

Pannoramic Confocal 2.0 User's Guide

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Declaration of Conformity

3DHISTECH Ltd. declares that the product Pannoramic Confocal is designed and produced with consideration of the quality management system certified according to the ISO 13485:2003 standard, and conforms to the directives and other standards listed below:

IEC 61010-1:2010 (ed. 3), "Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements"

EN 61326-1:2013 "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements"

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

EN 55011:2009+A1:2010 Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement

EN 61000-3-2:2006+A1:2009+A2:2009 Electromagnetic compatibility (EMC). Limits. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3:2013 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection

During the design, development, and production process of this device, the product safety standard *ISO 14971:2007, Medical Devices—The application of risk management to medical devices* was applied. The standard provides a process framework and associated requirements for management responsibilities, risk analysis and evaluation, risk controls and lifecycle risk management.

Further information may be obtained from the distributor:

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Character Formats and Symbols

Example	Words or characters that appear on the screen. These include field names, screen and window titles, push-buttons and menu names, paths or options. Keys on the keyboard. For example, function keys (such as F11) or the Ctrl+M key combination.
Example	Cross-references within this document or to other documents.
Warning!	It might cause irreversible damage or harm to the user of the product or the product itself if this instruction is not followed.
Caution!	It might cause the product to not work properly if this instruction is not followed and alerts to a potential danger situation.
Note:	Calls attention to some important features.

Notes Regarding Operational Safety

The below section of this User's Guide contains information and warnings of a kind that must be followed by owner/operator personnel.

Warning and advisory symbols which are used on the base unit of the Pannoramic Confocal and in the section **1.1.3 Warning and Information Labels** have the following meanings:

CAUTION Disconnect mains plug before any kind of intervention into the device!
CAUTION Crush hazard!

The Pannoramic Confocal, including any of its original accessory components, should not be operated in any other way than described in section **1.1.1** Intended Use.

Any of the following notes should be strictly observed:

Caution!	In the event of any non-conforming type of use, including non-conforming use of assemblies or single parts, no liability will be assumed by the Manufacturer. This shall also apply to service or repair work of any kind, which is performed by other than authorized service personnel. All claims for warranty and warranty services will be null and void in any such case.
Warning!	Insert the power cord plugs only into a grounding outlet. The protective action must not be rendered ineffective by extension cables without protective conductor. The Pannoramic Confocal has a built-in protection which must not be rendered ineffective by extension cables without protective (earth-ground) conductor.
Warning!	The operation of the instrument in explosion-risk environments is not allowed.
Warning!	If protective devices are found to be ineffective, the Pannoramic Confocal must be shut down and precautions must be taken to prevent unintended usage. For necessary repair work or work to restore proper operating condition, you should contact the Thermo Fisher Scientific Customer Service.
Note:	Electric power to the Pannoramic Confocal is supplied via an internal mains power supply unit. It allows for operation at line voltages in the range of 100 V to 240 V ±10%, 50-60 Hz, without any extra facilities required for voltage transformation.
Warning!	Check that your local line voltage is compatible with Pannoramic Confocal specifications before you turn power on.

Disconnect	Remember to unplug the power cord before you open the Pannoramic Confocal base unit or replace a fuse!	
Warning!	Only connect UL-approved SELV (safety extra low voltage) rated external devices to the instrument to avoid the risk of electrical shock.	
Warning!	The Pannoramic Confocal does not include any special facilities to protect from samples with an etching, potentially infectious, toxic, radioactive or other health-damaging effect. You are under obligation to comply with all currently binding legislation, notably, national accident prevention rules when handling samples of this kind.	
Caution!	Dirt or dust may adversely impact the operating capability of the Pannoramic Confocal. For this reason, measures must be taken to eliminate such influences to a maximum possible degree. During periods of non-use, the Pannoramic Confocal must be protected with a dust cover. Check that power is turned off before you put the cover on.	
Crush hazard!	There is crush hazard at the following areas of the device:	
	 The tray feeder door, the cross-belt area of the tray giude, and the safety plate during operation. Please note that the digitizing process has to be interrupted and the tray moved via software to the output position before removal. 	
	The two hinges of the service door.	
	The inner side of the door opener mechanism.	
	When reaching by the pipette unit into the farthest area of the device.	
Warning!	A defective Pannoramic Confocal is not classified as domestic waste. It must be properly disposed in accordance with currently valid legal requirements.	
Warning!	The Pannoramic Confocal may not be operated by other than properly instructed persons. Operating personnel must be fully aware of the potential dangers which a particular field of application involves. The Pannoramic Confocal is a precision instrument which may suffer a significant reduction in operational functions or even physical destruction following intervention performed in any nonconforming manner.	
Warning!	If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.	

Notes on Warranty

We at Thermo Fisher Scientific are proud of our quality, reliability and of our after-sales service. We continuously strive to improve our service to our customers.

Please ask a Thermo Fisher Scientific representative about Service Contracts which can keep your purchase in peak condition for many years to come.

Warranty provisions necessarily vary to comply with differences in national and regional legislation. Specific details can be found in the delivery documentation or from your dealer or representative.

Please note that your warranty may be invalidated if:

- This instrument is modified in any way.
- Accessories and reagents which have not been approved by Thermo Fisher Scientific are used.
- The instrument is not operated or maintained in accordance with the instructions in the Operator Guide.

Terms and Abbreviations

csv	Comma Separated Value	
FOV	Field of View	
NA	Numerical Aperture	
Virtual Slide / Slide	A digital image of a thin glass plate on which specimens are mounted for microscopic study:	
	a dynamic, interactive image that you can manage, save, magnify, zoom, name, evaluate, annotate, mark, comment, send to a colleague electronically for cooperation or advice, and so on.	

1 Product Description

1.1 Product Overview

1.1.1 Intended Use

The Pannoramic Confocal is a digital scanner microscope installed with an Aurox CC88 confocal unit and high-numerical aperture immersion and/or dry objectives designed to use transmitted light and reflected light fluorescence to digitize histopathology slides (histological sections, typically) based on confocal principles.



Warning!

The Pannoramic Confocal device must be operated by a properly instructed person only. Operating personnel must be fully aware of the potential dangers which a particular field of application involves. The Pannoramic Confocal is a precision instrument which may suffer a significant reduction in operational functions or even physical destruction following intervention performed in any nonconforming manner.



Warning!

After each scanning make sure to inspect the digital slide for overexposed areas. In case the slide is scanned based on improperly set parameters, it can highly affect theresults because of information loss.



Warning!

Any modification to a hardware or software component of the PC will highly affect the functionality of the scanner program.



Warning!

Do **NOT** install any other application than the **Scanner control** software application and its auxiliary drivers on the control computer.

1.1.2 Features and Benefits

The Pannoramic Confocal offers world-class brightfield and fluorescent whole slide scanning. An outstanding 0.16 μ m/pixel (both in Brightfield and Fluorescent modes) resolution is achieved with the 40×/1.2 NA (equivalent to 62× magnification) Carl Zeiss C-Apochromat objective.

Key features of the Pannoramic Confocal scanner:

- Outstanding image resolution is achieved by using Aurox CC88 confocal unit
- Widefield Fluorescent, Confocal Fluorescent, and Brightfield imaging
- Darkfield preview for low intensity samples
- PreScan function for FL preview imaging
- Up to 4 filter cubes (quad or dual) for fluorescence

NOTE: The number of channels available depends on the type of the applied fluorescent illumination device.

- High-end fluorescent illumination device Lumencor SPECTRA 7 Light Engine
- Multiband filter support
- FL scanning with a low noise, 16-bit scientific CMOS pco.edge 5.5 camera
- Software-aimed flat-field correction compensation method to create homogenous slide image
- 12 slide automatic loading and scanning
- Motorized objective changer
- Automated immersion for high NA objectives
- · Improved permanent autofocus
- Compact and robust device
- · Good quality and stable manufacturing
- High-resolution preview camera for 1D and 2D barcode reading
- Image sharpening (for both Fluorescence and Brightfield) feature to improve the visual appearance of digital slides
- Focus algorithm finds the focus which is most appealing to the human eye

Pannoramic Confocal is an optimal choice for customers who want to scan in brightfield and in fluorescent mode where the quantity of scanned slides will be regularly over 10 slides per day.

1.1.3 Warning and Information Labels

The following figure contains the labels used on the back panel, and on the inside of Pannoramic Confocal main unit.

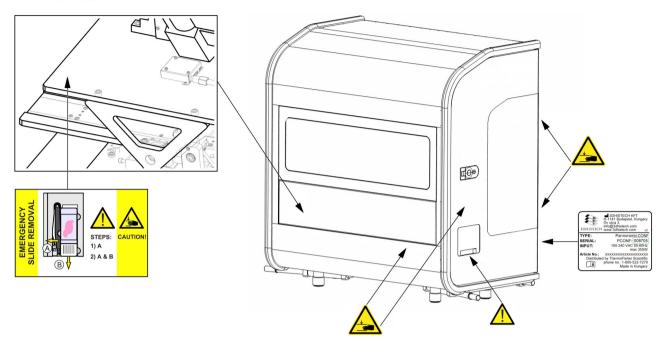


Figure 1 – Warning and information labels

1.1.4 Base Unit

The following figure shows the main outer parts of the device.

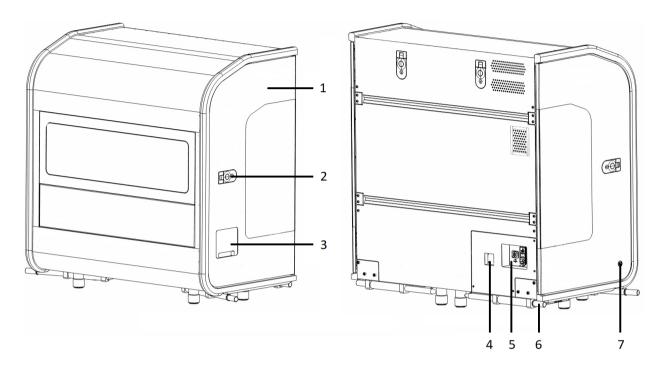


Figure 2 – Main parts of the base unit

- 1. Service door
- 2. Door securing lock
- 3. Slide tray feeder door
- 4. Cable outlet
- 5. Connector panel (USB port, power supply connector, fuse box)
- **6.** Transport handle (4x at the four corners of the device)
- 7. On/Off button

1.1.5 Connector panel

The following figure details the sub-assemblies of the connector panel.

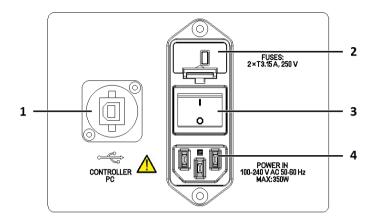


Figure 3 – Sub-assemblies of the connector panel

- 1. USB port for controller PC
- 2. Fuse box
- 3. Main power switch
- 4. Main power inlet

1.2 System Overview

The standard scope of delivery of the product includes the following hardware and software components.

1.2.1 Pannoramic Confocal system

The following figure shows the main parts of the Pannoramic Confocal system.

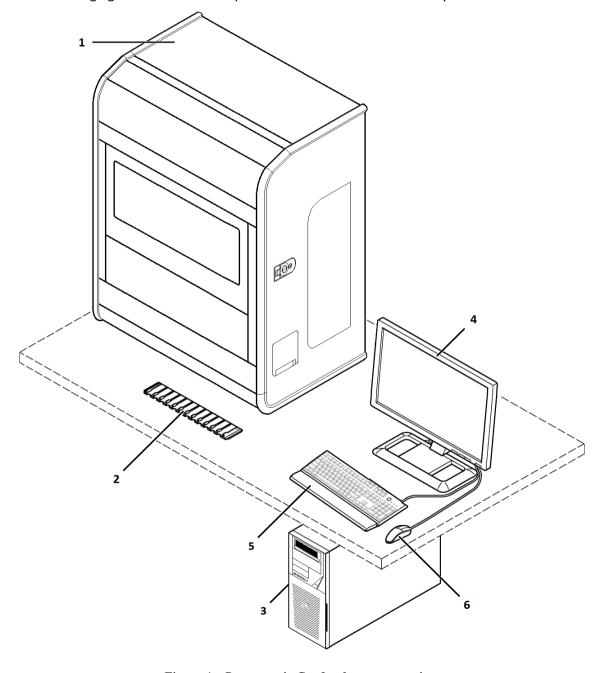


Figure 4 – Pannoramic Confocal system overview

- 1. Pannoramic Confocal base unit
- 2. Slide tray
- 3. Control computer
- 4. Monitor
- 5. Keyboard
- 6. Mouse

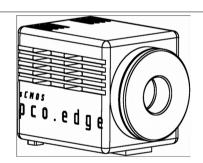
1.2.2 Hardware Options



Note:

The configuration of the control computer and monitor can vary depending on the product order.

Cameras



pco.edge 5.5

Equipped with a high-quality sCMOS image sensor for Brightfield and Fluorescent applications allowing fast scanning and an outstanding low read out noise. Cooled with Peltier element.



Warning!

The installation of the cameras in Pannoramic Confocal must be carried out by trained professionals!

In any other case the warranty will be automatically voided. The supplier or distributor is not liable for any damages caused by an installation carried out by an unauthorized person.

Base Unit

• Pannoramic Confocal – base unit completely equipped with pco.edge 5.5 camera and Lumencor fluorescence illumination unit, and Aurox CC88 Confocal unit with filters.

Objectives

- Plan-Apochromat 20×/NA 0.8
- C-Apochromat 40× Corr/NA 1.2



Warning!

Do not change correction collar settings on the 40×/NA objective, if you need it to be set, contact customer service.

Fluorescent Illumination unit for Pannoramic Confocal

Fluorescent illumination unit	Description
	Lumencor SPECTRA 7 Light Engine illumination unit

1.2.3 Control Software

Pannoramic Scanner control software

Optional:

- Barcode reader (licensed feature)
- Accesory software components (fully functional)
 - CaseCenter
 - CaseViewer
 - CaseManager

- Track & Sign
- QuantCenter, HistoQuant, NuclearQuant, MembraneQuant, CISHQuant, CISH-RNAQuant, FISHQuant, and DensitoQuant modules
- TMA module
- 3D Reconstruction module
- TumorBoard module
- E-School

2 Installation



Warning!

The installation of Pannoramic Confocal must be carried out by a trained professional! In any other case the warranty will be automatically voided. The supplier or distributor is not liable for any damages caused by an installation carried out by an unauthorized person.

Make sure that the unit is positioned in a way that it would be easy to have it disconnected if necessary.



Warning!

The device of Pannoramic Confocal must be operated on a leveled and solid desk that can support more weight than of the device's. The calibration of the device must be performed when it has been installed on the desk. In case the device has been moved to another location, recalibration must be performed by a qualified and experienced technician.

Only qualified service assistants are allowed to install the hardware and software. The product is ready for use after installation.

2.1 Control computer ports

The following figure shows the location of the connectors in order to enable easier transportation of the product for a short distance, by disconnecting cables and detaching hardware components from each other.

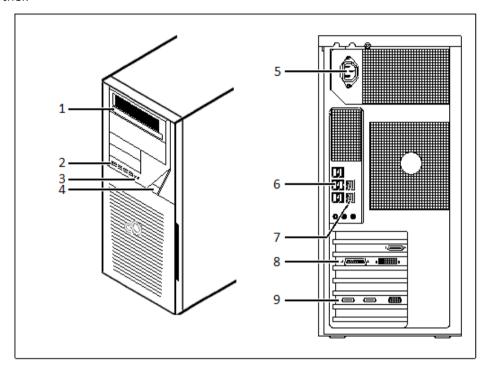


Figure 5 – Ports on control computer

- 1. DVD drive (RW)
- 2. 4x USB port
- 3. Audio in/out (3.5mm Jack ports)
- 4. Power on/off button
- **5.** Power supply connector
- 6. 6x USB port
- 7. Network ports
- 8. Monitor port
- **9.** Matrox Solios CameraLink ports (for pco.edge 5.5 camera)

2.2 Connectors and cables



Caution!

It is not recommended to use USB cables longer than 2.5 meters.

- Power supply cable (between 230V/110V and monitor)
- Power supply cable (between 230V/110V and control computer)
- Power supply cable (between 230V/110V and the power inlet of the Pannoramic Confocal)
- USB cable (between preview camera and control computer)
- USB control cable (between the USB control port at the connector panel of the scanner and control computer)
- USB cable for Aurox CC88 Confocal unit (between Pannoramic Confocal and control computer)
- USB-to-RS232 serial communication cable (between Pannoramic Confocal and control computer for Lumencor fluorescent illumination unit)
- CameraLink cables (between pco.edge 5.5 camera and control computer)
- Video cable (between monitor and control computer)



Warning!

Only connect external devices that are safety extra low voltage rated to the instrument to avoid the risk of electrical shock.

3 Operating Slides and Trays

3.1 Preparing Slides and Trays

This section demonstrates how to prepare slides and trays. You may use slides and coverslips that meet the following specifications:

	Slides	coverslips
Length	75.0 to 76.0 mm	max. 50 mm
Width	25.0 to 26.0 mm	max. 24 mm (recommended: 22 mm)
Thickness	0.95 to 1.05 mm	No. 1 and No. 1.5 (0.13 to 0.16 mm and 0.16 to 0.19 mm)
Corners	45° beveled corners	
Edges	Ground or cut	



Warning!

Do not use a slide when it is broken or its edges are not properly cut or grounded. Using such slides can lead to injury.



Warning!

If using immersion liquid for confocal scanning, make sure that you apply cover slips on each slide you are going to scan in a way that water cannot enter underneath the coverslip, since it may impair the section and falsify correct evaluation.

Ensure that no part of the mounted coverslip protrudes from the edges of the slide.

Use slides with completely dried embedding medium only. Otherwise, the coverslip can be shifted that makes slide loading less reliable. Not completely dried embedding might also influence the operation of objectives and other device parts.



Warning!

Do **NOT** use any marker on the slide when performing immersion scanning.



Caution!

Do **NOT** scratch any circular marker on the surface of a slide.

When performing dry scanning use a soft tip pen on the top side of the slide for marking area of interest.



Note:

The distance between slide edges and the edges of the mounted coverslip should be 1-2 mm, and they should be parallel with each other.



Note:

Fluorescent signals become more easily detectable for the scanner, therefore resulting in a brighter and better image, by treating the slide with a formula that prevents rapid photobleaching of fluorescent reagents during the protocol.

3.2 Affixing Barcode Stickers to Slides

This section describes how to affix barcode stickers to slides. Barcodes enable virtual slide identification.

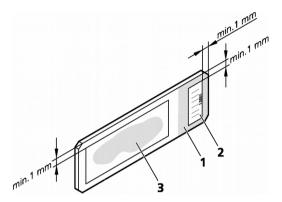


Figure 6 - Slide with a barcode sticker

The label area is recorded by the preview camera, and can be displayed by the control and viewer software.

To affix barcode stickers to slides, do the following:

- 1. Peel off the barcode sticker (2) from the roll.
- 2. Stick it on the colored label area (1) of the slide, on the specimen side.



Caution!

Ensure that a marginal space of 1-2 mm remains on all sides between the sticker and the label area outer limits. It is vital for barcode identification. Do not let barcode sticker protrude from slide edges, or stick on the coverslip surface (3).

The thickness of the barcode sticker on the slide must not exceed 0.4 mm!

Do not stick more than **four** barcode stickers over each other and the overall thickness must must be kept below 1.65 mm (including the barcodes and the slide).

3.3 Inserting and Removing Slides

To insert slides into a tray

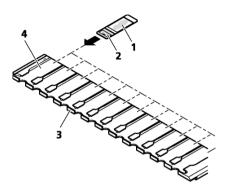


Figure 7 – Inserting slides into a tray

A tray can contain a maximum of 11 histological slides. In the 12th position a *Cleaner slide* must be loaded.

• Push a slide (1) into the desired slot (4) of the tray (3) with its barcode end (2) first.



Caution!

Incorrect slide insertion may break the glass. Always make sure that slides are correctly inserted in the tray. The edge of the broken area of the slide is sharp and its removal can lead to injury and contagion! Broken slide can be removed only by a well-trained person!

Only original 3DHISTECH trays are allowed for use with Pannoramic Confocal!



Note:

The coverslip and the label area should be on the top.



Note:

If you want to scan frozen samples, load only one slide a time, since the scanning process is relatively slow (depending on the size of the sample).

To insert and remove slide trays

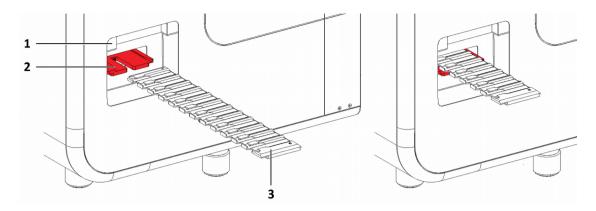


Figure 8 – Inserting the slide tray

- 1. Open slide tray feeder door (1).
- 2. Insert the tray (3) that contains at least one slide onto the tray rail (2), then push the tray until it stops.
- **3.** After digitizing slides, the tray is moved to the output position where it can be removed.



Caution!

To insert or remove a filled tray from the device, or when transporting it, slightly tilt it to its closed side to prevent the slides from accidentally falling out. Inserts should always be kept clean from dust, broken glass and other mounting media residues. Slides will only operate safely and properly, if trays are clean.



Warning!

Do not reach into the feeding area while slides are digitized.

4 Software Description

4.1 Starting / Exiting Pannoramic MIDI II Software Application

4.1.1 Starting the software

To start the program, double-click on the program icon on the desktop or start it from **Start \ Program Files \ 3DHISTECH \ Pannoramic Scanner**

For the scanning software you can choose from different scanning modes at the startup of the program.

After software initialization the user interface is opened and the mode selection icons are displayed.



These two mode buttons represent **Microscope** and **Planner** scanner modes:

Microscope mode

- for digitization of individual slide or individual rack
- set scanning profile of the slide
- run Live teleconsultation
- use Live microscope

Planner mode

- plan the entire scanning procedure
- · assign one or more profiles to each slide
- define Brightfield and Fluorescence or mixed scanning mode within a run
- define scanning profile to slides included in racks or trays
- automated scanning mode

After selecting the required mode, the main window is displayed.

4.2 Main window functions

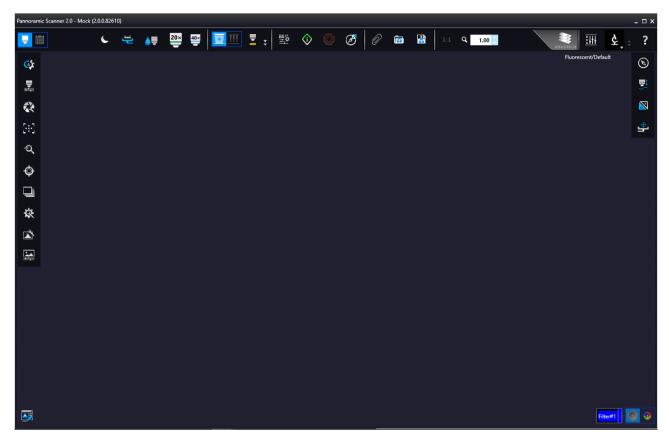
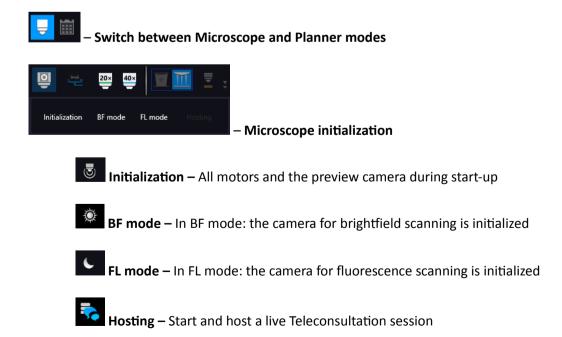


Figure 9 – Pannoramic Scanner 2.0 main window

The following functions are available for you to select from at the main menu bar:



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- Tray/ Slide loading

Upon clicking the slide icon or entering slide position number at the right side, the slide can be loaded.

Unload the slide by clicking **Unload** next to slide image, and unload the tray by clicking **Unload** next to the rack image.



The following slide markings can be displayed on the tray panel:

- Ø There is no slide in that position
- Slide preview is not yet taken
- Slide preview has already been created
- **V** Cleaner slide

NOTE: A *Cleaner Slide* must be placed into the 12th slide position to clear the water immersion objective if Pannoramic Confocal is used for immersion scanning.

A hatch and marking represent a slide that is loaded at the moment. If immersion has been used, the warning status icon is displayed on the slide icon.

If you want to modify slide status (for example, if the icon represents a wet slide status although a dry slide has been loaded), right-click on the slide icon and select **Change current slide status (wet/dry)** to modify slide status. Select **Mark as empty** to mark the slide position as empty.



When in **Service** mode (see section **5.6** for more information), additional functions are available for you to select for slide positions.





- Pipette status / Objective status

The objective icon can have three different states, where a specific color indicates the actual status of the objective:

。 **I**__Dry

- Cleaned with cleaner slide
- 。 🛢 Wet

Upon clicking on the objective icon, and selecting **Clean**, the objective can be cleaned with the *Cleaner Slide*. By selecting **Set to Clean**, its status can be set to *Clean* without phisycally cleaning it.





Important!

The Cleaner Slide must be inserted into the 12th position of the tray.

Click **Reload pipette** to inform the software that you have refilled the pipette.

Pipette status is displayed and continuously updated during operation. The quantity of the immersion fluid contained in the pipette is visualized by the level of blue filling of the icon.

- □ Pipette is half-full, can be used without the software prompting you to refill it.
- Pipette is empty, immersion scanning cannot be performed until refilling the pipette.
 When a warning message appears informing you that the fliud level in the pipette is low, do not hesitate to refill the pipette.



Important!

If the program warns you to refill the pipette, please act promptly as air can be sucked into the system resulting in insufficient operation of the pipetting unit.



Transformed widefield live mode ON

Confocal live mode ON



Live view is on with the shutter closed



Click to display the toolbar for Live view. These functions are only available for the displayed live image (i. e. Live view is ON), but not available for camera images during digitization.

When in **Normal live mode**, the images are taken with the user-specified exposure time.

- One pixel on the monitor corresponds to one pixel on the camera
- The live image completely fills the display area
- Displays or hides the vertical and horizontal scale bars
- Displays the magnifier window
- Activates red marking on overexposed pixels
- Saves the current image as BMP or JPEG file

• Fast live mode

Live images are displayed with a frequency of at least 10 images per second. If an exposure time is set to more than 100 ms, the pixel values are multiplied accordingly (for example, if an exposure time of 200 ms is set, the pixel values are multiplied by 2, and the exposure time is reset to 100 ms). Therefore the resulting images will have a higher noise level.

This function is useful for fluorescent live view where in spite of the higher noise level, the resulting image will be refreshed as in normal mode.

- Image intensity



- Screenshot
- Displays the magnifier window

- Displays or hides the vertical and horizontal scale bars
- Calculate white balance (accessible in Brightfield mode only)
- Image processor plugin functions
 - Convolute gray-scale image by custom kernel
 - Multi-channel histogram with normalization
 - Invert image (for testing purposes)
 - Mark overexposed pixels

- Scan Properties

Unique settings can be defined even for each separate scanning. This function is included on the profile cards as well, added to the slide in Planner mode.

Scan to Local

- Select the Slide save Path
- Folder from Barcode
- Free space: Free space capacity of selected local drive
- Use Barcode
- Slide name: Can be defined by manual or generate automatically with Generate name setting.
- Scan separately: The FOV areas of the preview image will be scanned and saved separately as discrete digital slides.

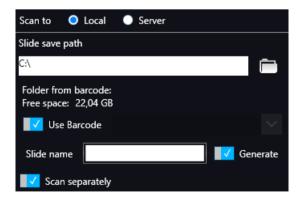


Figure 10 - Scan Properties window

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· Scan to Server

 Server: the drop-down list includes all the saved servers. Click Add new item ... to create another server connection.

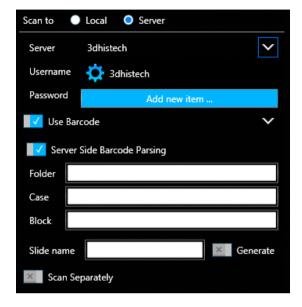


Figure 11 – Scan to server settings

- Server Editor: The user define here the following details of the Server:
 - Display Name
 - Host Name
 - Protocol

Server Editor stores each of the created server in a list. List entries can be removed or a new entry can be added if required. With the **Filters** function you can narrow down the results by searching for a specific server data. By double-clicking a list item, server data will be loaded in the **Scan to Server** panel.



Figure 12 - Window of server editor

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After loading server data, user name and password is required to be added for authentication and accessing the server. If connection is successful, a green checkmark is displayed in the window.



- **Use Barcode:** Barcode settings can be modified in the Barcode Editor window. By predefining barcode type and other settings.
- Server Side Barcode Parsing option can be selected if CaseCenter is connected with the supported HIS/LIS. This way the barcode read by the software is being identified, and the predefined location of that specific case in CaseCenter is automatically selected as scanning destination based on the CaseID (containing slide and patient data stored on HIS/LIS). Therefore, Folder, Case, Block, and Slide name field data cannot be modified, only a profile can be selected.



Figure 13 - Window of Barcode Editor

You can select the following barcode types:

1D barcode types

- *Code 39
- Code 128
- Code 16K
- *Interleaved 2 of 5
- Standard 2 of 5
- IATA 2 of 5
- Matrix 2 of 5
- Telepen
- Code 93
- Code 11
- MSI
- Codabar
- Patch Code
- Pharmacode
- EAN-13
- EAN-8
- UPC-A
- UPC-E

2D barcode types

- Aztec
- Data Matrix
- PDF417/Compact
- Micro PDF417
- QR
- Micro QR
- MaxiCode



Scanning of the actual slide or performing the whole previously planned scanning procedure can be initiated.







Each preview of slides in the tray is taken automatically. Preview types are the following:

- Brightfield
- Darkfield
- Pre-Scan
- · Pre-Scan High-Resolution
- Pre-Scan + High-Resolution

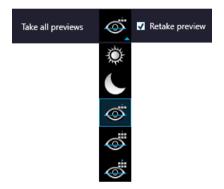


Figure 14 – Take all preview selector



The actually set or the loaded profile is assigned to the loaded slide automatically.



The Profile Browser window containing a list of previously saved profiles is opened. Based on the Illumination type, profiles are grouped into two clusters: Brightfield and Fluorescence. Additional profiles can be created here as well, and you can also search for a specific profile by filtering based on the following data:

- · Profile name
- Objective type (None / 20x / 40x)
- Confocal mode (None / True Confocal / Semi-confocal / Widefield)
- Multilayer mode (Extended focus / Z-stack)

- Illumination (None / Brightfield / Fluorescent)
- Filters
- Modify date
- Last used date



Figure 15 – Profile browser window



The defined profile can be saved in this window after typing the profile name into the text field and clicking **Save as**.



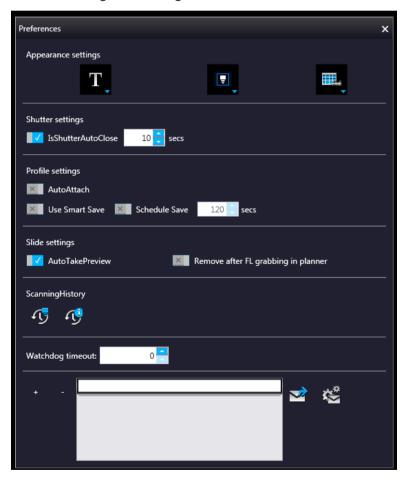
1:1 – Reset Zoom

This function is active only in Live view at 1:1 magnification.





This panel contains user settings that have global effect on the GUI and some of its functions.



Appearance settings

View Mode Selector

- Text mode
- Icon mode
- Float Text mode **T**
- Float Icon mode

Style selector

- Black Jelly
- Flat style
- Black Jelly P1000
- Flat style P1000

Planner style editor

- Slides with card
- Table
- Card Collection

Live mode

- Rendered 😇
- Extended legacy

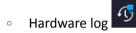
Profile settings

- Use profile history save With this function each profile modification is saved in Profile History from which the different stages can be reloaded.
- Planner Save Planner content is automatically saved at the specified time-frames.

Slide settings

- Take Preview automatically This function is designed to take preview images of slides automatically, once they are loaded.
- Remove Slide after FL grabbing in Planner: Available only in Confocal mode.

Scanning History



Scanner hardware operations are contained in this log. To enable this function, first the database from the following folder must be loaded: C:\ProgramData\3DHISTECH\ SlideScanner\HWLogDataBase

The following motor movements are recorded in the log list:

- Camera Changer
- Confocal
- DFP Light
- Filter Wheel
- Flash Light
- General
- Halogen Light
- Microscope Part
- Midi Loader
- ND
- Objective Changer
- Preview Light
- RGB Light
- Relay
- Scan Loader
- Service
- Shutter

- Slide Scanner
- Stage
- Waterpump
- Software log

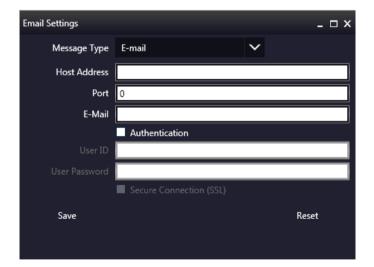
All of the circumstances and states of the slide scanning procedure is saved. LogID is the sequence number of scanning performed on the scanner in use. (Profile Name, Illumination mode, Scan type, Scan Start, Scan Finished, URL, Error)

Filtering for the following parameters is available:

- Scanning date
- Profile name
- Illumination mode
- URL
- Slide name
- Slide index
- Rack index

Email Settings

An e-mail can be sent automatically about every failure and error that is occurred during scanning to the specified address. The log files are compressed into a ZIP file, that is attached to the mail.



? – Help

5 Scanning modes and settings

After microscope initialization, if FL HW option is provided, you can select from the following two modes:

- Brightfield scanning mode (see section 5.1 Brightfield Scanning Mode for more information)
- Fluorescence scanning mode (see section 5.2 Fluorescence Scanning Mode for more information)
- Option modes
 - o È Off
 - Service (see section 5.6 Services and Settings for more information)
 - Settings (see section 5.6 Services and Settings for more information)

In accordance with the selected mode, the **Profile Settings Panel** and the **Microscope Control Panel** views are modified.

5.1 Brightfield Scanning Mode

Microscope View consist of three different sections:

- **Main functions**: Located at below the window header, these functions are identical in both modes.
- Profile Settings panel: Profile settings containing parameters used for scanning.
- Microscope Control Panel: Live microscope movement functions

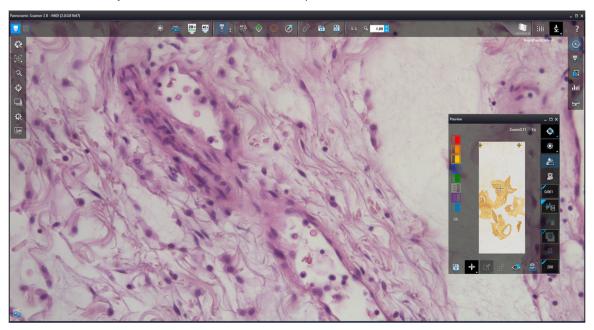


Figure 16 – Main window of Brightfield Microscope mode

5.1.1 Profile Settings Panel



This field displays the objective used for scanning.



- Objective type
 - 20x or 40x
- Output resolution
 - Fix values are: **37x Native** for 20x objective, and **73x Native** for 40x objective.

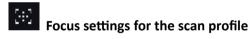


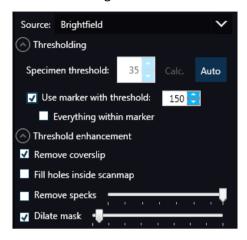


Figure 17 – Focus settings for scan profile

- **Limit the range**: You can define focus limits by selecting **Limit the range** for focusing. You can set the upper and lower limits by selecting the desired value in the selection boxes. This is useful if focusing was not targeted on the specimen, but on a spot on the coverslip.
- **Focus distance:** the distance of focal points can be set to create a focus map, based on which the software calculates interpolated focus values (one step in distance means one FOV).

Sample detection

This panel offers options for threshold setting and selection of the area to be scanned.



- **Source:** Brightfield preview a normal type of illumination in the microscope for scanning the slide. This option is recommended when scanning in Brightfield mode.
- Thresholding: The manually specified value is used for thresholding during scanning.

Preview image of the loaded slide is displayed in the Preview window, and when modifying any of the parameter values, it will have effect on the preview image. If the threshold value presented on the Microscope Controller preview window is modified, this value is automatically applied by the profile in the Profile Settings panel.

Specimen threshold

This value is definable manually: This sets the sensitivity of the specimen detection. To set the desired threshold value manually, change the setting in the **Specimen threshold level** selection box in the range of 0-255.

Smaller values result in a more sensitive scanning, meaning that more areas will be digitized, however, this may also include specks or other imperfections of the slide. Greater values result in a less sensitive scanning, but it is possible that some of the smaller specimen areas will not be digitized.

Auto Threshold

By clicking the specimen will automatically be detected in the preview image.



Caution!

Make sure that the detection result is acceptable for you. Otherwise, set the threshold value manually or append missing areas with the help of appropriate functions in the **Preview** window.

Use marker with threshold

If the specimen cannot be identified as required for digitization, (for example, weak contrast), it can help to encircle completely the specimen with a black marker pen. You have to draw a full circle with the pen to enable the detection. Marker pen detection will make specimen detection easier by limiting the scanned area. If this option is selected, only the area encircled with a marker pen will be scanned. You can define the threshold level by changing the threshold value in the **Use marker with threshold** selection box in the range of 0-255. This sets the sensitivity of the specimen detection inside the marker area. To set the desired threshold value manually, change the setting in the **Specimen threshold** selection box in the range of 0-255.

Everything within marker

To scan everything within the marked area, check the **Everything within marker** selection box.

Alternatively, click in the preview window to activate this function.

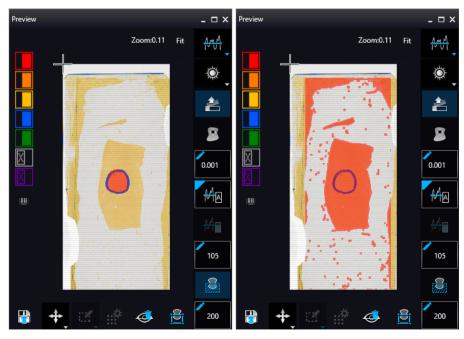


Figure 18 – Scan everything within the marked area (selected / not selected)

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Threshold enhancement

Remove coverslip – If selected, the edges of the coverslip are not detected as specimen
to be scanned. Depending on the threshold level, it is possible that the edges of the
coverslip are detected as areas to be digitized.

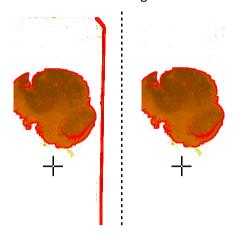


Figure 19 – Preview image with and without coverslip edge



Caution!

It requires lots of time (since it cannot find focus neither on the edges, nor on specks) to digitize coverslip edges. Select **Remove coverslip** function to eliminate those areas.



Warning!

Do **NOT** use **Remove coverslip** function on TMA slides! The layout of TMA slides may mislead the detecting algorithm.

- Fill holes inside the scanmap If selected, the holes inside the specimen will also be scanned. Often these holes contain small sample objects that otherwise would not be scanned.
- Remove specks If selected, the scanner does not digitize objects smaller than the
 predetermined size. This helps filtering specks and other uninteresting objects out. Set
 the maximum size of specks not to be digitized by adjusting the slider.
- **Dilate mask** Adjust the slider to enlarge or decrease the scanned area. The edge is extended discretely by 100 μm each time.



A previously saved scanmap can be loaded and applied.

- **Use Threshold:** Preview settings defined in the Microscope Controller Panel / Preview window are applied as the basis of scanmap.
- **Load scanmap:** This function is useful if the slides contain areas of interest that cannot be detected by the preview camera. This function along with saving profiles helps to scan all slides with the most adequate settings.
- To load a mask, click Load. It will display a drop-down menu. Select whether to load preview mask or TMA grid.
- Custom scanmap: The scanmap draws manually on the preview image is used for scanning.



Use selection box restriction

If selected, only the area inside the box is scanned. It is useful if you only want to scan the area that is equivalent with the size of the coverslip, so external specks will not be scanned.



- Single layer mode: Select Single layer option if you want to scan a single layer of the slide.
- Extended focus: By choosing the Extended focus option, the software selects the sharpest image from each focus level for each image field, and combines them into one single image. Therefore those parts that were blurry in auto/manual focus will also be sharp. This method guarantees the maximum depth of sharpness, however, it reduces digitization speed.

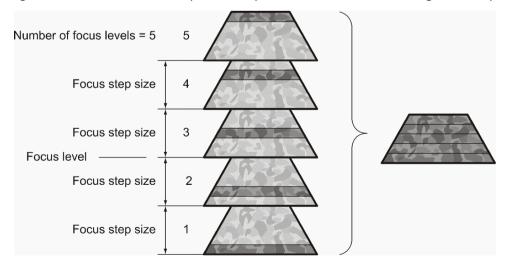


Figure 20 – Focus level and step size

Z-stack scan mode: Both for Extended focus and Z-Stack scanning methods, you can
determine the desired number of focus levels with the Levels selection box. The current focus
value is the starting point. If you set 5 for example, one current, two focus levels above and
below FOVs are captured. Therefore, it is advised to choose an odd number for the focus
levels. Separate layers are created and stored this way, and can be opened with Pannoramic
Viewer. The Z-stack slide contains the extended focus layer.



Step size determines the spacing between focus levels. One step is around 0.2 μm.

Default settings are: Levels: 7; Step size: 5.



Includes the **Stop and Go** scanning mode.

Use Color matrix: Select an applicable preset color profile to be used for Brightfield scanning from the drop-down menu. Settings according to the profile has effect on the color set, color temperature, and gamma value of the scanned image.

Separate color matrix can be defined and used for each profile and scanning.

Preset profiles are the following:

- Calibrated Linear: Color scheme is defined by calibration (Gamma value is not included)
- sRGB standard: Color scheme is defined by calibration (standard Gamma value -2.2- is applied)
- **sRGB standard Microscope Like**: Color scheme is defined by calibration (standard Gamma value / White Point: D50)
- Legacy: a Color scheme calibrated for the previous software version is applied
- Custom: Color profile set in Service is applicable if needed.

Image settings

You can choose the following predefined image formats (and a subsequent custom option) from the **Image Quality** drop-down list in the **Image Encoding** section of the window:

Excellent (JPEG: 90)

Good (JPEG: 80)

Medium (JPEG: 60)

Low (JPEG: 30)

Custom...

If choosing this option, the Image compression setting is displayed on which you can select from different image formats. Accordingly, further adjustments can be made, except if PNG or BMP image format is selected.



Figure 21 – Image encoding window

- JPEG The quality can be adjusted with the JPEG quality factor slider. Greater values result in better quality, but larger files. The default setting is 80%.
- PNG Lossless compressed image format.
- BMP Lossless uncompressed image format, but larger files due to less effective compression. It is a raw data file.
- Stitching: Use Stitching function enables the seamless stitching of digital tiles.
- Use save compensation image: The Use saved compensation image function enables the use
 of previously recorded reference images for all slides. Use this function when the slide is
 completely covered by the specimen (for example, blood smear) thereby making
 compensation image capture impossible. For such slides, use an empty slide with coverslip to
 grab a compensation image. If you select this, the software will not create new compensation
 images for each slide. Compensation images are reference images used for white balancing
 and shading.
- Save focus quality: The measurement of focus quality (correctness of average focus on layers) is saved. This option is inactive when **Extended focus** option is activated.
- Save image in original Bayer size function is only available if pco.edge 4.2 camera is installed
 on the scanner. It is not accessible for configurations installed with Point Grey Grasshopper 3
 camera. Image fields will be saved with native pixel resolution. If this function is disabled, you
 will work with reduced pixel resolution. These resolution differences are not really visible
 with the human eye, what is important in this feature is the resulting smaller file size.

5.1.2 Microscope Control Panel

The Microscope Control panel includes the main control features of the microscope.

5.1.2.1 S Preview Window

The Preview panel offers options for threshold setting and selection of the area to be scanned.

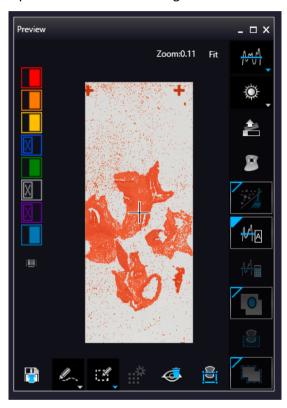


Figure 22 - Preview panel

Threshold options

This section is located at right side of the preview window. **Scanmap Source** is designed to set which type of scanmap is used on the preview image. This scanmap is displayed automatically in the **Profile Scanmap Source** setting. Selectable scanmap types are the following:

- Use threshold
- Load previously saved scanmap from file
- Custom scan map

Preview Type setting determines the type of illumination. In Brightfield mode when using MIDI II, the following preview types are available:

- **Brightfield preview** a normal type of illumination in the microscope for scanning the slide. This option is recommended when scanning in Brightfield mode.
- **Darkfield preview** preview image is created with transmitted Darkfield illumination. Make sure to select this option in Fluorescent mode.

Remove Coverslip — If selected, the edges of the coverslip are not detected as specimen to be scanned. Depending on the threshold level, it is possible that the edges of the coverslip are detected as areas to be digitized.



Figure 23 – Preview image with and without coverslip edge



Caution!

It requires lots of time (since it cannot find focus neither on the edges, nor on specks) to digitize coverslip edges. Select **Remove coverslip** function to eliminate those areas.



Warning!

Do **NOT** use **Remove coverslip** function on TMA slides! The layout of TMA slides may mislead the detecting algorithm.

Remove specks —— If selected, the scanner does not digitize objects smaller than the predetermined size. This helps filtering specks and other uninteresting objects out.

Set the maximum volume of specks manually in the setting window



Threshold settings have two different statuses:



Caution!

Make sure that the detection result is acceptable for you. Otherwise set the threshold value manually.

Make sure that the detection result is acceptable for you. Otherwise set the threshold value manually.

• Manual threshold — Set threshold value manually, or calculate value on the actual preview with Calculate Threshold function which is active only if setting the value manually. This sets the sensitivity of the specimen detection. To set the desired threshold value manually, change the setting in the Specimen threshold level selection box in the range of 0-255. Smaller values result in a more sensitive scanning, meaning that more areas will be digitized, however, this may also include specks or other imperfections of the slide. Greater values result in a less sensitive scanning, but it is possible that some of the smaller specimen areas will not be digitized.

Manual setting of Use marker with threshold —— If this option is selected, only the area encircled with a marker pen will be scanned. You can define the threshold level by changing the threshold value in the Marker threshold level selection box in the range of 0-255. This sets the sensitivity of the specimen detection inside the marker area. To set the desired threshold value manually, change the setting in the Threshold selection box in the range of 0-255.

Everything within marker — This function is available only to select if the Use marker with threshold function is activated. To scan everything within the marked area, check the Scan everything within marker selection box.

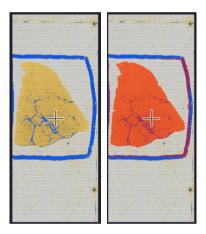


Figure 24 – Scan everything within the marker selected / not selected

Preview Toolbar



This section is located at the bottom of the preview image.



Click this icon to save the currently selected areas to scanmap.

Position +

To position the specimen holder that holds the current slide, click **Position sample** and then click on the area of interest on the preview image. This will define the Live image that you can access from the **Live view**.

Union 🦾

Add the selected areas to the preview. Mark area for scanning based on the shape selected in the Preview Toolbar. This area will not be scanned.

Erase 🎤

Delete selected areas from the preview image. Deselection is made based on the selected shape from the Preview Toolbar. This area will not be scanned.



Figure 25 - Not scanned selection

Edit

The size of selected area (positive or negative) can be modified at the borderlines.

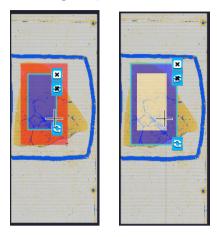


Figure 26 - Edited negative and positive selection masks.



Crop the area of the selected area.

Place Circle

You can select the area to be scanned with the different tools on the **Preview toolbar.**

Rectangle tool

Draw rectangle shaped area.

Ellipse tool

Draw ellipse selection.

Polygon tool

Area selection by defining a polygon shape. Finish area selection by double-clicking with the mouse at or near the starting point.

TMA tool

TMA tool is used for selecting TMA spots on TMA slides. You can set the selection settings on the following four tabs:





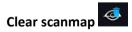
This function is enabled only if a TMA grid has already been placed on the preview image. Set grid parameters (row and column numbers) and spot shape (round or rectangle).



Figure 27 - TMA tool: Grid selector

Delete TMA grid by clicking the **X** at the top right corner, and rotate grid by clicking the icon at the bottom right corner. Enter the number of rows and columns in the **Rows** and **Columns** fields or select the appropriate values with the arrows.

Enter the distance between two spots on the X and the Y axis in μm in the **Core distance** fields or select the appropriate values with the arrows. Enter the average diameter of the spots in the **Core size** field or select the appropriate value with the arrows.



The entire scanmap area will be cleared and reset to default.

Use selection box restriction

If selected, only the area inside the box is scanned. It is useful if you only want to scan the area that is equivalent with the size of the coverslip, so external specks will not be scanned.

The preview image shows the area that will be digitized with a red and/or an orange mask. If the **Use selection box** is enabled, and the crop function is selected, a black frame displayed in the image.

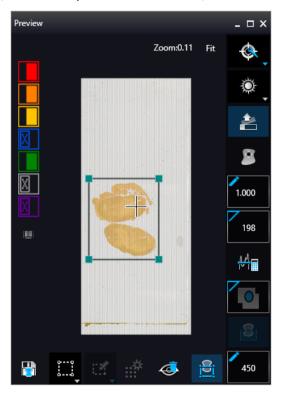


Figure 28 – Use selection box

The following colors are used in the preview image to demonstrate digitization and selection settings:



Figure 29 – Colors in preview image and Label area switching button











Areas that will be scanned

These areas are digitized on the basis of user settings (for example, **Fill holes in scan area**) and not detected by the selected threshold value.



Detected sample areas that will be scanned

These areas are digitized. They are detected on the basis of the selected threshold value.



Detected sample areas that will not be scanned

These areas are not digitized on the basis of their position (for example, they are outside the selection box). They are detected by the selected threshold value.



Marker

If **Scan area inside the marker** is selected in the Preview panel, the preview camera detects the marker pen. The inside areas appear in red color and will be digitized.



Areas scanned in

This color is only displayed during scanning.



Hide all layers

All the layers will be hidden / existing but not visible.



Separate scanning

Discrete sample areas will be scanned separately as individual slides. If there are two samples on a slide, two separate virtual slides will be created.

Click the button to display barcode label area. To rotate the label area by 180°, click



Figure 30 - Barcode label area window

5.1.2.2 Focus Indicator

Click to activate the **Focus indicator** function. Search for the sharpest focus on the current field of view automatically by clicking - **Auto focus** button.

To define focus limits, select **Limit the range**. Set the upper and lower limits by selecting the desired value in the selection boxes. By using **Set +-Range**, the **Lower limit** value is set to -32 of the current focus value and the **Upper limit** value is set to +32 of the current focus value. This is useful if **Auto Focus** does not find the focus on the specimen, but on the coverslip. Also, this makes the focusing sequence faster.

For manual focusing define the manual focus step size by adjusting the **Step size** slider and use the two arrow buttons to focus manually. This is useful when you are interested in an area that remained blurry with **Auto Focus** (for example, the specimen is thicker in that area). This does not influence the way slides are digitized in Auto focus mode.



Figure 31 – Focus indicator panel

5.1.2.3 Exposure Indicator

Activate Exposure indicator function by clicking Click to calculate exposure time for the actual Live image. In Brightfield mode there is no option for manually setting the values. Exposure time can be displayed in microsecond, millisecond, and also in second.

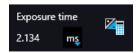


Figure 32 – Window of Exposure Indicator in Brightfield scan mode

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5.1.2.4 Image Intensity

Click to open Image intensity settings window. An **image** is defined as a two-dimensional function f(x, y) the amplitude of at any pair of coordinates (x, y) is called the **intensity** or gray level of the **image** at that point. The pixel intensity at the coordinate pointing at with the cursor is displayed in the Image Intensity window.



Figure 33 – Window of Image Intensity

5.1.2.5 Stage positioning

Click to activate **Stage Positioning Tool** to navigate on the slide, so to perform microscope movements on the Live image with this control function. The number at the center of the controller defines the step size by which the stage is moved. Value can be entered by hand or with the slider.



Figure 34 – Stage positioning tool

This tool offers easy and punctual slide navigation in distinctive steps. Set step size (FoV) -1, $\frac{1}{2}$, or $\frac{1}{2}$ to determine the size of movement in proportion of one FOV. Click an arrow to move to the required direction with the set step size.

5.1.2.6 Hidden functions

Use **Ctrl+mouse wheel** to zoom in or out to the preview area or the Live image.

A **Quick Toolbar** pops up by right-clicking to the preview area. It allows a quick access to main functions:

- Drag
- Draw
- Erase
- · Rotate previews
- Settings
 - Toggle deletion always on top
 - Reset zoom
 - Window auto-size
 - Clean scanmap



Figure 35 - Quick toolbar

5.2 Fluorescence Microscope Mode

Fluorescence Microscope View consist of three different sections:

- Profile Settings panel: Profile settings containing parameters used for scanning.
- Microscope Control Panel: Live microscope movement functions
- Main functions: Located at below the window header, these functions are identical in both modes.

5.2.1 Profile Settings panel



Every parameter is set automatically during scanning.



Compact table view of microscope filters used for Fluorescence scanning.

Legend of the table:

- A: Actually used filter
- Use: Filters used for viewing Live image and for scanning.
- Auto Exp: When activated, the exposure time of the selected filter is calculated automatically during scanning.
- Exp. Time: If Auto Exp is inactive, exposure time of each filter can be defined manually.
 Values such as Calc Exposure time in Microscope Control panel and those that are specified manually are loaded in these fields. Value units can be the following: microsec, millisec, sec.
- Exc %: The given value specifies the excitation intensity in percentage of the illumination unit.
- **DG** (Digital Gain): This is camera-dependent, with Point Grey Grasshopper 3 the index value ranges from 0 to 4, and with pco.edge 4.2 from 0 to 6. Give **Index** value by entering it in the box or by selecting the value with the arrow buttons. If you raise the **Index** value, the exposure time is halved by every step, and the image becomes noisier. To move between the filters, click **Previous Filter** or **Next Filter**.
- TW %: You can set the Exposure time weight (%) here (displayed under TW in the Filter Selection frame).
- F: Focus channel under the scanning
- S: The selected channel will be the stitching channel under the scanning.

• **E**: Multilayer option: Select Extended focus or Z-stack scanning for the required channels in accordance with the scanning mode set in the profile.



Figure 36 – Filter table



This field displays the objective used for scanning.



- Objective type
 - 20x or 40x
- Confocal mode

Select the mode you want to apply from the **Confocal mode** drop-down list:

- True confocal Normal confocal image is created.
- Semi confocal Mixed-effect mode, halfway between confocal and widefield modes. Disk is applied (High/Mid/Low-resoution grid) to create a calibration error-free cut image with less illumination deriving from layers that are out of focus (on the other hand, image is brighter than in Confocal mode, and darker than the image created in transformed widefield mode).
- Widefield This option is recommended to gain less illumination loss, the resulting image has no diffraction noise, no plane-parallel shift, nor calibration error. Scanning time can be four times faster when digitizing faint samples.

· Confocal disk position

Confocal disks have different grid density that affects the confocality (High-resoution grid / Mid-resoution grid / Low-resoution grid).

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Higher grid density results in better confocality, and lower light intensity. The default setting is **Auto**, and the predefined confocal disk position for the selected objective type will be used.



Focus settings for the scanning. Focus modes can be the following:

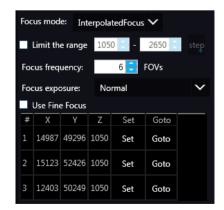
• Coarse: Preset the coarse focus value. By activating the Coarse focus function, the lower limit value is set to -64, and the upper limit value is set to +64 of the current focus value. You can accept the current Z-value by clicking Assign Current.



Before entering coarse focus value, turn live image on and set a suitable focus position.

• Interpolated: If you select the Interpolated option, the coarse focus level is calculated from three different focus points of the specimen. Carry out a manual focusing sequence in the preview image on those three points. Set the correct focus value of the desired preview position by clicking Set in the table of interpolated focus. If you want to go back to any of the previously set focus points, click the appropriate Goto button.

To delete the stored values, click the other proper focus point or turn off the function. The software calculates a coarse focus level from the three values determined this way as a basis for the fine focusing routine. You can only define the start parameter here. This will, however, speed up the focusing process. If you deselect the **Use fine focus** checkbox, the software immediately starts scanning on the basis of the interpolated values, without pre-fine-focusing.

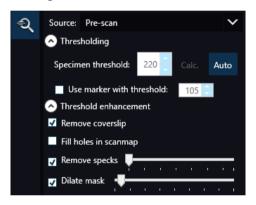


Auto focus: Focus value is set automatically to match sample characteristics.

- **Limits of the range**: You can define focus limits by specifying a range for focusing. You can set the upper and lower limits by selecting the desired value in the selection boxes. This is useful if focusing was not targeted on the specimen, but on a spot on the coverslip.
- Focus frequency: This value determines how many field of views will pass before the sample is refocused. This value should be selected depending on the unevenness and size of the specimen.
- **Focus Exposure:** The exposure time during focusing, it can have three states:
 - Short
 - Normal
 - Long

€ Sample detection

This panel offers options for setting threshold and the selection of scannable areas.



Source

- Brightfield preview a normal type of illumination in the microscope for scanning the slide. This option is recommended when scanning in Brightfield mode.
- **Darkfield** sample detection is performed with transmitted Darkfield illumination (for low-intensity samples).
- Pre-scan creates a fast FL preview image that is displayed in the Profile Wizard window.
 Scanning process takes a couple of minutes only, and it cannot be interrupted.
- Pre-scan high-resolution creates a High-Resolution fast FL preview image of every FOV within the selected area (in single layer DAPI, with an illumination time of 20ms) that is displayed in the Profile Wizard window. Scanning process takes a couple of minutes only, and cannot be interrupted.
- Pre-scan + high-resolution creates a High-Resolution fast FL preview image of every FOV within the selected area (in single layer DAPI, with an illumination time of 20ms) that is displayed in the Profile Wizard window. Scanning process is initiated with a simple PreScan, the located sample with auto threshold is selected, and finally, an HR PreScan is launched.

Thresholding

The manually set threshold value is applied during scanning. The preview of the loaded slide is displayed in the Preview window. The set value has effect on the preview image. If threshold value is modified in the Microscope Controller preview window, that value is automatically applied in the profile in the Profile Settings panel.

Specimen threshold

Sets the sensitivity of the specimen detection. To set the desired threshold value manually, click the **Auto** button first (as it is activated by default), then change the setting in the **Specimen threshold** selection box in the range of 0-255. The default value is 212. Click **Calc.** to calculate threshold for the preview image. Smaller values result in a more sensitive scanning, meaning that more areas will be digitized, however, this may also include specks or other imperfections of the slide. Greater values result in a less sensitive scanning, but it is possible that some of the smaller specimen areas will not be digitized.

Auto Threshold

By clicking the specimen will automatically be detected in the preview image.



Caution!

Make sure that the detection result is acceptable for you. Otherwise, set the threshold value manually or append missing areas with the help of appropriate functions in the **Preview** window.

Use marker with threshold

If the specimen cannot be identified as required for digitization, (for example, weak contrast), it can help to encircle completely the specimen with a black marker pen. You have to draw a full circle with the pen to enable the detection. Marker pen detection will make specimen detection easier by limiting the scanned area. If this option is selected, only the area encircled with a marker pen will be scanned. You can define the threshold level by changing the threshold value in the **Use marker with threshold** selection box in the range of 0-255. This sets the sensitivity of the specimen detection inside the marker area. To set the desired threshold value manually, change the setting in the **Specimen threshold** selection box in the range of 0-255. The default value is 105.

Everything within marker

To scan everything within the marked area, check the **Everything within marker** selection hox

Alternatively, click in the preview window to activate this function.

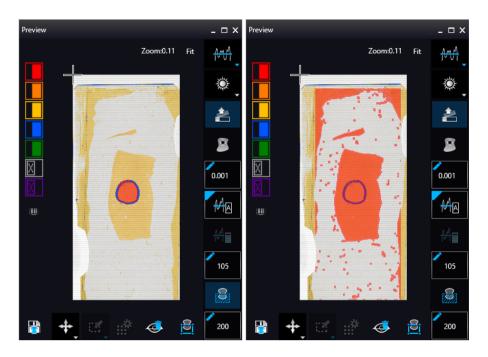


Figure 37 – Scan everything within the marked area (selected / not selected)

· Threshold enhancement

Remove coverslip – If selected, the edges of the coverslip are not detected as specimen
to be scanned. Depending on the threshold level, it is possible that the edges of the
coverslip are detected as areas to be digitized.

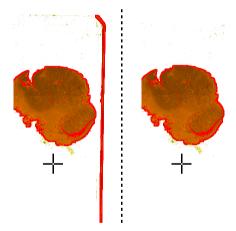


Figure 38 - Preview image with and without coverslip edge



It requires lots of time (since it cannot find focus neither on the edges, nor on specks) to digitize coverslip edges. Select **Remove coverslip** function to eliminate those areas.



Warning!

Do **not** use **Remove coverslip** function on TMA slides! The layout of TMA slides may mislead the detecting algorithm.

- Fill holes inside the scanmap If selected, the holes inside the specimen will also be scanned. Often these holes contain small sample objects that otherwise would not be scanned.
- Remove specks If selected, the scanner does not digitize objects smaller than the predetermined size. This helps filtering specks and other uninteresting objects out. Set the maximum size of specks not to be digitized by adjusting the **Speck size** slider.
- Dilate mask Adjust the slider to enlarge or decrease the scanned area. The edge is extended discretely by 100 μm each time.



The previously saved scanmap can be loaded for use.

- **Use Threshold:** Preview settings set in Microscope Controller Panel / Preview window are applied to create a scanmap.
- Loaded scanmap: This function is useful if the slides contain areas of interest that cannot be
 detected by the preview camera. This function along with saving profiles helps to scan all
 slides with the most adequate settings.

To load a mask, click first, then browse for the scanmap to be loaded.

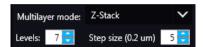
- Custom scanmap: The scanmap drawn on the preview image is used for scanning.
- Use selection box restriction

If is selected, only the area inside the box is scanned. It is useful if you only want to scan the area that is equivalent with the size of the coverslip, so external specks will not be scanned.

Multilayer mode

• **Single layer mode:** If none of the filters are selected in the Filters table for multilayer scanning, this mode is active and can be selected, and Multilayer mode turns inactive.

- Extended focus: By choosing the Extended focus option, the software selects the sharpest image from each focus level for each image field, and combines them into one single image. Therefore those parts that were blurry in auto/manual focus will also be sharp. This method guarantees the maximum depth of sharpness, however, it reduces digitization speed.
- **Z-stack scan mode:** Both for Extended focus and **Z-Stack** scanning methods, you can determine the desired number of focus levels with the **Focus levels** selection box. The current focus value is the starting point. If you set 5 for example, one current, two focus levels above and below FOVs are captured. Therefore, it is advised to choose an odd number for the focus levels. Separate layers are created and stored this way, and can be opened with Pannoramic Viewer. The Z-stack slide contains the extended focus layer.



Focus step size determines the spacing between focus levels. One step is $0.2 \, \mu m$. Default settings are: Levels: 7; Step size: 5.

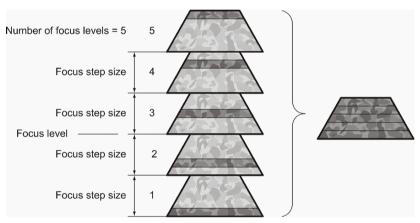


Figure 39 - Focus level and step size



· Change filters after whole slide scan

To optimize speed, filter change should take place after the digitization of the slide with one channel.

· Change filters at each field of view

Filters should be changed for each field of view if very precise colocalization is required, but consider that this option is more time consuming.



Make sure to select the **Change filters at each field of view** option if using multi band filter for multi-channel digitization.



Caution!

If the specimen area is barely visible, it is possible that the software will analyze that area as an empty one.

- Max exposure A limit value can be set to determine that the exposure time cannot be longer than the time of focusing and calculation of exposure. This is necessary because the exposure time would be too long when taking image of an empty field of view. Default value is 2000 ms.
- Multiple shots Take multiple shots, specified by the value set in the box.



Image Correction settings

- Flat field correction If this function is active the scanned slide compensates itself with a special method (light intensity statistical data, not to modify the average intensity of the slide. Quantitative measurements can be made on the slide. The following three options can be selected from the drop-down list:
- Intensity statistics legacy compensation algorithm
- Intensity reducing pixel-level analyzation of the acquired image during which the background of the image is reduced based on the comparison of the image recorded by the camera and the compensation image.
- **Intensity equalization** pixel-level analyzation of the acquired image, a one-by-one type image compensation method is applied.
- **Sharpening** image contrast is increased (the image may become noisier)



Note:

Do not use this option if you want to take quantitative measurements, since it may minimally affect the results.

Extended Focus Settings

Select the type of the extended focus algorithm used during scanning:

- Legacy uses original extended focus algorithm, it is recommended for wide-field fluorescence scanning.
- Maxima the final image is made up from all of the layers created, areas (pixel groups)
 with the highest intensity are combined together.
- **AVG** an average of the layers is used for the final image.
- Max-AVG the final image is made up from all of the layers created, areas (pixel groups)
 with higher intensity than the average are combined together.



Activate image settings by clicking this button, then choose one of the following predefined image formats (and a subsequent custom option) from the **Image Quality** drop-down list:

Excellent (JPEG: 90)

Good (JPEG: 80)

Medium (JPEG: 60)

Low (JPEG: 30)

• Custom... – If choosing this option, the Image compression setting is displayed on which you can select from different image formats. Accordingly, further adjustments can be made, except if PNG or BMP image format is selected.



Figure 40 - Image encoding window

Compression

- BMP Lossless uncompressed image format, but larger files due to less effective compression. It is a raw data file.
- PNG Lossless compressed image format.
- JPG The quality can be set in the value box. Greater values result in better quality, but larger files. The default setting is 80%.
- Bit depth: 8-bit
- Stitching: Use Stitching function enables the seamless stitching of digital tiles.
- Sharpening: Select this option to improve the visual appearance of digital slides.

5.2.2 Microscope Control Panel:

5.2.2.1 Preview window

Click to open the Preview panel that offers options for threshold setting and selection of the

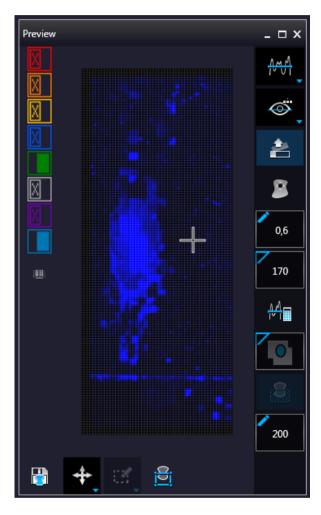


Figure 41 – Pre-scan preview image

Threshold options

This section is located at right side of the preview window. **Scanmap Source** is designed to set which type of scanmap is used on the preview image. This scanmap is displayed automatically in the **Profile Scanmap Source** setting. Selectable scanmap types are the following:

- Use threshold
- Load previously saved scanmap from file

Preview Types

In FL Microscope mode the following additional preview modes are available:

- **Brightfield preview** a normal type of illumination for scanning. This option is recommended when scanning in Brightfield mode.
- Darkfield preview preview image is created with transmitted Darkfield illumination. Make sure to select this option in Fluorescent mode.
- Fluorescent PreScan

 creates a fast FL preview image that is displayed in the

 Profile Wizard window. Scanning process takes a couple of minutes only, and it cannot be interrupted.
- Fluorescent PreScan (HR)
 creates a High-Resolution fast FL preview image of every FOV within the selected area (in single layer DAPI, with an illumination time of 20ms) that is displayed in the Profile Wizard window. Scanning process takes a couple of minutes only, and cannot be interrupted.
- Fluorescent PreScan (+HR)
 creates a High-Resolution fast FL preview image of every FOV within the selected area (in single layer DAPI, with an illumination time of 20ms) that is displayed in the Profile Wizard window. Scanning process is initiated with a simple PreScan, the located sample with auto threshold is selected, and finally, an HR PreScan is launched.
- Remove Coverslip : If selected, the edges of the coverslip are not detected as specimen to be scanned. Depending on the threshold level, it is possible that the edges of the coverslip are detected as areas to be digitized.

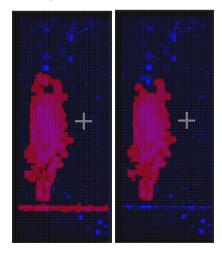


Figure 42 – Preview image with and without coverslip edge



Caution!

It requires lots of time (since it cannot find focus neither on the edges, nor on specks) to digitize coverslip edges. Select **Remove coverslip** function to eliminate those areas.



Warning!

Do **not** use **Remove coverslip** function on TMA slides! The layout of TMA slides may mislead the detecting algorithm.

- **Fill holes inside scanmap**: If selected, the holes inside the specimen will also be scanned. Often these holes contain small sample objects that otherwise would not be scanned.
- Remove specks : If selected, the scanner does not digitize objects smaller than the predetermined size. This helps filtering specks and other uninteresting objects out.

Set the maximum volume of specks mannually in the setting window



- Threshold settings
 - Auto threshold

Select this option to automatically detect the specimen in the preview image.



Caution!

Make sure that the detection result is acceptable for you. Otherwise set the threshold value manually.

Manual threshold

Set value manually or calculate value by using the **Calculate Threshold** function (can be activated only when manual thresholding is selected). This sets the sensitivity of the specimen detection. To set the desired threshold value manually, change the setting in the **Specimen threshold level** selection box in the range of 0-255. The default value is 212. Smaller values result in a more sensitive scanning, meaning that more areas will be digitized, however, this may also include specks or other imperfections of the slide. Greater values result in a less sensitive scanning, but it is possible that some of the smaller specimen areas will not be digitized.

Use marker with threshold

If the specimen cannot be identified as required for digitization, (for example, weak contrast), it can help to encircle completely the specimen with a black marker pen. You have to draw a full circle with the pen to enable the detection. Marker pen detection will make specimen detection easier by limiting the scanned area.

Manual setting of Use marker with threshold



If this option is selected, only the area encircled with a marker pen will be scanned. You can define the threshold level by changing the threshold value in the **Marker threshold level** selection box in the range of 0-255. This sets the sensitivity of the specimen detection inside the marker area. To set the desired threshold value manually, change the setting in the **Threshold** selection box in the range of 0-255. The default value is 212.

Everything within marker



Available only if **Use marker with threshold** function is activated. To scan everything within the marked area, check the **Scan everything within marker** selection box.

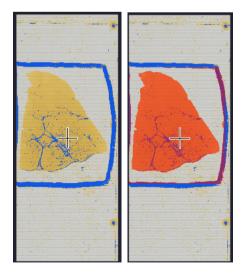


Figure 43 – Scan everything within the marker selected / not selected

Dilate mask

Adjust the slider to enlarge or decrease the scanned area and the edge will be extended discretely.

To switch to manual mode click the top left corner of the button and the required value can be entered in the box

Preview Toolbar

This section is located at the bottom of the preview image.



Save scanmap

Click this icon to save the currently selected areas to scanmap.

Position

To position the specimen holder that holds the current slide, click **Position sample** and then click on the area of interest on the preview image. This will define the Live image that you can access from the **Live view**.

· Union 🦾

Add the selected areas to the preview. Mark area for scanning based on the shape selected in the Preview Toolbar. This area will not be scanned.

• Erase

Delete selected areas from the preview image. Deselection is made based on the selected shape from the Preview Toolbar. This area will not be scanned.



Figure 44 – Not scanned selection

• Edit

The size of selected area (positive or negative) can be modified at the borderlines or corners.

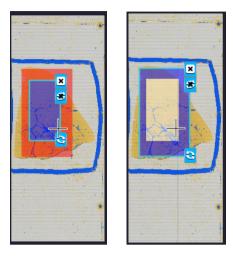


Figure 45 – Edited negative and positive selection masks

· Crop

Crop the area of the selected area.

Place Circle

You can select the area to be scanned with the different tools on the Preview toolbar.

• Rectangle tool

Draw rectangle shaped area.

• Ellipse tool

Draw ellipse selection.

· Polygon tool

Area selection by defining a polygon shape. Finish area selection by double-clicking with the mouse at or near the starting point.

• TMA tool

TMA tool is used for selecting TMA spots on TMA slides. You can set the selection settings on the following four tabs:



• TMA Grid Setting

This function is enabled only if a TMA grid has already been placed on the preview image. Set grid parameters (row and column numbers) and spot shape (round or rectangle).



Figure 46 – TMA tool: Grid selector

Delete TMA grid by clicking the X at the top right corner, and rotate grid by clicking the icon at the bottom right corner. Enter the number of rows and columns in the **Rows** and **Columns** fields or select the appropriate values with the arrows. Enter the distance between two spots on the X and the Y axis in μ m in the **Core distance** fields or select the appropriate values with the arrows. Enter the average diameter of the spots in the **Core size** field or select the appropriate value with the arrows.

• Clear scanmap

The entire scanmap area will be cleared and reset to default.

• Use selection box restriction

If selected, only the area inside the box is scanned. It is useful if you only want to scan the area that is equivalent with the size of the coverslip, so external specks will not be scanned.

The preview image shows the area that will be digitized with a red and/or an orange mask. If the **Use selection box** is enabled, there is a black frame displayed in the image.



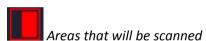
Figure 47 – Use selection box

The following colors are used in the preview image to demonstrate digitization and selection settings:



Figure 48 – Colors in preview image and Label area switching button





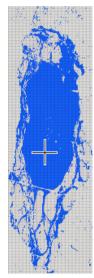
These areas are digitized on the basis of user settings (for example, **Fill holes in scan area**) and not detected by the selected threshold value.



These areas are digitized. They are detected on the basis of the selected threshold value.



These areas are not digitized on the basis of their position (for example, they are outside the selection box). They are detected by the selected threshold value.







If **Scan area inside the marker** is selected in the Preview panel, the preview camera detects the marker pen. The inside areas appear in red color and will be digitized.



This color is only displayed during scanning.





Discrete sample areas will be scanned separately as individual slides. If there are two samples on a slide, two separate virtual slides will be created.



Show pre-scans pseudo-colorized

Click the button to display barcode label area. To rotate the label area by 180°, click **C**.



Figure 49 - Barcode label area window

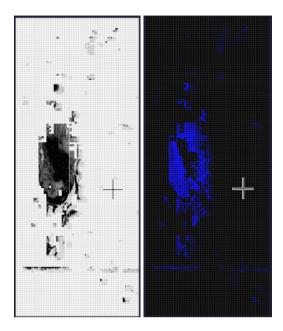


Figure 50 – Pseudo-colorized pre-scan image

5.2.2.2 Focus Indicator

Click to activate the **Focus indicator** function. Search for the sharpest focus on the current field of view automatically by clicking - **Auto focus** button.

To define focus limits, select **Limit the range**. Set the upper and lower limits by selecting the desired value in the selection boxes. By using **Set +-Range**, the **Lower limit** value is set to -32 of the current focus value and the **Upper limit** value is set to +32 of the current focus value. This is useful if **Auto Focus** does not find the focus on the specimen, but on the coverslip. Also, this makes the focusing sequence faster.

For manual focusing define the manual focus step size by adjusting the **Step size** slider and use the two arrow buttons to focus manually. This is useful when you are interested in an area that remained blurry with **Auto Focus** (for example, the specimen is thicker in that area). This does not influence the way slides are digitized in Auto focus mode.



Figure 51 – Focus indicator panel

5.2.2.3 Exposure Indicator

Exposure time for the live image can be calculated by using the **Calculated Exposure** function is available to switch between microsec, millisec, and sec units for the reading of exposure time.



Figure 52 - Window of Exposure Indicator in Fluorescence scan mode

Select the types of filters you want to use during scanning. You can select the filter types and the number of channels to be used. The values in the **EXC** column define the excitation of the Lumencor illumination, in **TW** define exposure time weight, and in the **DG** the amount of digital gain is displayed. It is also available for you to enable Extended Focus (**EF**) and/or Z-stack (**ZS**) functions in this field.

Exposure Settings

You can set the **Exposure time weight (%)** here (displayed under **TW** in the **Channel Settings** frame). Set Lumencor excitation intensity at the **Excitation intensity (%)** field. The defined value will be used as maximum when applying Auto Exposition time if you activate the **Max. excit. Intensity** option.

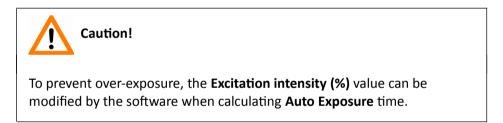


Image Intensity

Click to open Image intensity panel. An **image** is defined as a two-dimensional function f(x, y) the amplitude of at any pair of coordinates (x, y) is called the **intensity** or gray level of the **image** at that point. The pixel intensity at the coordinate pointing at with the cursor is displayed in the Image Intensity window.



Figure 53 – Window of Image Intensity

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5.2.2.4 Stage positioning

After clicking you can perform microscope movements on the Live image with this control function. The number at the center of the controller defines the step size by which the stage is moved. Value can be entered by hand or with the slider.

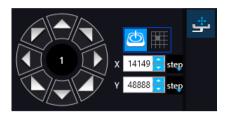


Figure 54 – Stage positioning panel

5.2.3 Quick Preview functions

Use Ctrl + mouse wheel to zoom in or out to the preview area or the Live image.



Figure 55 – Settings of preview quick toolbar

A **Quick Toolbar** pops up by right clicking any of the control menu items. It allows a quick access to main functions, and for FL these are the following:

- Drag
- Draw
- Erase
- · Retake preview
- Settings
 - Toggle delation always on top
 - Reset Zoom
 - Window auto-size
 - Clear Scanmap

5.2.4 Quick Microscope functions

A quick microscope functions tool can be displayed upon right-clicking on the background of the main window (outside the preview window). It includes quick-access-buttons to main functions:



Figure 56 – Quick toolset for microscope

Focus



Figure 57 – Focus

- Autofocus
- Set coarse focus point
- Set interpolated focus point 1
- Set interpolated focus point 2
- Set interpolated focus point 3

Objective type



Figure 58 – Objective type

- ∘ 20x
- o 40x

Filters



Figure 59 – Filters

Microscope mode



Figure 60 – Microscope mode

- Brightfield
- Fluorescence

Live tools

- Fast mode
- Screenshot
- Magnifier
- Ruler
- Image processor plugins
- Use pseudo-color
- Add scanmap



Figure 61 – Live tools

Auto-exposure



Figure 62 – Auto-exposure

5.2.5 Bottom menu bar of the main window

Profile History

This function can be activated by clicking in **Preferences**. During setting scanning profile all of the previously used parameter will be saved automatically.

Each modification in the profile creates a so-called Milestone unit. These stage units are linked in a row displayed at the bottom left corner of the main window.



Figure 63 – Progress of the profile modification history

Once you are moving the mouse cursor over a unit all of the parameters will become visible in a popup window.



Figure 64 – Details of parameter modification

For the easier perspicuity, modifications can be observed in a pop-up window by clicking the button in which both the original and the modified values are presented.

Click to save parameters of the milestone unit into a new profile.

Click to restore a modification stage (load parameters of a milestone unit) if needed.

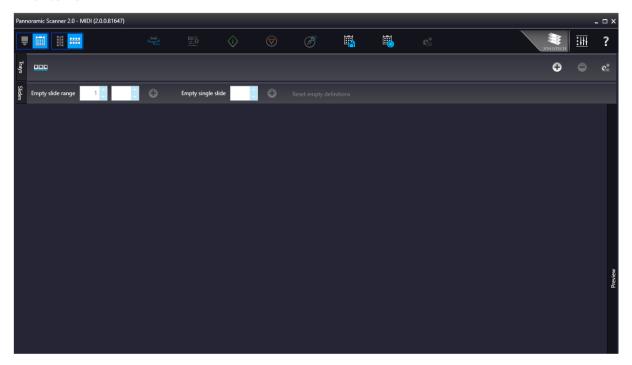


Figure 65 – Profile history tree

5.3 Planner mode

The whole scanning procedure can be planned in this mode. Assign profiles to slides, modify scanmaps without performing physical loading of slides.

In Planner mode not only the scanning of the actually loaded tray can be planned, but also profile assignment to slides of prepared virtual trays is available to be performed. It is also possible to scan to different locations with each profile, and virtual slides can be created and stored in different folder or server.



Planner module includes three appearance types for planning scans, located under the **Preferences** / **Planner Layout Selector** menu:

- Slide view with card
- Table
- Card collection

5.3.1 General functions at the main menu

- Microscope/Planner selector
- Horizontal/Vertical selector (Available in Slide view with card mode)
- Stage Control Available after initialization, upon clicking the slide icon or entering slide position number at the right side, the slide can be loaded.
- Scan to Available after loading procedure, unique settings can be defined even for each separate scanning.
- Start scan Scanning of the actually loaded slide, or if the planner has been defined, the whole scanning process can be initiated.
- Stop scan
- Stop actual process
- Start scan Scanning of the actually loaded slide, or if the planner has been defined, the whole scanning process can be initiated.
- **Take all previews** Preview images of all the slides on the tray are taken automatically. Select the required preview type from the following: Brightfield, Darkfield, Pre-scan, Pre-scan high-resolution, Pre-scan + high-resolution.



Figure 66 - Take all preview selector

Save planner – A scanning plan containing all parameters and profile assignment will be saved.

Load planner – The previously saved scanning plan can be loaded.

- Planner menu The following profile-related tasks applicable for the planner can be performed:
 - · Add current profile to all racks
 - · Open profile for all racks
 - Detach current profile from all racks
 - · Detach profiles from racks
 - Clear planner



Figure 67 – Planner menu

- Jump to scanned Loads the planner view of the actual slide during scanning
- Preferences
- ? Help

5.3.2 General functions at the tray menu

Rack view mode selector: Several other trays can be added to the planner



- Click + to add a virtual tray to the planner, and to remove a tray from the planner.
- Rack menu includes the following global settings applicable to all trays:
 - Generate random planned rack
 - Add current profile for all slides
 - Open profile to all slides
 - · Detach current profile from all slides
 - · Detach profiles from slides

5.3.3 General functions at the slide menu

- Mark empty slide positions Define range in the Empty slide range boxes to set multiple slide positions as empty. For single slides, enter / set slide position with the arrows in the Empty single slide box or right-click on a slide and select Mark as empty.
- Click **Reset empty definitions** to cancel slide selections as empty, or right-click the slide selected as empty and click **Reset**.



Figure 68 – General functions at the slide menu

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5.3.4 Slide view with card

Select from Preferences / Appearance settings / Planner layout selector to activate this view.

Depending on the actual view preference selected at it, slide positions can have a horizontal or vertical layout. Slide preview and the list of the assigned profiles are displayed.

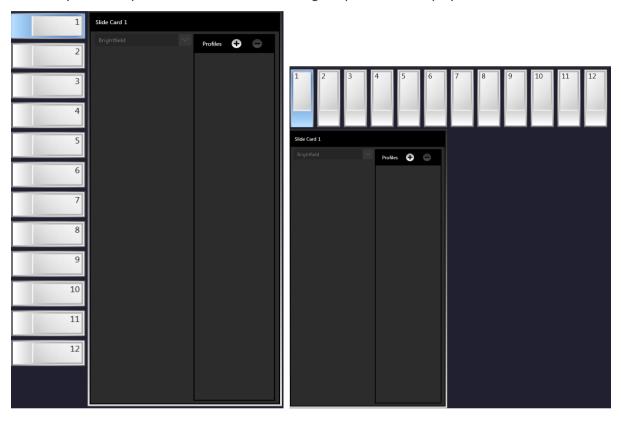


Figure 69 - Vertical and horizontal Slide view with card

By clicking or profiles can be added or removed for/from the slide, respectively. The parameters of the assigned profile is displayed in a card. The colors of a Brightfield and a Fluorescence profile cards are different.



Figure 70 - Brightfield profile card and Fluorescence profile card

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The following information are included in a profile card:

- Profile name in the top left corner.
- Profile status is marked with spots of different color:

 - ∘ **I** Draft
- Scanning mode icon representing Brightfield or Fluorescence mode
- Objective type
- Filter channel color bars (for FL mode only)
- Scan progress
- Scanned FOC count
- Scan duration
- Slide: actual status of the slide is presented here. If the slide is under scanning, the "Scanning", if scanning has been interrupted by some error, the "Failed" text is visible.

NOTE: If slide status is marked as "Failed", delete status before scanning by clicking **x**.

If the virtual slide is created (the scanning is finished), the location path of the destination folder is displayed. To re-scan and thus recreate the slide, click at the front of the displayed path to start the scanning process over.

Scan properties

5.3.5 Table view mode

By clicking each slide will be displayed in a separate row.

Click to assign profile to a slide, and to detach a profile from a slide. A slide can have more than one profile assigned to it, and these profiles can either be BF or FL if the scanner is capable to operate in these two scanning modes.

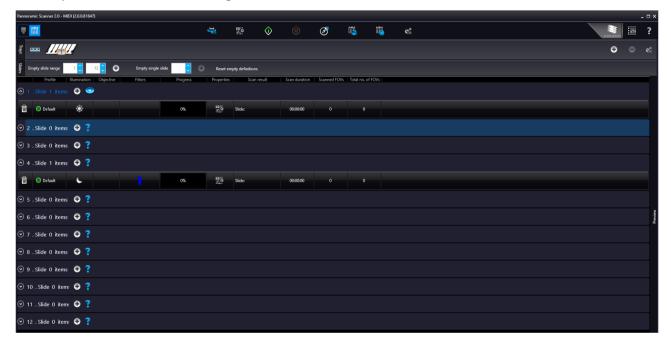


Figure 71 – Table view mode

In Table view the following information are displayed in the profile strip based on the loaded profile:

- Profile name
- Illumination
- Objective type
- Filters
- Progress
- Properties: The location of the virtual slide with the selected profile can be defined
 - Scan result
 - Scan duration
 - Scanned FOV'S
 - Total FOVs

5.3.6 Card collection view mode

If you click the button, each of the slide previews are displayed in the window. Add profiles by clicking + and detach profiles by clicking – . Functions are the same as with the other modes.

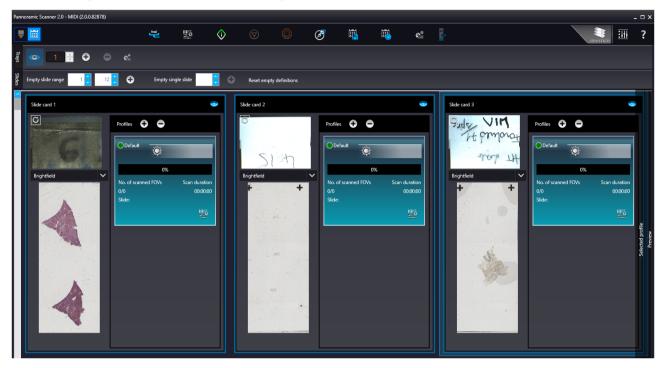


Figure 72 – Card collection mode

5.4 Profile and Preview overview on the Planner

Each of the assigned profiles are checkable and modifiable. The expanding panel at the right side includes all of the profile settings, in coherence with the view type of the Profile Setting panel. Slide preview is displayed in the Preview window in which the scanmap can be modified until beginning the scanning process. Every aforementioned Profile setting can be modified depending on the scan profile type, being Brightfield or Fluorescence.

Click to load the planner view of the actual slide during scanning.

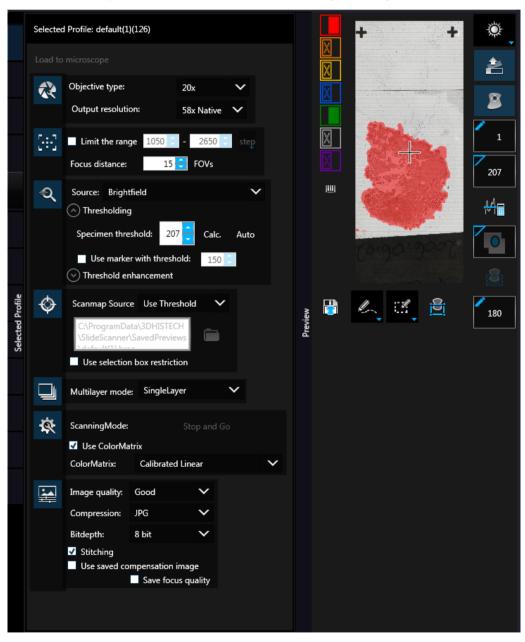


Figure 73 - Selected profile and expanded Preview window in Planner mode

5.5 Progress features

The progress is visible both in Microscope and Planner modes whenever there is a running hardware operation or scanning procedure. Progress content can be therefore different depending on the type of the running procedure.



The following information is included in the progress log list during scanning:

- Filter
- Elapsed time
- Location
- Slide name
- Free space
- FOV number

5.6 Service and Settings

Activate **Service** by clicking and **Settings** by clicking at the right side of the main menu bar.

5.6.1 Service

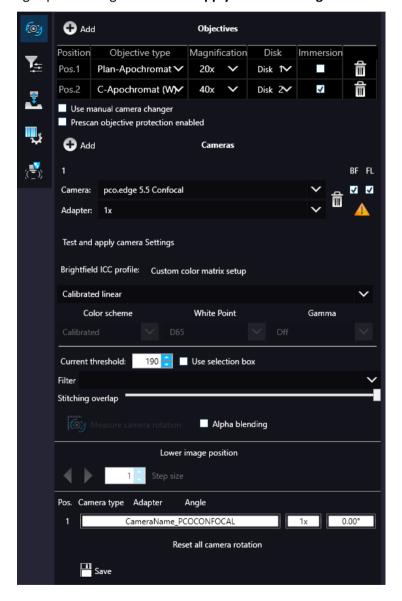
Activate **Services** by clicking at the right side of the main menu bar.

- Camera settings
 - Position
 - **Objective type** Select the type and the magnification level of the objective.

- Magnification
- Use manual camera changer Changing the cameras is performed manually.
- Prescan objective protection enabled If activated, slide area near the edges will not be scanned to record fast preview image. If inactive, Fast Preview processing becomes slower.

Cameras

Activate **BF** and/or **FL** mode for the camera. The software automatically loads the camera settings upon clicking the **Test and apply camera settings** button.



Brightfield ICC Profile

Select an applicable preset color profile to be used for Brightfield scanning from the drop-down menu. Settings according to the profile has effect on the color set, color temperature, and gamma value of the scanned image.

Preset profiles are the following:

- Calibrated Linear: Color scheme is defined by calibration (Gamma value is not included)
- sRGB standard: Color scheme is defined by calibration (standard Gamma value -2.2is applied)
- sRGB standard Microscope Like: Color scheme is defined by calibration (standard Gamma value / White Point: D50)
- Legacy: a Color scheme calibrated for the previous software version is applied
- Custom: parameters are freely customizable as follows:

Color Scheme

- Calibrated: Scheme is defined by the color calibration slide
- Legacy: a Color scheme calibrated for the previous software version is applied
- Raw: the color information of the recorded raw image is applied

White Point

- **D65**: color temperature according to a standard illuminant D65 white point value is applied (6500K / daylight)
- D50: color temperature according to a standard illuminant D50 white point value is applied (5000K / horizontal daylight)

Gamma

Standard: a value of 2.2 is used

Medium: a value of 1.8 is used

Off: a value of 1.0 is used



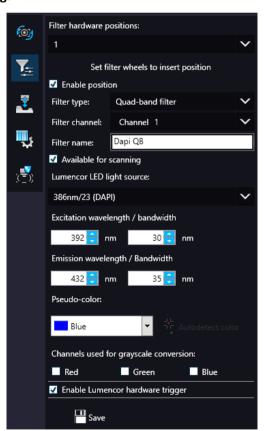
Note:

If Lumencor SPECTRA 6 is configured as illumination unit, the corresponding **Enable Lumencor hardware trigger** option is displayed on the **Filter settings** form.

- Use manual camera changer
- Prescan Objective Protection Enabled If activated, slide area near the edges will not be scanned to record fast preview image. If inactive, Fast Preview processing becomes slower.
- Current threshold Set the desired threshold level in the box.
- Use selection box If selected, only the area inside the box is scanned. It is useful if you
 only want to scan the area that is equivalent with the size of the coverslip, so external
 specks will not be scanned.
- Stitching overlap Set the amount how much the FOVs should extend over
- Measure camera rotation Camera rotation angle is measured
- Alpha blending The two images are blended
- Lower image position Moves the upper image sideways in distinctive steps
- Reset all camera rotation Click this button to set camera rotation values to default.

Save settings by clicking

• Filter settings



On this panel you can define which filters occupy which turret positions.

- Select filter hardware positions from the drop-down list
- Move filter wheel to insert position
- Enable position
- Select Filter type, Filter channel, and Filter name
- Check Available for scanning
- Set Lumencor LED light source, set Excitation and Emission wavelength / bandwidth values for the selected filter.
- Set Pseudo-color
- Select channels used for grayscale conversion
- Select Enable Lumencor hardware trigger

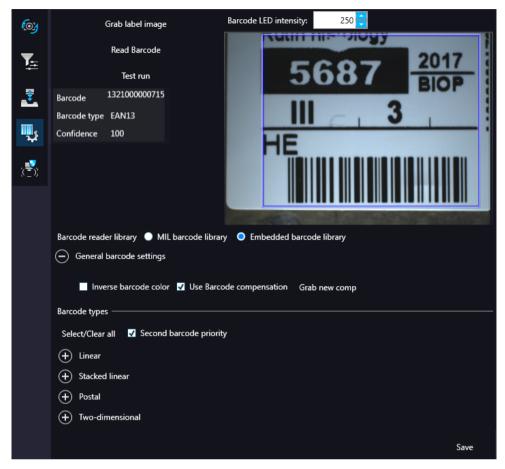
Click Save to save settings.

- Z-difference

This function is available only for fluorescence settings; it enables you to set the basic focus differences between the filters. This facilitates more precise focusing during scanning.







By predefining barcode type, foreground color (black or white – the color of the barcode), and other settings, you enable the **Read Barcode** option when using the control software.

To display an image of the barcode area, click . You can redefine the barcode reading area by dragging the edges of the blue square. To check whether the barcode reading settings are correct, display the barcode digits in the **Barcode** field by clicking . If the label area is not correctly illuminated, adjust **Barcode LED intensity** value. Click to check that barcode settings are correctly set.



If you did not set the barcode type correctly, or there is no barcode in the barcode area, the software will display the following error message: "Barcode detection unsuccessful! There might be no barcode present."

Barcode reader library

Select MIL barcode library or Embedded barcode library

General Barcode settings

Inverse barcode color

Activate to invert foreground and background colors of the barcode.

Use barcode compensation

A compensation image is used during barcode reading

Grab new comp

Click this button to create a new compensation image for barcode.

NOTE: New compensation image for barcode can be recorded only if MIL is used for barcode identification.

Barcode types

- Linear
- Stacked linear
- Postal
- Two-dimensional

Second barcode priority

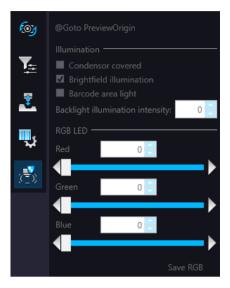
The software is capable to read two barcodes at the same time. If activated, the second barcode will be the barcode used for slide identification.



Note:

When having two barcodes on the slide, barcode layout must be consequential.

• Microscope control



Goto Preview Origin

Illumination

- Condensor covered
- Brightfield illumination
- Barcode area light
- Backlight illumination intensity

• RGB LED

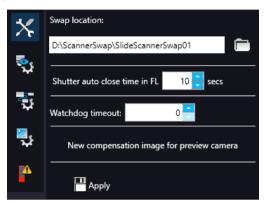
• Set illumination intensity per channel

Save RGB

5.6.2 Settings

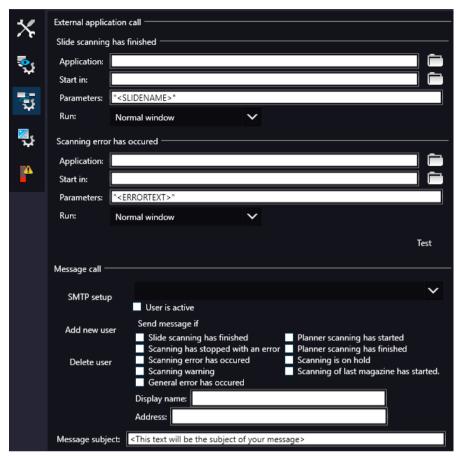
Activate **Settings** by clicking at the right side of the main menu bar.

- Basic settings



Prescan settings





• External application call

Two of the three settings are responsible for opening external applications (.exe or .bat) as defined (for example, CaseViewer software can be opened after scanning is finished).

You can define external application call settings for the following cases:

- Slide Scanning Finished
- Scanning Error Occurred

For **Slide scanning has finished** and **Scanning error has occurred** you can define the external software by entering the file path in the **Application** box, or by browsing for it by clicking [!] .

If you define parameters in the **Parameters** field, it will pass them to the software that it starts. If no parameter is defined, then the parameter will not be passed. The default parameters are the following:

 For Slide scanning has finished: "<SLIDENAME>" – transfers the slide name For Scanning error has occurred: "<ERRORTEXT>" – transfers the error message

Run defines the window mode that the external application will start in. The following window modes can be set:

- · Normal window
- Minimized
- Maximized

You can test whether the **Scanning Error Occurred** settings work by clicking . .

In the **Message Call** section of the window complex messaging functions can be defined. Here you can setup parameters of the mail server, add or remove users, and also set the message body in the **Message subject** field by entering a text for example, to inform recipients on the location of the scanner, or the slide set you are working with.

Click • to test settings (by sending an e-mail to the address defined in the **E-mail To** field) after you have finished to check their relevancy before applying them.

First click **SMTP setup** to display the E-mail settings window, in which you can dedicate an e-mail server through which the software sends e-mails to the selected recipients.

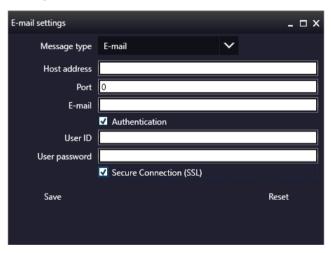


Figure 74 – Messenger Setup window

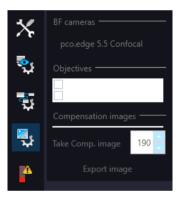
In the Messenger Setup window the following parameters can be set:

- Message Type E-mail
- Host Address
- Port
- E-mail
- Authentication User ID and User password are required.

- **Secure Connection (SSL)** If activated, the messages will be sent through secured connection.
- If you have properly set messenger settings, click **Save**.
- Click Add new user in the Message Call section of the External application call settings window then enter Display name and Address of the recipient. Select message functions under the Send Message if: field for the selected recipients (from the drop-down list at the top of the section).
- Click **Delete user** if you want to remove a user from the list after selection.

■ – Image compensation

You can use a saved compensation image whenever compensation-related issues occur (deriving from the slide, illumination, staining or embedding medium irregularities).



- BF cameras field displays the active camera. Currently, there is only one active camera for Brightfield mode.
- Objectives field displays the objective used for scanning.

There might be specks or minor etches on the surface of the compensation slide that require modifying the threshold settings. Therefore, the scanner will not use those areas for the creation of the compensation images.

To modify the threshold settings, set the desired threshold value in the box.

To create the compensation image(s), click **Take Comp. image**. Click the **Stop** button to interrupt the process. The progress bar at the bottom of the window displays the progress of the compensation image creation.

• **Export image** – Save compensation image.

Emergency slide operations

This panel contains control and maintenance functions.

• Emerg. position

The slide holder will be moved to a position where the slide can be removed manually after opening the cover (see section **7.3.1 Opening the protective covers**).

Slide removed

Click this button to notify the software that you have removed the slide manually.



5.7 Hosting

Hosting a live teleconsultation session gives specialists the opportunity to examine the same Live microscopic image during a real-time counseling even if being in laboratories far away from each other. This means multiple users can connect to the device at the same time. The user of the scanner will be the host with direct access to the scanner.



Both the client's and the host's scanner software version must be identical.

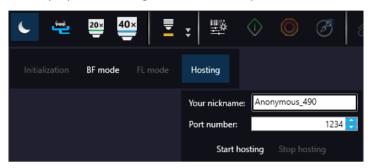
Once client users have connected, they will be able to reach the following functions of scanner:

- Live image
- Preview window
- · Profile content
- Stage control.

Each participant see the same live image within the same preview window. The active user can navigate on the slide and set up a scanning profile. The **Start scan** function is also available for the active user. Each participant can make comments in a chat window while examining the slide image.

Hosting a teleconsultation session

- 1. Select Hosting from the microscope mode menu
- 2. Type in your nickname used during the session
- 3. Click Start hosting
- 4. The software displays the hosting address and the port number



Join teleconsultation as a client

- 1. Start the Lite version of the scanner software
- 2. Type in your nickname used during the session
- 3. Enter Host address and Port number
- 4. Click Connect

On Client side the following functions are unavailable/inactive:

- Selection box
- Scan properties
- · Separate scanning



Note:

During a fluorescence Live consultation the shutter of light path will be closed automatically during the host time in order to save the sample from the burnout effect.

6 Using Profiles



Saved profile settings can be used only on that specific Pannoramic scanner you are working with.

If you want to scan a group of slides, it is advised to save your settings previously in a profile and continue scanning in Automatic mode. You can save the following settings in a profile:

Scan Mode

- Brightfield
- Fluorescent

Scan Options

- Focus frequency (in Fluorescent mode)
- Focus frequency (in Brightfield mode)
- Compression procedure
- Use of a fixed compensation image (in Brightfield mode ON/OFF)
- Use of Save focus quality (ON/OFF)
- Use of stitching (ON/OFF)

Determination of the area to be scanned

- Use of automatic threshold specimen
- Use of specimen threshold value
- Use of marker pen threshold and specimen threshold values
- Use of scan everything within marked area (ON/OFF)
- Remove coverslip function (ON/OFF)
- Filling of holes (ON/OFF)
- Use of removing specks according to the set value (ON/OFF)
- Use saved scan area
- Use selection box (ON/OFF)

Fluorescent settings

- Filter position(s)
- Selected focus channel
- Selected stitching channel
- Flat field correction (ON/OFF)
 - Intensity statistics
 - · Intensity reducing
 - Intensity equalization
- Sharpening (ON/OFF)
- · Custom extended focus

Other settings

- Limitation of focus range (ON/OFF)
- Enable/disable Multilayer options
- Use of extended focus or Z-stack step size and focus level

7 Troubleshooting and Maintenance

7.1 Safety Information

Check cables, plugs and connections before operation, and if defective or cannot be replaced, contact Thermo Fisher Scientific Service for support.

Check whether the device is compatible with your local line voltage. It can operate at line voltages 100V to 240V and 50-60 Hz.

Only plug the device in a socket with protective grounding (earth) contact.

Do not operate the device in explosive environment.

Disconnect the device from the power outlet before opening it or replacing a part.

The product is not equipped with protection against hazardous materials (infectious, toxic, radioactive, corrosive substances or other effects damaging to health). Decontaminate infectious materials after use.

Dust, specks and humidity may decrease or harm the operating capability of the device. Protect it with dust cover when not in use. Switch the power off before covering it.

There is crush hazard during operation in the area of input or output. Trays should be moved through software. Never open the device unless prompted accordingly by the software.

Defective devices do not classify as domestic waste. Dispose of the device in compliance with the currently valid legal requirements.

7.1.1 Cleaning the device

- · Before cleaning, switch off the device and pull the plug out.
- Do not let liquid penetrate underneath the cover of the device.
- To clean liquid from the device, use a lint-free cotton cloth. You can moisten the cloth with water.
- To clean outer surfaces of the device, it is recommended to dip a piece of cloth into clean water and gently rub problematic areas.
- For the cleaning of inner parts of the Pannoramic Confocal use **Ethanol**.

7.1.2 Cleaning the objectives

During immersion scanning fluid may get to the stage, slide, tray, and the objectives. Before using the "dry" objective always make sure to clean these areas at the following cases:

- On Service panels when clicking **Clean Microscope**.
- When switching to dry objective.
- Upon clicking on the Auto forms. If there is a "dry profile" slide in the slide set, then it will be skipped.
- Whenever you select dry scanning after immersion scanning.

Every time it is necessary, the software instructs you to perform cleaning tasks, providing you detailed steps in each of the information boxes.

For the cleaning of optical parts use Ethanol.

For more information read "*The Clean Microscope*", a Zeiss manual on how to clean optics. To read the book online, follow this link: http://microscopy.duke.edu/downloads/The%20Clean http://microscopy.duke.edu/downloads/The%20Clean

7.1.3 Cleaning the trays

NEVER clean the trays with **Xylene**, because it might harm the plastic. We recommend to apply **Isopropanol** on a piece of lint-free cotton cloth and gently rub the surface instead. In case the tray is damaged, use either order a new one, as inserting a deteriorated tray could lead into unsafe loading of slides.

7.1.4 Preventive maintenance

To prevent fungus growth

- Do not leave the equipment in an unconditioned environment with a storage temperature above 60°C (140°F) or below 0°C (32°F), which may damage the equipment.
- Maximum operating temperature is 35°C (95°F) with a relative humidity of less than 75%.
- Install it in a room with proper air ventilation.
- Do not let dust or fingerprints remain on optical surfaces.

7.2 Troubleshooting

This section describes the most common troubleshooting solutions for the Pannoramic Confocal product. If any problem arises that does not have solution in this manual, contact the service personnel.

The product does not start

Power supply is interrupted

- 1. Make sure that the power switch is on (state 1).
- 2. Check cable connections.

Control software has stopped

· Slide jammed

- 1. Exit control software.
- 2. Switch off control computer and the power supply, disconnect power cable.
- **3.** Open the service door. Follow the steps in section **5.3.1 Opening the service door**.
- 4. Remove slide manually (see section 5.3.4 Removing a slide).
- 5. Close the service door.
- **6.** Reconnect power supply cable and control computer to line power supply.
- 7. Switch on the power supply.
- 8. Switch on the control computer.
- 9. Launch control software.

Tray jammed

- 1. Exit control software.
- 2. Switch off control computer and power supply, disconnect power cable.
- 3. Open the service door (see section 5.3.1 Opening the service door.
- **4.** Remove tray manually. If a jammed tray cannot be removed, contact service personnel.
- 5. Close the service door.
- **6.** Reconnect power supply cable and control computer to line power supply.
- **7.** Switch on the power supply.
- 8. Switch on the control computer.
- 9. Launch control software.

Virtual slide is improperly focused almost across its entire surface

- · Focus range enabled
 - Disable Limiting focus range function

Poor image quality

- Imaging error (for example, chromatic aberrations)
 - Contact Thermo Fisher Scientific Service for support.



Warning!

Do not modify the camera driver settings, as the default factory settings give the most accurate images.

- Image is of low intensity or noisy
 - The scannable depth of tissue is highly based on the light-absorption capacity of the sample. If scanning a thicker tissue sample, the resulting image may become noisy due to the characteristics of confocal imaging and the loss of intensity.
- Brightfield image is blurred when using any of the two objectives
 - Check the cleanness of the condenser, and clean it if needed. Fore more information see section 5.3.7 Removing and cleaning the condenser.



Warning!

Prior performing this operation, the device must be powered off.

- FOVs are of different intensity on the confocal image
 - Recalibration must be performed. Contact Thermo Fisher Scientific Service for support.

Virtual slides show poor stitching in Pannoramic Viewer

- · Scan camera is not properly adjusted (for example, due to loose fixture)
 - Contact Thermo Fisher ScientificService for support.

Slide is often positioned incorrectly

- · Guiding fault in transport system
 - Contact Thermo Fisher Scientific Service for support.

Digitization process is extremely slow

- Extended focusing option is activated
 - Deactivate the Extended focusing option if not required.
- Z-stack option is activated
 - Deactivate the **Z-stack** option if not required.

Image is out of focus (in Manual mode)

- · Focus range limit is activated
 - Deactivate the **Limiting focus range** option.
- Focus range setting is incorrect
 - Change focus range setting.

All individual images show a shading effect

- · Algorithm failed to find empty image fields
 - Capture a reference image with a blank slide (see section 4.3.2 Scan Options).

7.2.1 Fluorescent Applications

The switching of the Lumencor cannot be triggered, in spite of trigger connection through the camera.

Contact Thermo Fisher Scientific Service for support.

No suitable exposure time can be found. Signal is too weak.

Contact Thermo Fisher ScientificService for support.

7.3 Maintenance

This section describes the most common maintenance solutions that can be performed by the user of the product. For maintenance solutions not described in this manual, contact the service personnel.



The security level of the device will not be altered after maintenance work is done.

7.3.1 Opening the service door

To remove the pipette, perform other maintenance work, or if the running digitization procedure is interrupted because of slide or tray jamming, the service door of Pannoramic Confocal need to be opened in order to eliminate the problem. Except for the filter change and pipette removal, before opening the service door, exit control software, switch off power supply and disconnect power cables.

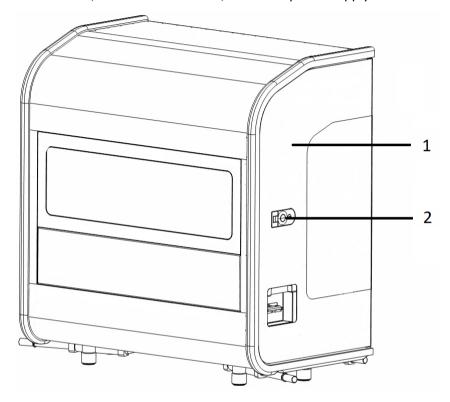
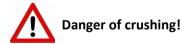


Figure 75 – Lock for service door

The service door (1) can be opened simply by releasing the door lock (2), then the door can be manually opened. On completion of the maintenance or repair work, the service door must be closed back again and locked (a "clack" sound can be clearly heard).



Be careful when closing the service door as your fingers may get crushed at the areas of door hinges.

7.3.2 Replacing fuses of the main power switch

- 1. Switch off the main power supply and disconnect the power supply cable (see section 1.1.4 Base Unit).
- **2.** The fuse compartment is located above the main power supply switch at the back side of the Pannoramic Confocal.
- 3. Release lock (1) by pushing the lever upwards, so the insert (2) can be pulled out.

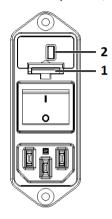


Figure 76 – Fuse compartment

4. Remove insert from the compartment.

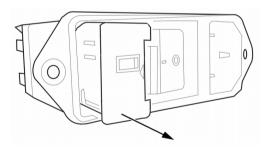


Figure 77 – Removing the fuse insert

5. Replace fuses, put the insert back into its seating, and push it inwards until you hear a snap, so the lever locks.

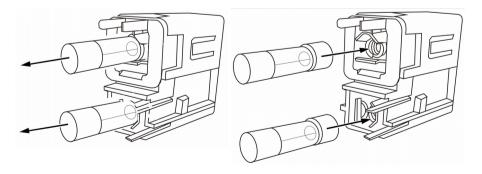


Figure 78 – Replacing the fuses

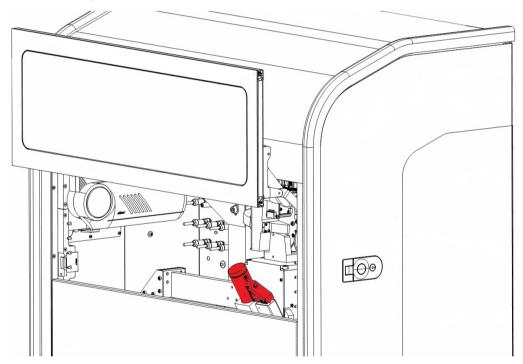
7.3.3 Removing and refilling the pipette

The pipette is capable of storing distilled water as immersion fluid for the confocal objective. If the remaining quantity in the pipette is too low, the software instructs you to remove the pipette unit and refill with distilled water. Make sure that only premium quality distilled water (conductance is less than $10 \,\mu\text{S/cm}$) is used.

NOTE: Two types of pipette that can be used – **Type 1** and **Type 2**, according to the purchase order. Type 2 pipette can contain a higher amount of distilled water.

Follow the below steps to remove and refill the pipette if necessary.

- 1. Open the pipette door by pushing it at its lower part while the device is powered. The door lifts automatically.
- **2.** The pipette is located at the front of the device behind the door (marked with red on the below image).



3. Grab the pipette firmly at the top, then pull it outwards from its seating.



Warning!

Do **NOT** turn the pipette upside down, and make sure to hold it so that its tip points downwards during the whole process of emptying and refilling.



Warning!

Pipette unit removal must be performed by an experienced and trained person only. If the pipette unit is removed with not enough care, the skin of your hand can be bruised.

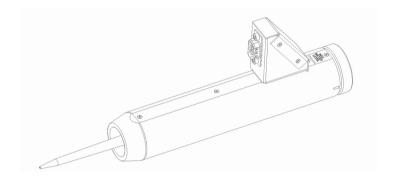


Figure 79 – Type 2 pipette

4. Rotate the knob anti-clockwise to empty the pipette entirely (Type 1)

OR

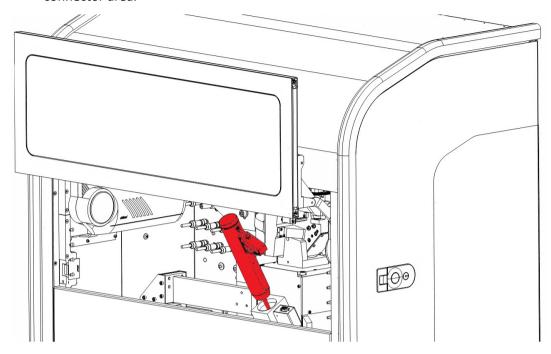
Remove the top cap of the pipette (Type 2).

5. Dip the pipette head into the container for distilled water, and rotate knob clockwise until end-point to pump up the necessary amount of immersion fluid (**Type 1**)

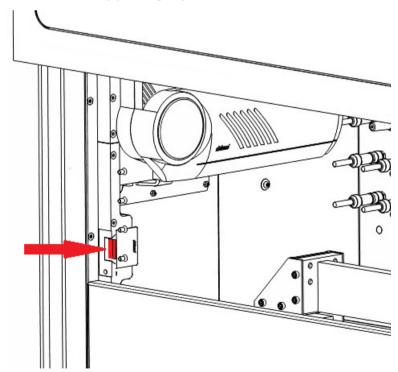
OR

Hold the pipette vertically and top up with distilled water until its level reaches the marking "MAX LEVEL" (**Type 2**). Place cap back when finished.

6. Place the pipette back to its seating, and make sure that there is no gap remaining at the connector area.



7. Close the service door by pushing any of the two buttons at the sides of the door frame.



7.3.4 Removing a slide

If a slide got jammed or has suffered breakage during the process of digitization, stop the process and, if possible, move the slide holder to a position where the slide can be easily removed by clicking the **Emergency Manual Slide Removal Position** button (see section **4.3.6 Service panel**).



Warning!

Crush hazard! Before you remove a jammed slide, cancel the running digitization process, terminate the software session and turn the power off

Any manipulation performed on a mechanical component must be followed by a complete device initialization routine (software restart).

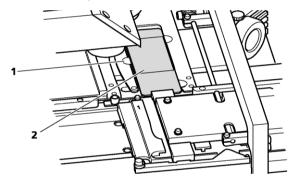


Figure 80 – Removing a slide

- 1. Open service door (see section 5.3.1 Opening the service door).
- 2. Move clamp (1) to the left, so the slide could be easily removed.
- **3.** Remove the slide **(2)** carefully.



Caution!

If the slide is broken, make sure to remove all pieces completely from the device. The edge of the broken area of the slide is sharp and it can lead to injury and contagion! Broken slide can be removed only by a well-trained person!

- **4.** Close service door (see section **5.3.1 Opening the service door**).
- 5. Launch control software.

7.3.5 Installing and Removing Filter Cubes



This section recites some extracts from the *Aurox CC88* operating manual. For detailed information, especially instructions regarding safety, consult that manual.

The Aurox CC88 Spinning Disk Confocal Imaging Attachment is a sealed unit, hence the internal optics will not be affected by normal level of ambient dust and dirt. However user accessible elements such as the filter cubes or illumination adapter can become exposed to dust which could impair the performance of the instrument. Therefore, the filter turret door must be kept closed at all times.

The CC88 is a high-precision instrument that can be impaired in its performance or damaged when handled improperly.

Filter cubes:

- Filter cubes are supplied in a polyethylene case, each case can hold up to four filter cubes.
- Each filter cube has a label showing the excitation, emission and dichroic wavelengths
- Each filter cube is comprised of one excitation filter and two emission filters.



Figure 81 – Filter cube

The instrument is equipped with filter cubes which are user-replaceable. It will be necessary to install the filter cubes before the CC88 can be used. The same operation will have to be performed with any new filter cubes purchased by the user.

The filter turret can hold up to four filter cubes, a full list of filters is available from the distributors.

Inserting filter cubes

The instrument has an initialization step which senses incorrect filter cube insertion and/or obstruction of the filter wheel. It is therefore recommended to power the instrument during filter cube change. After the first installation, during normal use, the software supplied by the system vendor provides a filter change option.



Caution!

If a light source is connected to the CC88 make sure that it is on standby or turned off before opening the filter turret door.

- 1. Open the service door of Pannoramic Confocal.
- 2. Open filter turret door.
- **3.** Manually rotate the turret to the desired position.



Figure 82 – Filter turret

4. Insert the filter cube along the guiding spokes of the filter wheel until the locating magnet pulls the filter cube.

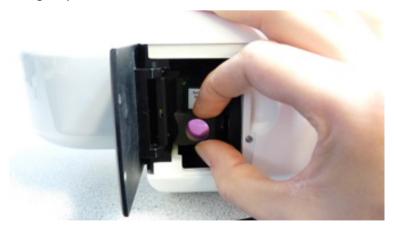


Figure 83 – Inserting the filter cube



Warning!

Do not use excessive force in this step! If you are having trouble inserting the cube it is most likely due to initial misalignment of the cube with respect to the wheel. Take the cube back out and try again.

5. Insert the filter cube in place by pushing it against the filter wheel.



Figure 84 – Positioning the filter cube

6. Check that the filter cube is flush with the wheel.



Warning!

Failure to insert the filter cube properly could result in damage to the instrument and/or filter cube, as well as compromising the optical performance of the instrument.

- 7. Repeat from step 2. to insert the next filter cube.
- **8.** When all filter cubes have been inserted close the filter turret door. The instrument will undergo its initialization procedure during which the wheel spins slowly to detect any misplaced filter cube or obstruction. If the initialization procedure fails the filter turret door indicator will remain dark. If the initialization procedure pass then the door indicator will be purple.

Removing filter cubes

Pull the filter cube outward by holding the side grip as shown in the below figure.



Figure 85 – Removing the filter cube

7.3.6 Transporting

The following procedure shows how to transport Pannoramic Confocal.



The base unit has four carrying handles for transporting. Two or four people can carry the base unit using these carrying handles. To determine the appropriate number of transporter people, observe the laws of your country regarding load carrying capacity limitations. You can find the weight data of the base unit in section *6. Technical Data*.

To transport Pannoramic Confocal do the following:

- 1. Switch power supply off (see section 1.1.4 Base Unit) and detach all other cables.
- **2.** Pull all four carrying handles (marked with red on *Figure 88*) out until mechanical stop position.
- **3.** Now you can transport Pannoramic Confocal with the help of the required number of people assisting you in transportation.
- **4.** After finishing transportation, push carrying handles back into normal position.

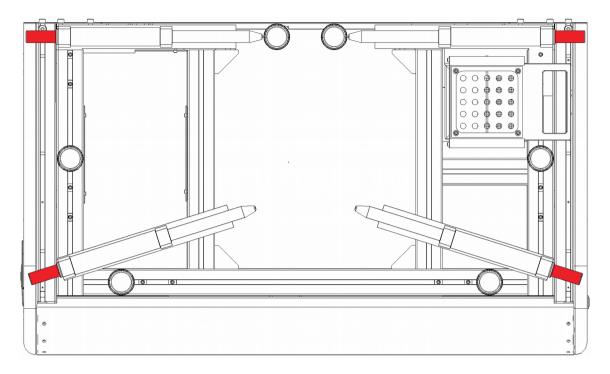


Figure 86 - Transporting handles

7.3.7 Removing and cleaning the condenser

The quality (intensity, cleanness) of the resulting image is highly affected by the condition of the condenser, therefore it is advised to remove the unit and clean the surface of the condenser lens on a weekly basis.

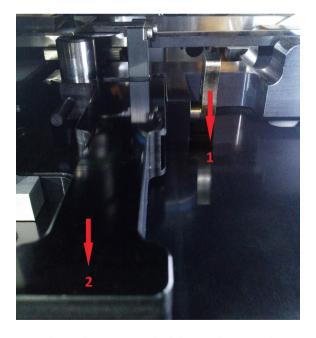


Figure 87 – Removal of the condenser unit



Caution!

During this procedure it is not necesary to power off the device, but make sure that no scanning operation has been started.

The procedure of the removal is the following:

- 1. Open service door (see section 5.3.1 Opening the service door).
- 2. Locate condenser unit under the stage and objectives.
- **3.** Move locking lever (1) downwards to release the lock.
- **4.** Hold the condenser unit (2) by its handle and pull it outwards.
- **5.** Place the condenser unit onto a piece of cloth (lint-free and clean).

Follow the below steps to ensure the unit is in good condition:

- 1. Check the surface of the condenser lens. If it needs cleaning, use a lens cleaning brush to remove dust particles. If there remain some particles visible on the lens, use a clean lens cleaning cloth, and gently rub the surface with circular motions.
- 2. Check the unit for mechanical damages or dust on the surfaces of the dovetail joint area. Clean the surfaces if necessary, or replace unit if damaged.

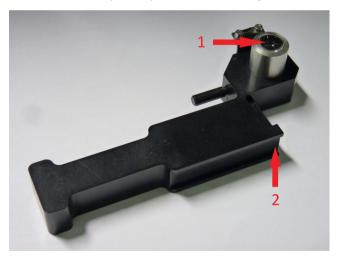


Figure 88 – Areas to be inspected

Before reinstalling the condenser unit, make sure that the grooves of the male part of the dovetail joint is clean.

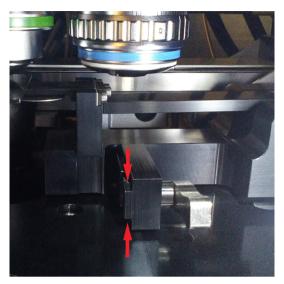


Figure 89 – Dovetail grooves

Reinstall unit by following the below procedure:

1. By caring attention to applying the unit correctly so that joint elements are interlocking, gently slide the condenser unit back to its position.

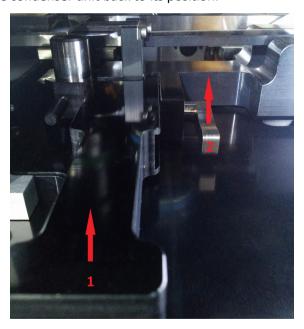


Figure 90 – Reinstallation of the condenser unit

- 2. Lock the unit by moving the lever upwards.
- 3. Close the service door.

8 Technical Data

Dimensions (width x depth x height)

Base unit	approx. 950 mm (W) x 570 mm (D) x 1000 mm (H)

Weight

Base unit	approx. 90 kg
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Ambient conditions

Transportation / shipment (packed)

Permissible ambient temperature	-20°C to +70°C
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Storage

Permissible ambient temperature	+0°C to +60°C
Permissible relative air humidity (non-condensing)	75%

Operation

Permissible ambient temperature	+10°C to +35°C
Permissible relative air humidity	75%
Altitude at installation site	max. 2000 m
Atmospheric pressure	500 hPa to 1060 hPa
Degree of pollution	2

Operating data

Intended site	closed room facilities
Electrical protection class	
Internal protection degree	IP 20
Electrical safety	in compliance with DIN EN 61010-1:2001 (IEC 61010-1:2001)
Over-voltage category	Ш
Radio interference suppression	in accordance with EN 55011 class B
Noise immunity	in accordance with EN 61326-2-6:2005
Base unit input voltage	100-240V AC
Power consumption of the complete device	max 350W
Fuses	2x T3.15A, 250V

Light sources

Brightfield illumination	3CCD equivalent separated R-G-B LED
Average service life of LED	25,000 hrs
Fluorescent illumination	Lumencor SPECTRA 7 Light Engine
Estimated service life of Lumencor's light source	75,000 hrs

Scan camera

pco.edge 5.5	
16.6×14.0 mm sCMOS (CIS2051)	
Pixel size	6.5 μm x 6.5 μm
Camera resolution	2560 x2160 active pixel
Camera max. speed	100 fps at full resolution (2560 x2160 pixel)
Bit-depth	16 bit
Image resolution (in focus plane)	0,4 μm FWHM (with 40x 1.2NA objective)
Cooling	Peltier with forced air (fan)
Connection type	Dual Camera Link Full (10 taps, 85MHz)

Control computer, minimum system requirements

Operating System	Microsoft Windows 7 Professional SP1 64-bit EN
СРИ	2x Intel Xeon E5-2609v3 1.90GHz 15MB Cache
RAM	16 GB DDR3
Hard disk	5 TB
Optical drive	DVD-RW
Display	96 dpi
Graphics	Full HD (1920×1080)
Input devices	Keyboard, mouse
Ports	2xDouble CameraLink port; 4 × USB 2.0; GB Ethernet

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