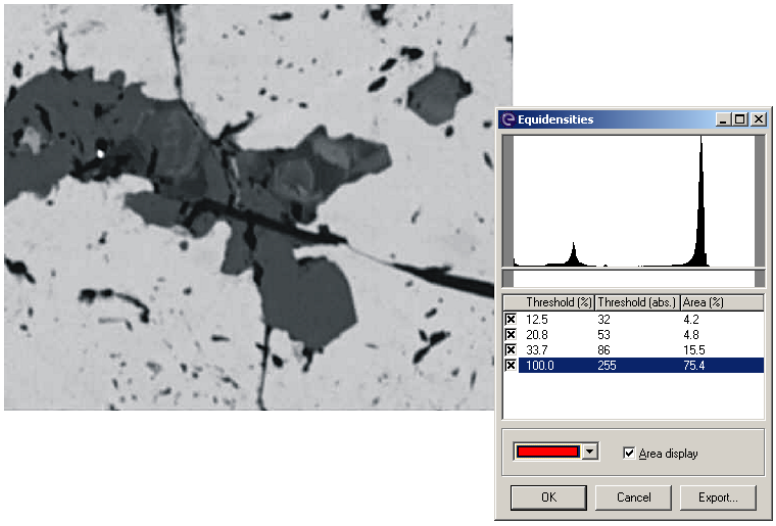
Equidensities...

Description Equidensities are lines or areas which connect pixels with equal optical or color densities. In the **Equidensities** window, threshold values for the optical density can be defined. In the selected image, these densities will be displayed as equidensities in two different ways.

Equidensities can be helpful to highlight image areas that show very little difference in B/W images or to quickly determine percentages of areas with equal optical density, e.g. phases.

The Equidensities function basically is an extension of the **Area** tab from the **Histogram Functions** window. There, one gray value range can be selected and its percentage calculated. With the Equidensities function, several gray value ranges can be defined and allocated to different colors. The percentages of individual areas will also be determined.

Fig. 1) Original image and Equidensities window



Continued on next page ...

... Continuation: Equidensities...

Fig. 2) Equidensities as area display

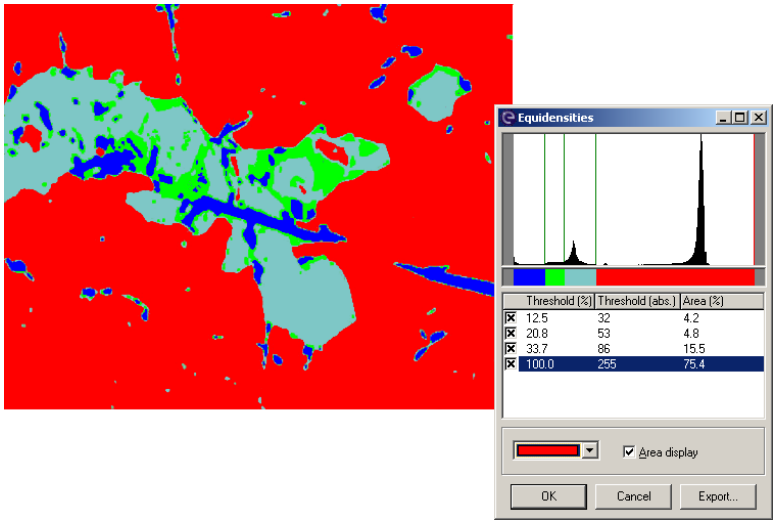
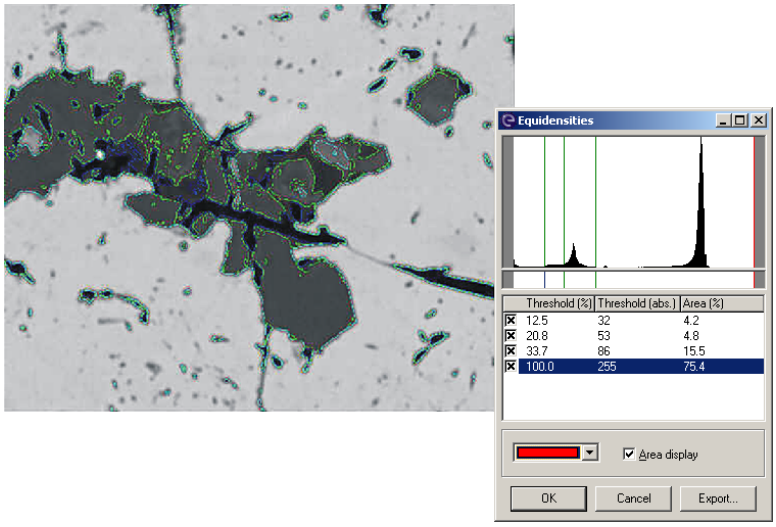


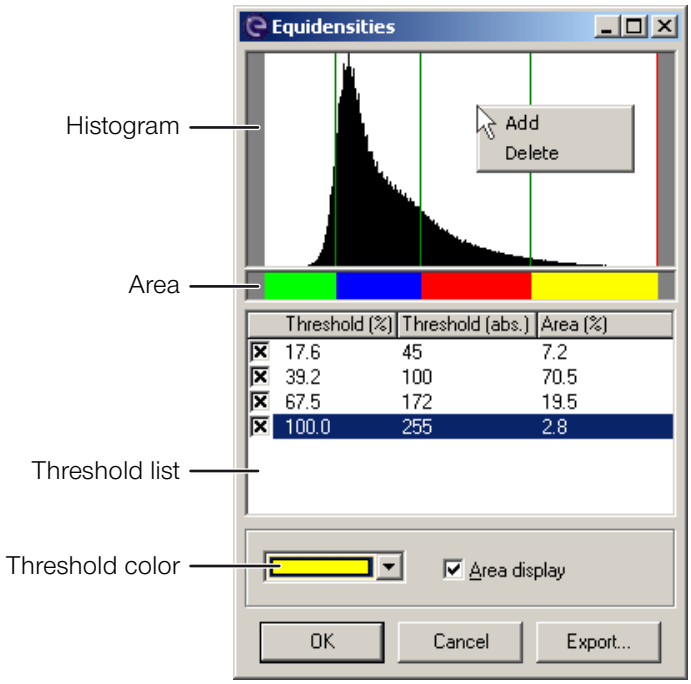
Fig. 3) Equidensities as dotted graphics



Continued on next page ...

... Continuation: Equidensities...

Structure The following figure shows the **Equidensities** window with its components:



Function The following table contains information on the components of the **Equidensities** window:

Component	Function
Histogram	Displays the distribution of gray scales in the selected image: – left: 0=black – right: 255=white A right-click on the histogram opens a context menu with two functions: – **Add**: Adds a new threshold to the histogram. A vertical bar is displayed. It can be shifted with the mouse to set the threshold. – **Delete**: Deletes the selected threshold All activated thresholds are displayed as vertical bars. All bars can be moved with the mouse to readjust the thresholds.
Area	Displays a threshold in the selected color

Continued on next page ...

... Continuation: Equidensities...

Component	Function
Threshold list	Displays all defined thresholds in a list: – Checkbox: Activates or deactivates the threshold – **Threshold (%)**: Displays the percentage position of the threshold in the total gray scale area (between 0% and 100%) – **Threshold (abs.)**: Displays the absolute position of the threshold in the total gray scale area (between 0 and 255) – **Area (%)**: Displays the area within a threshold as a percentage of the total area (between 0% and 100%) A right-click on the threshold list opens a context menu with two functions: – **Add**: Opens the **New Threshold** window with two input fields to define the percentage or the absolute position of a new threshold – **Delete**: Deletes the selected threshold
Threshold color	Assigns a color to the selected threshold
Area display	Colors the area of the threshold with the selected color in the active image
| OK |	Closes the dialog window The selected image is dyed with all defined and activated thresholds. Dyed images cannot be reconverted to gray scale images.
| Cancel |	Closes the dialog window All thresholds defined for the selected image are rejected.
| Export... |	Opens the **Export Table** window to export the threshold list as an XLS file

Calibrate...

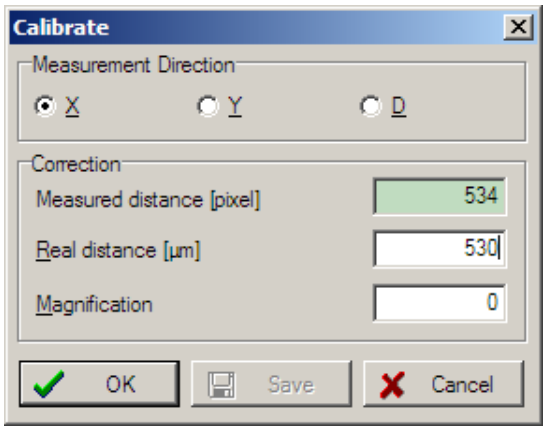
Description The Calibrate function is only available in Measurement mode.

With this function, DIPS can be calibrated. For the calibration, an image with structures (test grid) is acquired with a high resolution and known dimensions. After entering the magnification, the image is transferred to the DIPS user interface.

In Measurement mode, the corresponding vertical or horizontal measurement cursors are placed on these structures.

The function opens the **Calibrate** window.

Structure The following figure shows the **Calibrate** window with its components:



Function The following table contains information on the components of the **Calibrate** window:

Component	Function
Measurement Direction	Contains checkboxes **X, Y** for the selection of the measurement direction to be calibrated and checkbox **D** for the selection of the distance

Continued on next page ...

... Continuation: Calibrate...

Component	Function
Correction	Contains three input fields to calibrate the selected measurement direction
– **Measured distance [pixel]**	For entering the measured distance in pixel
– **Real distance [µm]**	For entering the real distance in micrometer
– **Magnification**	For entering the magnification
| OK |	Closes the dialog window All settings are applied to the active image, but are not saved.
| Save |	Closes the dialog window All settings are saved. This button should only be clicked after the calibration of DIPS.
| Cancel |	Closes the dialog window All settings are rejected.

In the dialog window, the real distance is entered in X or Y direction. By clicking the **| Save |** button, the system is calibrated and the dialog window is closed.

The determined correlations between pixel and micrometer are saved under Registry/DISS5.ini.

If images contain a structure with known dimensions, non-calibrated images can also be calibrated later. For this, the measurement cursor must be positioned at the known structure, and the known value for X or Y distance must be entered. Then click the OK button.

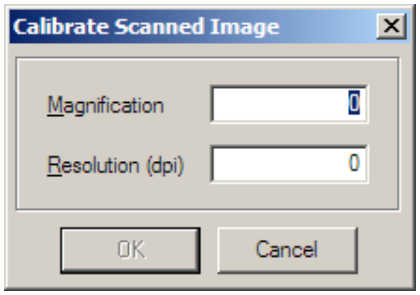
If the system was calibrated after installation, the **| Save |** button must not be clicked when recalibrating an image. Clicking this button would override the calibration.

Calibrate Scanned Image...

Description The Calibrate Scanned Image... function is used to calibrate images not acquired from the DISS 5 TWAIN source but from another source (e.g. frame grabber or scanner). An image is calibrated with known structures and with the specification of the used magnification.

This function opens the **Calibrate Scanned Image** window.

Structure The following figure shows the **Calibrate Scanned Image** window with its components:



Function The following table contains information on the components of the **Calibrate Scanned Image** window:

Component	Function
Magnification	For entering the current magnification
Resolution (dpi)	For entering the resolution in dpi (Dots per inch)
| OK |	Closes the dialog window The connected acquisition source is calibrated with the settings.
| Cancel |	Closes the dialog window The settings are rejected. The connected acquisition source is not calibrated.

Image Info Window

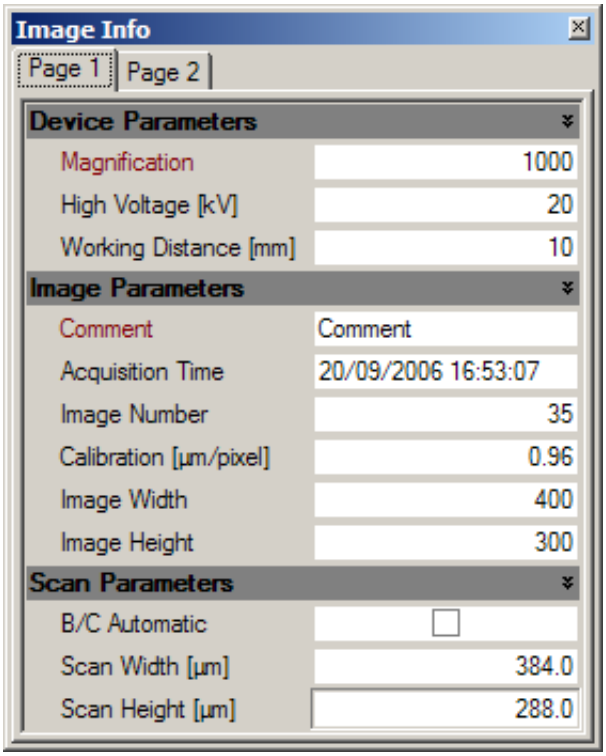
Description The Image Info window displays information saved with the current image. In the window, the information is grouped as hardware, image and scan parameters.

Additional information like an image comment or source name can also be entered.

Additional image information is saved only if the image is saved in TIF format.

This function opens the **Image Info** window with two tabs.

Structure The following figure shows the **Image Info** window:



5.4 Functions in the Tools Menu

Overview

Purpose This section contains detailed descriptions of specific functions in the Tools menu.

Contents This section contains the following information:

› Zoom 5-46
› Crop 5-47
› Measurement Cursor 5-48
› Angle Measurement 5-50
› Line Profile 5-51
› Structure Measurement (optional) 5-52
› Image Caption 5-54
› Caption 5-57
› Labeling Tools 5-59
› Point Scan Data 5-62
› Measurement Values Window 5-65
› Mix Window 5-66

Zoom

Description The Zoom function activates Zoom mode.

In this mode, the mouse cursor is displayed as a magnifier over the active image.

A click on the left mouse button magnifies the image, a click on the right mouse button reduces the image magnification. The clicked point is moved to the center of the image.

The current magnifying factor is displayed in the title bar of the image window.

Pressing the Ctrl key in zoom mode changes the mouse cursor from magnifier to a hand symbol. This is used to move the section for the image view.

The Zoom function is also available in Full Screen mode.

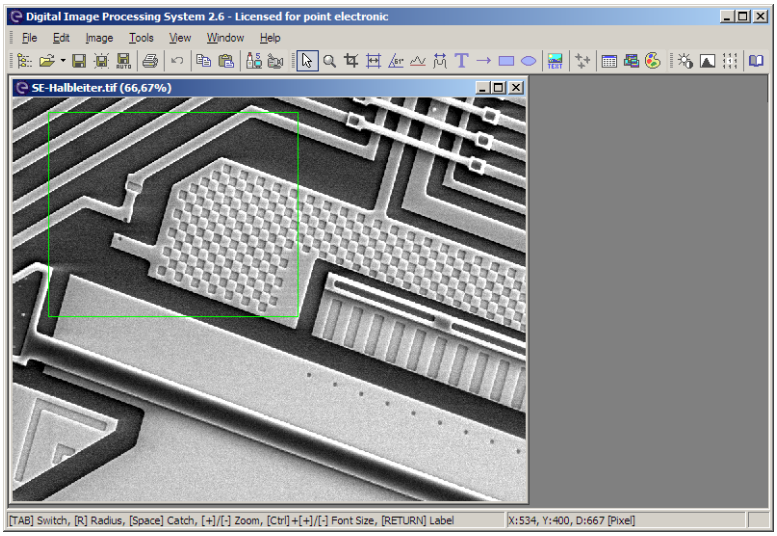
Crop

Description The Crop function allows to crop a rectangular section from the image. The cropped sections can be combined to create a new image.

Position the mouse pointer in the active window, keep the left mouse button pressed and draw the preferred rectangle. Width and height of the rectangular section are displayed in the status bar.

By pressing the ↵ key, a new image with the data of the selected section will be created.

The following figure shows the Crop function:



Measurement Cursor

Description The Measurement Cursor function activates the Measurement function.

The Measurement function allows to determine distances in X, Y and diagonal direction with the help of the double cross measurement cursor.

Measurement data for all directions are displayed in the status bar.

For all non-calibrated images, the unit for measuring distances is pixel.

If they contain known structures or a measuring bar, these images might be calibrated later via the Image→Calibrate menu.

All images acquired and transferred into DIPS are automatically calibrated provided the SEM magnification has been entered or automatically read-out after image acquisition.

The double cross measurement cursor can be positioned with the mouse. Lines or corners of the measurement cursor can be moved with pressed left mouse button. By pressing the left mouse button while pressing the Ctrl key, the closest corner will be caught. Pressing the space bar catches the whole measurement cursor in the active image section.

In high resolution images, the measurement cursor can easily be positioned when zooming the image. With the + and - keys of the numeric keypad, the zoom can be changed in the Measuring mode.

While directly switching from Measuring to Zoom mode, the deactivated measurement cursor will remain visible. Thus, the relevant image section can be zoomed before switching back to Measuring mode for positioning the measurement cursor.

The highlighted measuring length of the measurement cursor including the dimensioning can be added to the image. Pressing the ↵ key opens the **Caption** window (Page 5-57) for entering the standard caption.

Continued on next page ...

... Continuation: Measurement Cursor

When pressing the ⇆ key, another measuring length of the measurement cursor will be selected for a caption.

With the mouse, the dimension caption can be moved to any position in the image.

To modify the font size, use Ctrl++ or - on the numeric keypad.

A confirmed caption is fixedly integrated into the image and saved as image information. Before confirming captions, the original image should be backed-up. Via Edit→Undo or by clicking the mouse on the Undo button in the toolbar, the last caption can be rejected.

Angle Measurement

Description Use the mouse to select the two end points of the angle arms. Then determine the vertex.

By clicking the mouse on the preferred location, the position of the displayed angle can be modified. The nearest point will be caught.

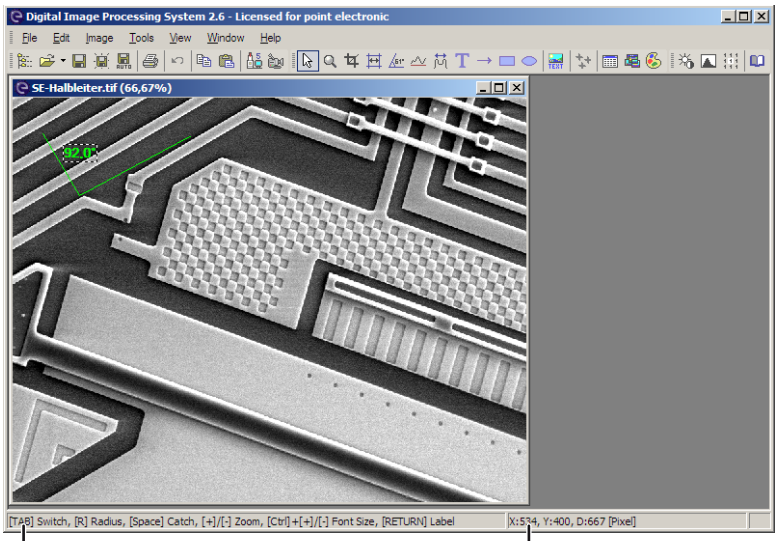
Use the mouse to move the angle caption to another position. To modify the font size, use Ctrl++ or - on the numeric keypad.

By pressing the ↵ key, the shown angle is integrated into the image. The **Caption** window (Page 5-57) opens where you can confirm or change the angle caption.

During angle measurement, the status bar shows the following information:

- Description of the keys for angle measurement settings including function
- Size of the currently measured angle

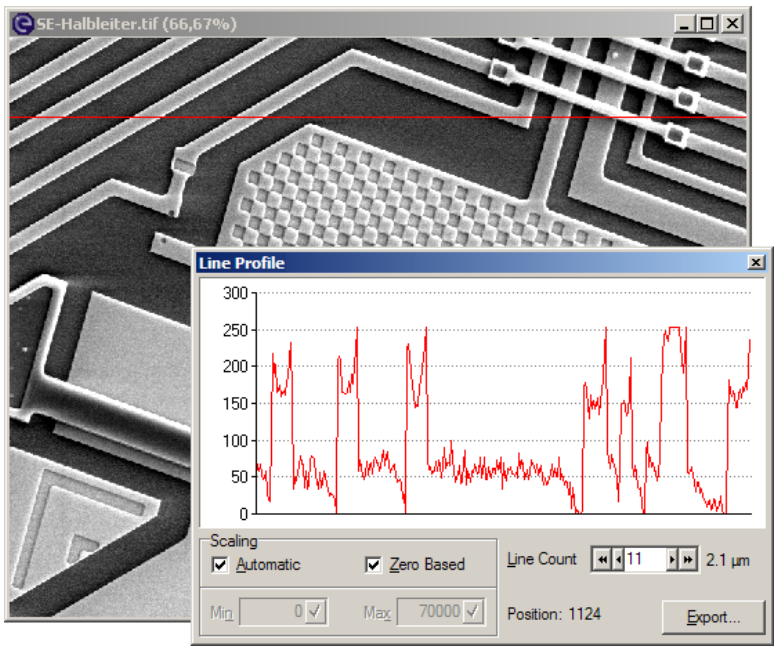
The following figure shows the angle measurement:



Line Profile

Description The Line Profile displays the structure of a surface along a horizontal measurement line over the entire image.

Structure The following figure shows the **Line Profile** window with its components:



Function The following table contains information on the components of the **Line Profile** window:

Component	Function
Scaling	
– **Automatic**	Scales the diagram depending on the minimal and maximal values
– **Zero Based**	Scales the diagram starting from the zero base
– **Min, Max**	For manual scaling of the diagram with disabled automatic
Line Count	Expands the measuring area in vertical direction by the measurement line The measuring area is displayed with green lines.
Position	Displays the vertical position of a measuring line in the active image
| Export |	Exports the measurement data as CSV format

Structure Measurement (optional)

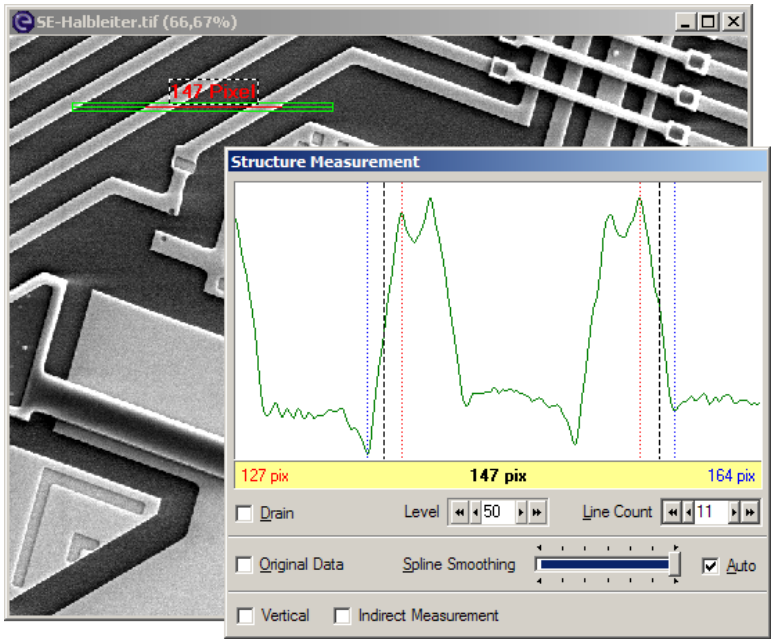
Description The Structure Measurement allows measurements in a subpixel range. Measurements can be averaged over one or several lines.

After the activation of Structure Measurement, a measuring line can be put into the image. To do this, starting point and final point have to be marked with the mouse.

The structure below this measuring line as well as the thresholds of the measurement are found automatically and are displayed in the **Structure Measurement** window.

The length of the measuring line can be modified by moving the left and right edge with the mouse. The position of the measuring line can be changed by moving the line with the mouse. The position of the caption can be changed in the same kind.

Structure The following figure shows the **Structure Measurement** window with its components:



Continued on next page ...

... Continuation: Structure Measurement (optional)

Function The following table contains information on the components of the **Structure Measurement** window:

Component	Function
Diagram	Displays the measurement area in graphical and numerical style
– **red value and red bar**	Display the minimal value
– **black value and black bar**	Display the threshold value
– **blue value and blue bar**	Display the maximal value
Drain	Measures the structure as a drain
Level	Sets the threshold value in single steps or steps of ten
Line Count	Sets the number of measuring lines in the measuring area This expands the measuring area in vertical direction.
Original Data	Displays, in addition, the unsmoothed original data
Spline Smoothing	Changes the value of the smoothing
Auto	Sets the value of the smoothing automatically
Vertical	Measures distances in vertical direction
Indirect Measurement	Measures distances which do not lie on a line

Saving of Measuring Data in the Image After the determination of the measuring data, a labeled measuring line can be integrated into the active image.

Pressing the [↵] key opens the **Caption** window.
(Page 5-57)

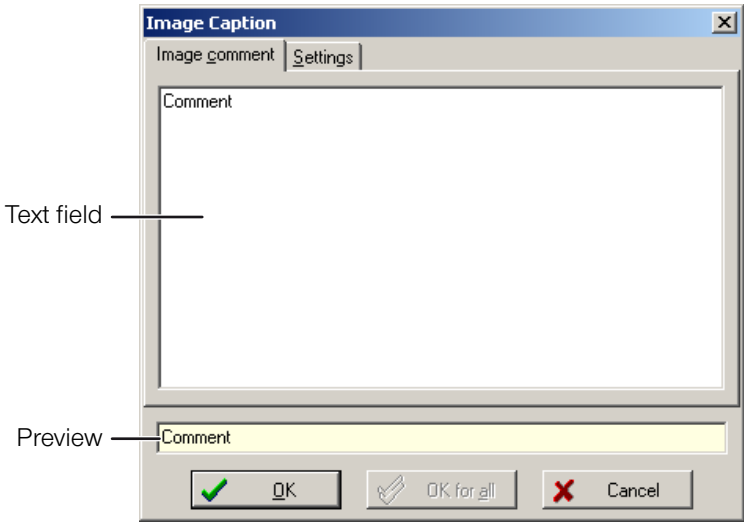
Image Caption

Description The Image Caption function allows to create and save an image comment for the active image. The first line of the entered comment is displayed as image caption. Any additional text in the following lines is saved with the image if the image is saved as TIF file.

Integrated text overwrites the pixels of the image at the position where it is applied.

The function opens the **Image Caption** window with the **Image Comment** and **Settings** tabs.

"Image Comment" Tab The following figure shows the **Image Caption** window with the **Image Comment** tab:



The following table contains information on the components of the **Image Comment** tab:

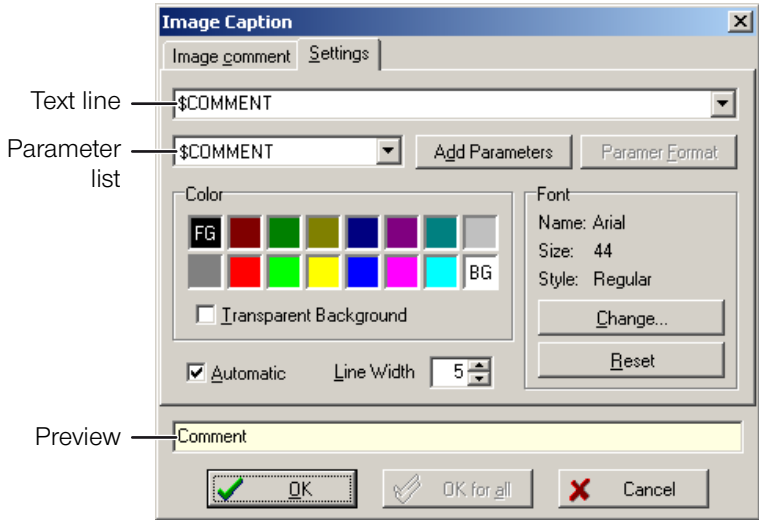
Component	Function
Text field	For entering, editing and showing the whole text saved with the active image. Only the first text line is displayed in the image. Any additional text in the following lines is saved with the image if the image is saved as TIF file.
Preview	Displays a preview of the comment text in the active image

Continued on next page ...

... Continuation: Image Caption

"Settings" Tab

The following figure shows the **Image Caption** window with the **Settings** tab:



The following table contains information on the components of the **Settings** tab:

Component	Function
Text line	Displays the selected parameter in the given order and the freely definable image comment
Parameter list	Contains all parameters which are available for the image caption
Add Param.	Adds the selected parameter to the text line
Parameter Format	Opens a dialog window for editing the display format of the selected parameter
Color	Contains two lines with different color fields to select the foreground color and the background color of the text field A left-click in a color field selects the foreground color. The letters **FG** are added to the selected color. A right-click in a color field selects the background color. The letters **BG** are added to the selected color .
– **Transparent Background**	Displays the text field without background
Automatic	Adapts the font size to the resolution of the active image

Continued on next page ...

... Continuation: Image Caption

Component	Function
Line Width	For setting the width of the measuring bar in pixels
Font	Contains information on the used font and functions to modify and/or reset the font
– **| Change... |**	Opens a dialog window for setting up some font properties
– **| Reset |**	Resets the font properties to the default
| OK |	Closes the dialog window The image caption is displayed with the preset settings in the selected image. In a layout with several images, the image caption is only displayed in the selected single image.
| OK for all |	Closes the dialog window The image caption is displayed with the preset settings in all images of a selected layout. This process can only be canceled for the last image of a layout. This function is only available if a layout window with several images is selected on the DIPS interface.
| Cancel |	Closes the dialog window The settings are rejected.

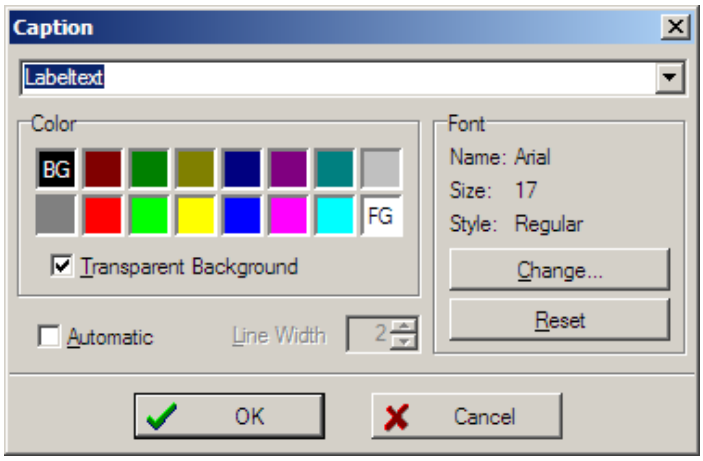
Caption

Description The Caption function allows to add text to any position in the active image. A left-click into the active image sets the position of the text.

Integrated text overwrites the pixels of the image at the position where it is applied.

The function opens the **Caption** window.

Structure The following figure shows the **Caption** window with its components:



Continued on next page ...

... Continuation: Caption

Function The following table contains information on the components of the **Captions** window:

Component	Function
Text line	For entering a caption text
Color	Contains two lines with different color fields to select the foreground color and the background color of the text field A left-click in a color field selects the foreground color. The letters **FG** are added to the selected color. A right-click in a color field selects the background color. The letters **BG** are added to the selected color .
– **Transparent Background**	Displays the text field without background
Automatic	Adapts the font size to the resolution of the active image
Line Width	For setting the width of the measuring bar in pixels
Font	Contains information on the used font and functions to modify and/or reset the font
– **| Change... |**	Opens a dialog window for setting up font properties
– **| Reset |**	Resets the font properties to the default
| OK |	Closes the dialog window The comment is displayed with the preset settings in the active image. Use the mouse to move the text to another position. The Caption function only ends when another mode is activated.
| Cancel |	Closes the dialog window The settings are rejected.

Labeling Tools

Description DIPS contains three labeling tools to add graphic elements permanently to the active image.

The following table contains information on the available labeling tools:

Icon	Tool	Function
	Arrow Ctrl+A	Adds an arrow to any position in the active image A click into the image with the left mouse button sets the target point of the arrow. With pressed mouse button, length and angle of the arrow can be set. Length, position and angle of an inserted arrow can be modified by clicking the red intersections with the mouse. Pressing the ↵ key opens the Pen Settings window to set up line color and line width of the arrow.
	Rectangle Ctrl+R	Adds a rectangle to any position in the active image A click into the image with the left mouse button sets the upper left corner of the rectangle. With pressed mouse button, width and height of the rectangle can be set. Width and height of the rectangle can be changed by clicking the red intersections with the mouse. By clicking the mouse button within the rectangle and pulling it while pressing the mouse button, the position of the rectangle can be changed. Pressing the ↵ key opens the Pen Settings window to set up line color and line width of the rectangle.

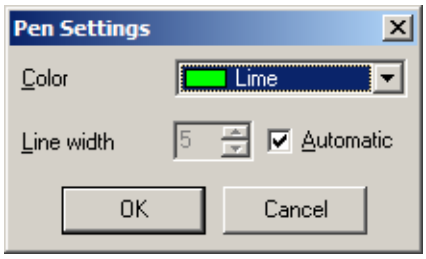
Continued on next page ...

... Continuation: Labeling Tools

Icon	Tool	Function
	Ellipse Ctrl+E	Adds an ellipse to any position in the active image A click into the image with the left mouse button sets the upper left corner of the ellipse. With pressed mouse button, width and height of the ellipse can be set. Width and height of the ellipse can be changed by clicking the red intersections with the mouse. By clicking the mouse button within the ellipse and pulling it while pressing the mouse button, the position of the ellipse can be changed. Pressing the ↵ key opens the Pen Settings windows to set up line color and line width of the ellipse.

"Pen Settings" Window

The following figure shows the **Pen Settings** window with its components:



The following table contains information on the components of the **Pen Settings** window:

Component	Function
Color	Sets the line color of the drawn element
Line Width	Sets the line width of the drawn element
Automatic	Automatically adapts the line width to the resolution of the active image

Continued on next page ...

... Continuation: Labeling Tools

Component	Function
| OK |	Closes the dialog window The settings are applied to the drawn element. After pressing the **| OK |** button, the drawn element is fixed into the image. Afterwards, the drawn element can neither be shifted nor can its settings be modified.
| Cancel |	Closes the dialog window The settings are rejected.

Point Scan Data

Description The Point Scan Data function activates the display mode for point scan data.

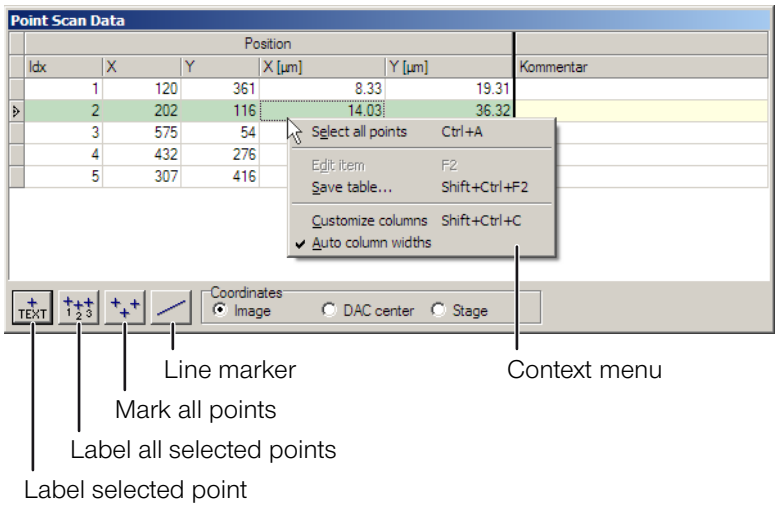
This mode is only available with the DDEPlus option and if the selected image contains point scan data.

A right-click on the point scan data table opens a context menu with edit options for the following functions:

- Labeling scan points in the active image
- Selection of columns to be displayed
- Saving the table in ASCII, HTML or XLS format

The function opens the Point Scan Data window.

Structure The following figure shows the **Point Scan Data** window with its components:



Continued on next page ...

... Continuation: Point Scan Data

Function The following table contains information on the components of the **Point Scan Data** window:

Component	Function
Label selected point	– Marks and labels the point of the image which is selected in the table – Opens the **Caption** window to set up the caption settings
Label all selected points	– Marks and labels all selected points of the image with a consecutive number. The numbers are assigned according to the index of the points. Thus, point 2 from the table will be labeled with the digit 2. If only one point in the table is selected, only that point will be labeled in the image. All other points will simply be marked. – Opens the **Caption** window to set up line width and the color of the marker
Mark all points	– Shows all points in the image The point selected in the table will be highlighted. – Opens the **Caption** window to set up line width and the color of the marker
Line marker	– Connects the first and last point with a line – Opens the **Caption** window to set up line width and the color of the line This function is useful to display concentration profiles.
Coordinates	
– **Image**	Displays the coordinates of the points in the table originating in the lower left corner of the image
– **DAC center**	Displays the coordinates of the points in the table originating from the center of the image
– **Stage**	Displays the coordinates of the points in the table as stage coordinates if the system is connected to a motorized microscope stage

Continued on next page ...

... Continuation: Point Scan Data

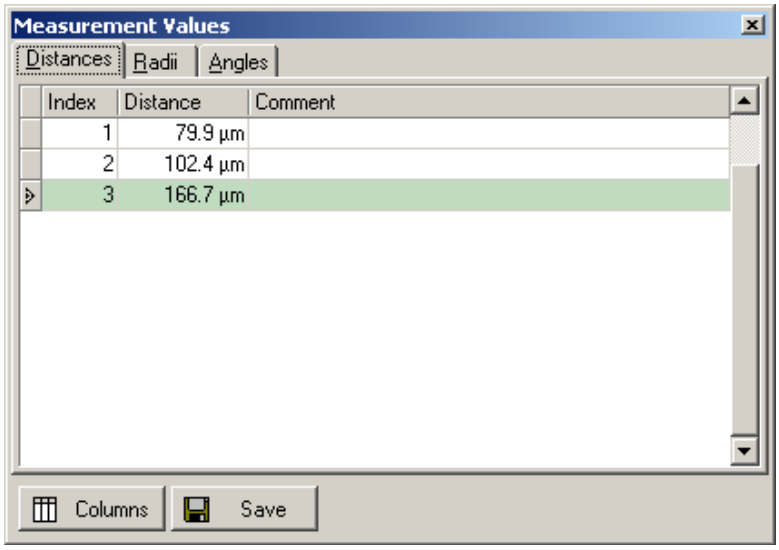
Component	Function
Context Menu	
– **Select all points** Ctrl+A	Selects all points listed in the table
– **Edit item** F2	For editing a point which is selected in the table
– **Save table** ⇧+Ctrl+F2	Opens a dialog window for saving the table as XLS, CSV or HTML format
– **Customize columns** ⇧+Ctrl+C	Opens the **Customizing** window with two tabs to customize the columns
– **Auto column widths**	Sets the widths of all columns automatically to fit the table within the window

Measurement Values Window

Description In the Measurement Values window, the measured distances, radii and angles of the selected image are displayed as tables. The data can be saved either as XLS, HTML or TXT.

The function opens the **Measurement Values** window.

Structure The following figure shows the **Measurement Values** window with its components:



Function The following table contains information on the components of the **Measurement Values** window:

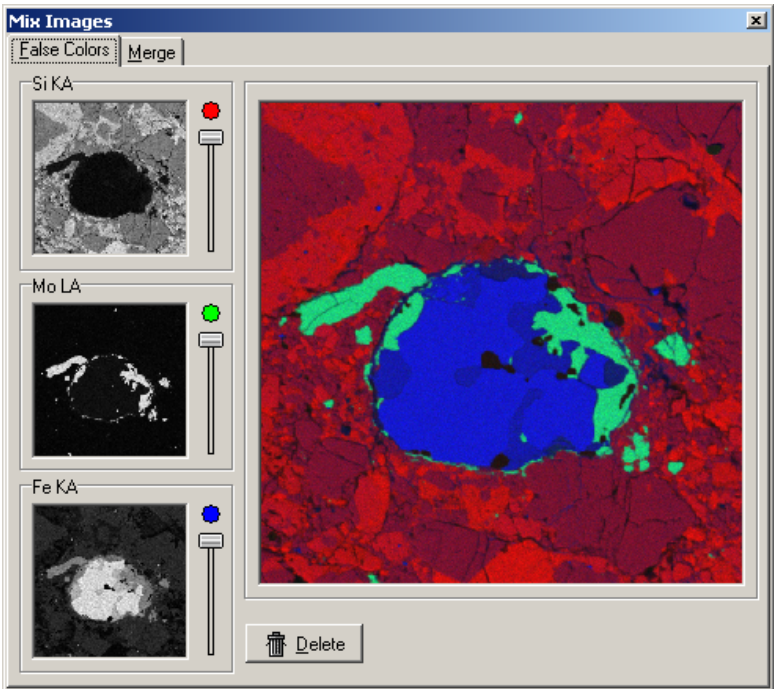
Component	Function
Distances tab	Displays information on all measured distances in the selected image
Radii tab	Displays information on all measured radii in the selected image
Angles tab	Displays information on all measured angles in the selected image
| Columns |	Opens the **Customizing** window to customize the table columns
| Save |	Closes the dialog window All displayed measurement data are saved as tables in XLS, HTML or TXT format.

Mix Window

Description The Mix Window function allows to overlay images, to combine images into false color images or to color images.

The function opens the **Mix Images** window with the **False Colors** and **Merge** tabs.

"False Colors" Tab The following figure shows the **Mix Images** window with the **False Colors** tab:



In the **False colors** tab, elemental mapping images can be overlaid or combined into false color images.

The images to be mixed are assigned by Drag & Drop to the three color channel fields in the Mix Window.

All three fields must be filled with images in the following order: 1. the upper field 2. the center field 3. the lower field.

The images to be mixed must have the same dimensions and pixel resolution.

Only gray scale images can be mixed and/or colored.

The colors can be set with the sliders.

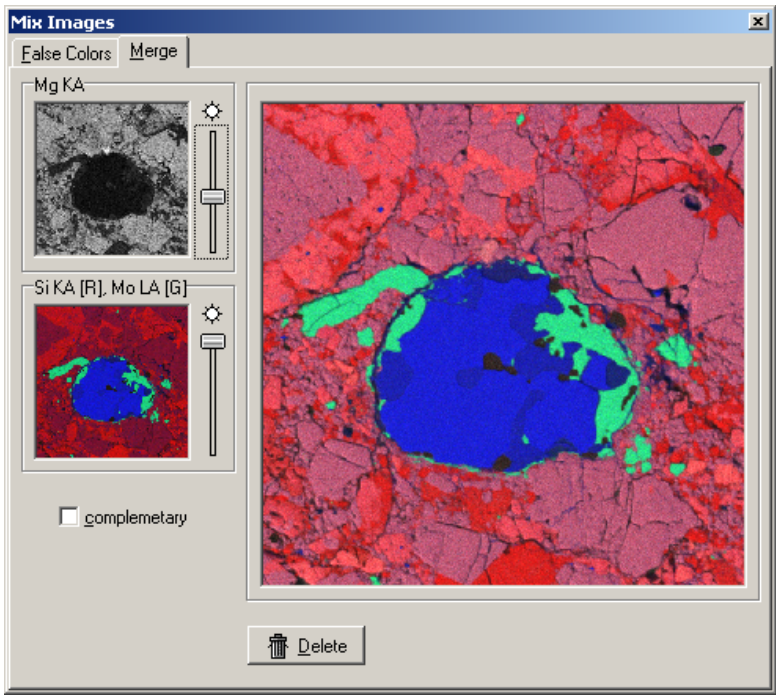
Continued on next page ...

... Continuation: Mix Window

Via Drag & Drop, a mixed image can be transferred from the dialog window into the DIPS work area or into an opened layout.

"Merge" Tab

The following figure shows the **Mix Images** window with the **Merge** tab:



The **Merge** tab contains two fields. Images can be assigned to the fields via Drag & Drop. The tab also contains an empty mix window to display the mixing result.

Both fields must be filled with images in the following order: 1. the upper field 2. the lower field.

The images to be mixed must have the same dimensions and pixel resolution.

Gray scale images as well as color images can be mixed.

With the sliders, the weighting for each image for entering the mix field can be adjusted.

If the **"complementary**" checkbox is activated, the sliders move in mutual dependence.

Continued on next page ...

... Continuation: Mix Window

Via Drag & Drop, a mixed image can be transferred from the dialog window into the DIPS work area or into an opened layout.

6 Calibration

Chapter overview

Purpose This chapter contains instructions that support you with calibrating DISS 5.

Contents This chapter contains the following information:

› Calibration of the Magnification. 6-2

Calibration of the Magnification

Description For calculating the scale bar (Micron Bar) and for distance measurement in the image, image acquisition uses the SEM magnification (Magnification) and a SEM-specific calibration constant.
To determine the SEM constant, it is necessary to carry out a calibration with a sample with known structures.

You will need admin rights to carry out the calibration.

The precision of measurement depends on the linearity and accuracy of the magnification of the SEM.

Steps Complete the following steps to calibrate the magnification:

1. Set an image with a known structure in the SEM.
2. Start a Slow Scan with the following settings:
   - Minimum **Width** 1000 pixels
   - Activated **Line** synchronization

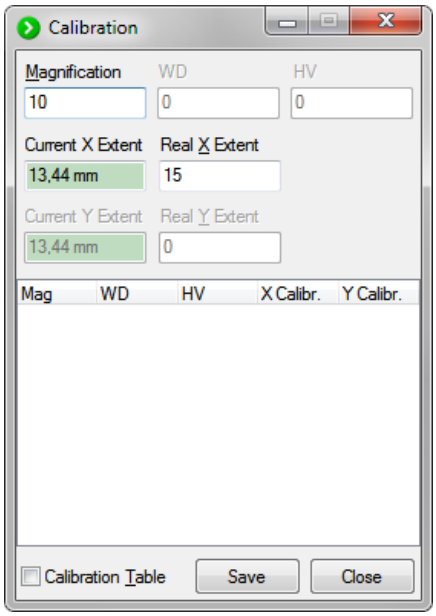
   Please refer to „Slow Scan“ on Page 3-45

Continued on next page ...

... Continuation: Calibration of the Magnification

3. During the Slow Scan, press Ctrl+Alt+C to start calibration.

   ⇒ A double cross with green lines appears in the Image Acquisition window. The lines of the double cross will form a square. Additionally, the **Calibration** window opens:



4. Adjust the vertical green lines to the known structure.

   By clicking and dragging the lines while pressing the Ctrl key, the lines of the double cross will form a square.

5. Enter the following values in the **Calibration** window:
   - magnification in the **Magnification** field
   - real distance value in the **Real X Extend** field

     If you enter the distance value without unit, the value is adopted in millimicronmeters. You can also enter another unit directly after the distance value.

6. Click the **| Save |** button in the **Calibration** window to confirm the settings.

(Empty page for technical reasons.
Include in double-page printings or copies!)

List Of Abbreviations

ASCII	American Standard Code for Information Interchange (character encoding)
AUX	Auxiliary
Avg.	Averaging
AVI	Audio Video Interleave (File format)
BMP	Windows Bitmap (File format)
BNC	Bayonet Nut Connector
BSE	Back Scattered Electron
CL	Cathodoluminescence (Signal)
CSV	Character-Separated Values (File format)
DIPS	Digital Image Processing System
DISS	Digital Image Scanning System
DOC	Document (File format)
EBIC	Electron Beam-Induced Current
EDX	Energy Dispersive X-ray Spectroscopy
EMPA	Electron Microprobe Analyzer
GIF	Graphics Interchange Format (File format)
HTML	Hypertext Markup Language
HV	High Voltage
JPG (JPEG)	Joint Picture Expert Group (File format)
CL	Cathodoluminescence
LED	Light Emitting Diode
Mag	Magnification
Param.	Parameter
PNG	Portable Network Graphics (File format)
RE	Back Scattered Electron
SEM	Scanning Electron Microscope
ROI	Region Of Interest
RTF	Rich Text Format (File format)
SE	Secondary electron
SEM	Scanning Electron Microscope

STEM	Scanning Transmission Electron Microscope
TIF (TIFF)	Tagged Image File Format (File format)
TWAIN	Tool Without An Important Name (Standard for data exchange with image acquisition devices)
TXT	Text (File format with plain text)
WD	Working Distance
WDX	Wavelength Dispersive X-Ray Spectroscopy
XMP	Extensible Metadata Platform
XLS	Microsoft Excel (File format)

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