Pannoramic 1000

User's Guide

June 4, 2018

For research and education uses only, not for use in diagnostic procedures.

Contents

Disclaimer

Intellectual property related to the 3DHISTECH products are as follows:

EP 1,789,831; US 7,663,078; EP 2,024,772; JP 2009-512685; US 12/301,781; EP 1,644,767; JP 2007-516451; US7,327,515; EP 1,994,398; JP 2008-557835; US 12/281,566; U0700210; US 6,246,785; HU0900142; HU0700404; PCT/HU2007/000065; EP 08762668.5; US 12/663,537; PCT/AT2006/000492; JP 2008-542552; EP 06817469; US 12/095,545; PCT/AT2006/000493; EP 06817470.5; US 12/095,596; HU0900741; US 61/264,732; US 11/826,752; P0401870; PCT/IB2005/050344; US 11/662,976; HU0700409; US 12/042,050; US 77/636,144 and 007502032.

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CAUTION

For research and education uses only, not for use in diagnostic procedures. This product has not been approved or cleared as a medical device by the U.S. Food and Drug Administration or the European Union.

Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources), as these may interfere with the proper operation.

Further Information

For the latest information on 3DHISTECH products and services, please visit our website at the following URL: http://www.3dhistech.com.

Or contact the distributor:

Richard Allan Scientific Co.

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Declaration Of Conformity

3DHISTECH Ltd. declares that the product Pannoramic 1000 digital slide scanner is designed and produced with consideration of specified requirements according to the ISO13485 Medical devices. Quality management systems. Requirements for regulatory purposes (ISO 13485:2016).

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

EN 61010-2-081:2015 – "Safety requirements for electrical equipment for measurement, control and laboratory use. Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes "

EN 61010-2-101:2017 – "Safety requirements for electrical equipment for measurement, control and laboratory use.

EN 61326-2-6:2013 – "Electrical equipment for measurement, control and laboratory use. EMC requirements."

EN 55011:2016 – Group 1, Class B – "Industrial, scientific and medical (ISM) equipment – Radiofrequency disturbance characteristics - Limits and methods of measurement"

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-button 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 potentially critical situation.
 **Note:**	Calls attention to some important information or feature.

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 1000 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 1000, 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!**	Use of this instrument in a dry environment, especially if synthetic materials are present (synthetic clothing, carpets, etc.) may cause damaging electrostatic discharges that may cause erroneous results.
 **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 1000 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 1000 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.
 **Warning!**	Check that your local line voltage is compatible with Pannoramic 1000 specifications before you turn power on.
 **Disconnect plug!**	Remember to unplug the power cord before you open the Pannoramic 1000 device.

 **Warning!**	Only connect external devices that are safety extra low voltage rated to the instrument to avoid the risk of electrical shock.
 **Warning!**	The Pannoramic 1000 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 1000. For this reason, measures must be taken to eliminate such influences to a maximum possible degree. During periods of non-use, the Pannoramic 1000 must be protected with a dust cover. Check that power is turned off before you put the cover on.
 **Crush hazard!**	Never open the front door unless prompted accordingly by software. When you open the door at any other time, make sure not to reach with your hands into the instrument to avoid the risk of crushing your fingers.
 **Warning!**	The front door is equipped with an interlock switch. If the door is opened while a digitization process is running, the process will be stopped instantly.
 **Warning!**	A defective Pannoramic 1000 is not classified as domestic waste. It must be properly disposed in accordance with currently valid legal requirements.
 **Warning!**	The Pannoramic 1000 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 1000 is a precision instrument which may suffer a significant reduction in operational functions or even physical destruction following intervention performed in any nonconforming manner.

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 and comment, send to a colleague electronically for co-operation or advice, and so on.

1 Product Description

1.1 Product Overview

1.1.1 Intended Use

Pannoramic 1000 is designed to digitize histology slides using high-numerical aperture immersion and/or dry objectives through illumination of transmitted light (Brightfield illumination).

Warning!

After each scanning make sure to inspect the digital slide for over-exposed areas. If the slide has been scanned based on improperly set parameters, it can highly affect the results 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!

The Pannoramic 1000 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 1000 scanner 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!

Do **NOT** install any other application than the **Pannoramic 1000 Scanner control** software application and its auxiliary drivers on the control computer.

1.1.2 Features and Benefits

The Pannoramic 1000 offers world-class brightfield whole slide scanning. An outstanding 0.12 µm/pixel resolution in Brightfield mode is achieved with the 40×/0.95 NA (equivalent to 80× magnification) Plan-Apochromat objective.

Key features of the Pannoramic 1000 Scanner are:

- 1000 slide automatic loading and scanning
- Outstanding image resolution
- Brightfield imaging
- Adimec QUARTZ Q-12A180 camera
- Software-aimed flat-field correction compensation method to create homogeneous slide image
- Motorized objective changer, 3 objectives
- 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 feature to improve the visual appearance of digital slides
- Focus algorithm finds the focus which is most appealing to the human eye

The Pannoramic 1000 is an high-level automatic scanner with low maintenance, simple and easy use. Optimal for those customers, who want to begin with digitizing of their tissue samples and intend to use the scanner for batch processing (recommended daily scan quantity up to 1000 slides).

1.1.3 Warning and Information Labels

The following figure contains the labels used on the Pannoramic 1000 main unit.

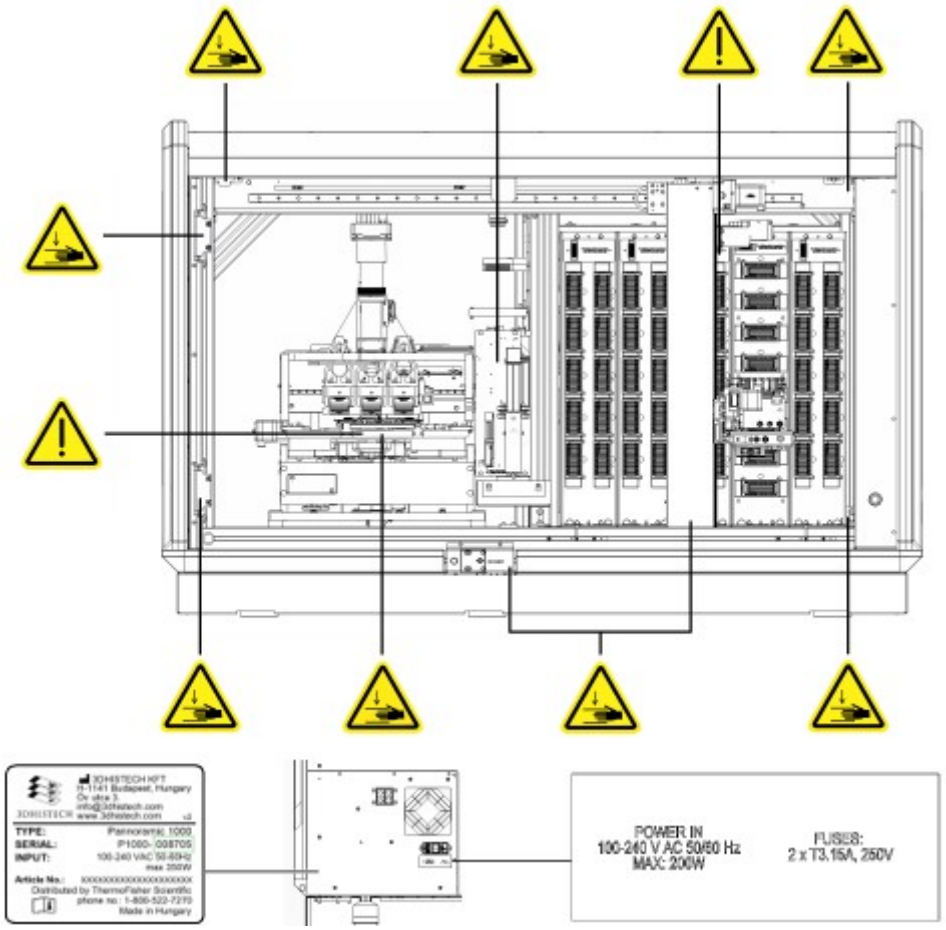


Figure 1 – Warning and information labels

NOTE: The  symbol refers to the possibility of exposure to biological hazards whenever handling slides.

1.1.4 Main Parts of the Device

The following figure shows the main outer parts of the base unit.

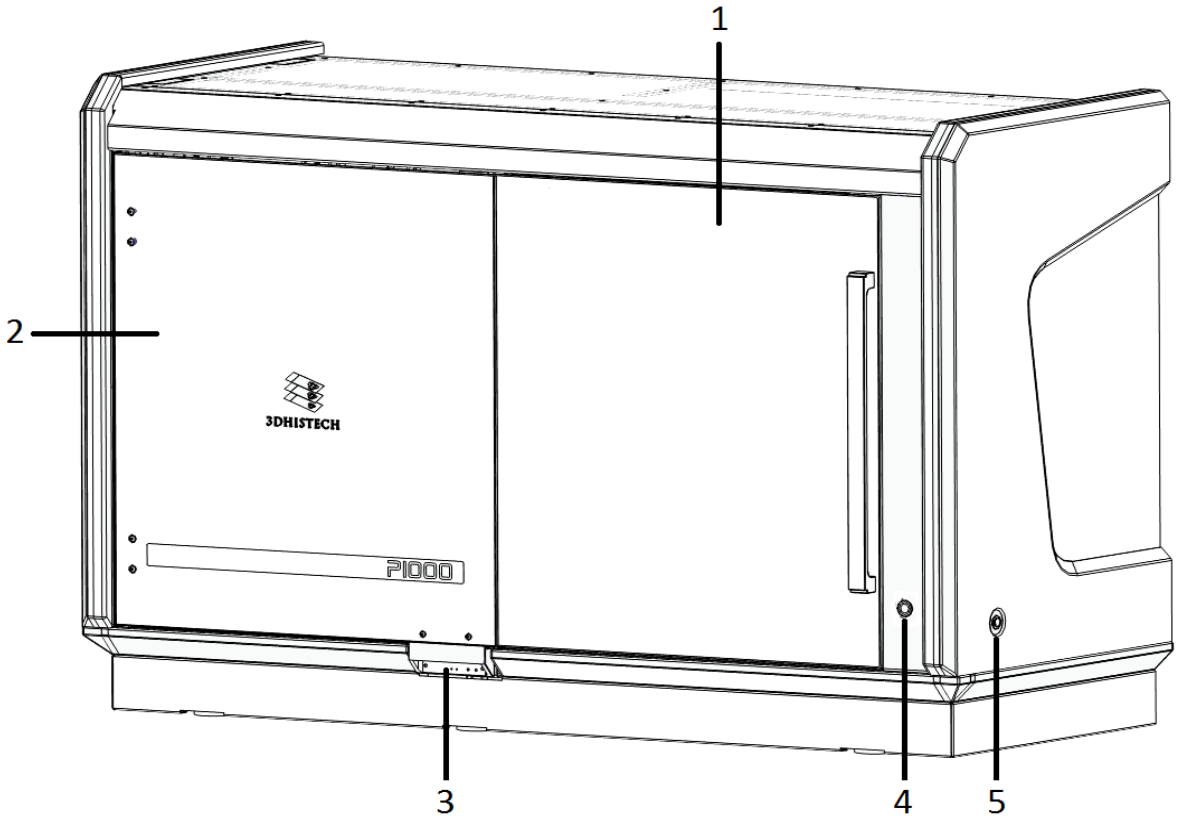


Figure 2 – Main outer parts of the base unit

1. Sliding door of slide compartment
2. Service door
3. Service door opener
4. Door open request button
5. Power ON/OFF button

The below image shows the main inner components of the base unit.

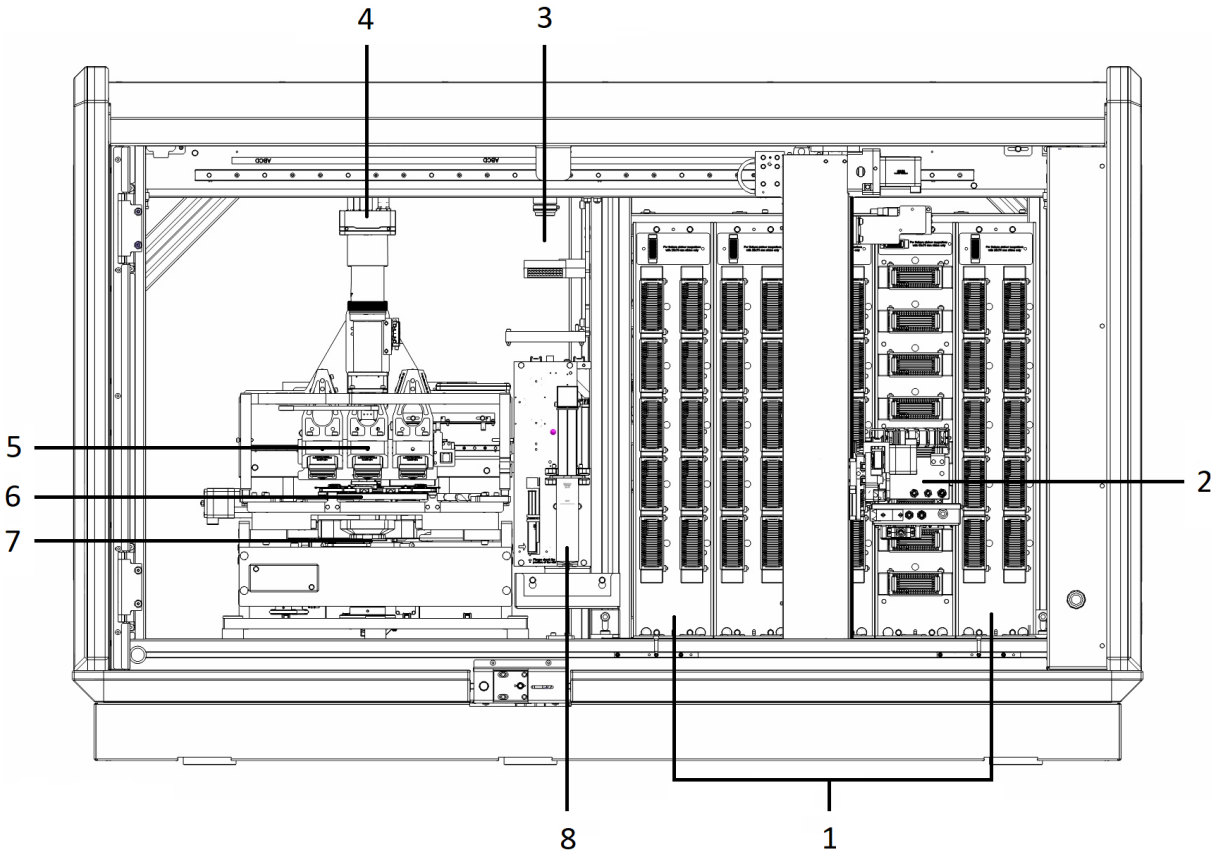


Figure 3 – Main inner components of the base unit

1. Magazine compartment
2. Slide loader/grabber
3. Preview unit
4. Camera
5. Objectives
6. Slide stage
7. Condenser
8. Pipetting unit

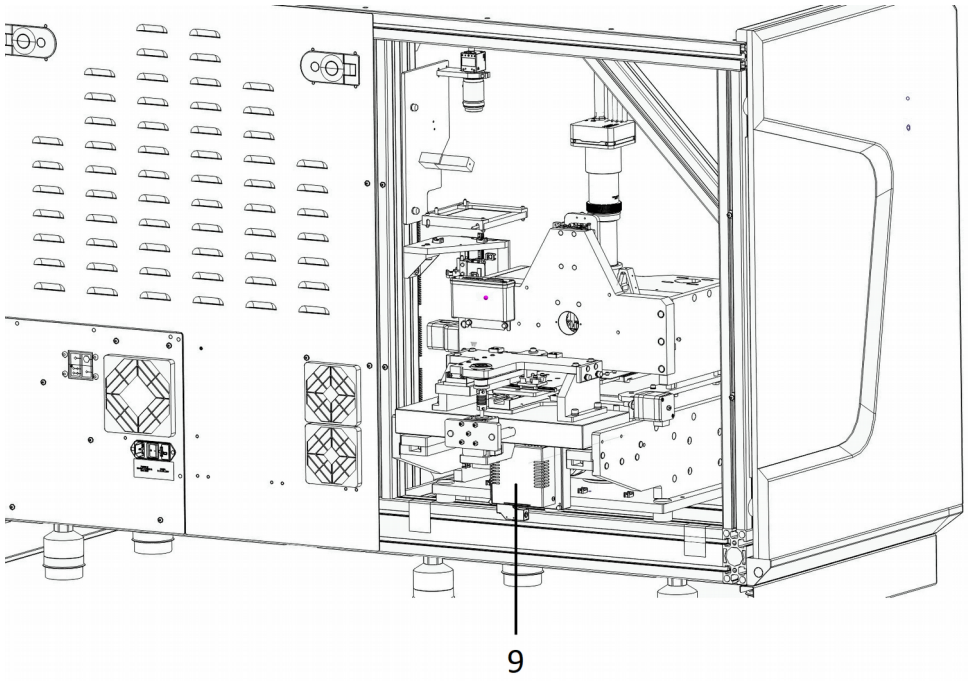


Figure 4 – Illumination component of the Pannoramic 1000

9. PAX 10 FLASH illumination unit

1.1.5 Connector panel

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

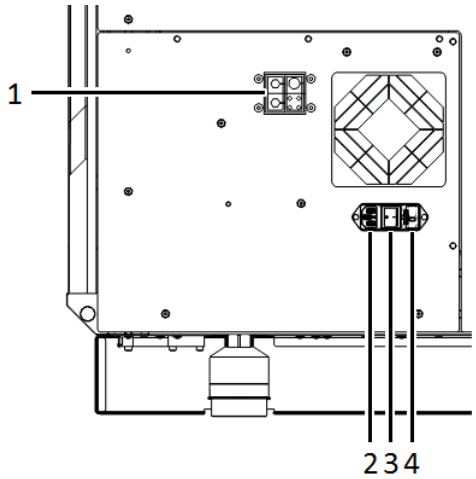


Figure 5 – Sub-assemblies of the connector panel

1. USB port for controller PC, camera cable port, HUB port
2. Main power inlet
3. Main power switch
4. Fuse box

1.2 System Overview

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

1.2.1 Pannoramic 1000 system

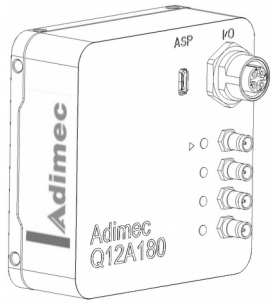
The main components of the Pannoramic 1000 system are the following:

1. Pannoramic 1000 base unit
2. Monitor
3. Mouse
4. Control computer
5. Keyboard

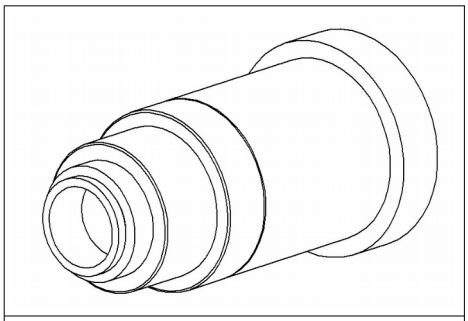
1.2.2 Hardware Options

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

Camera

	**Adimec QUARTZ Q-12A180** 1 CMOS camera for high-quality Brightfield applications allowing fast scanning

Camera adapter



1.6× adapter

Warning!

The installation of the cameras in Pannoramic 1000 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 options

- Pannoramic 1000 Fast Option – base unit equipped with Adimec QUARTZ Q-12A180 camera for Brightfield scanning

Objectives

- Plan-Apochromat 20×/NA 0.8
- Plan-Apochromat 40× Corr/NA 0.95
- C-Apochromat 40× Corr/NA 1.2 (optional)

Warning!

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

1.2.3 Control Software

Pannoramic Scanner control software

Optional:

- Extended focus
- Z-stack
- Barcode reader (licensed feature)

P**annoramic Viewer software (fully functional)**

Optional:

- CaseCenter
- Pannoramic Viewer TMA module
- 3D Reconstruction module
- QuantCenter, HistoQuant , NuclearQuant , MembraneQuant, and DensitoQuant modules
- TumorBoard module
- E-School Encoder

2 Installation

Warning!

The installation of Pannoramic 1000 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.

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.

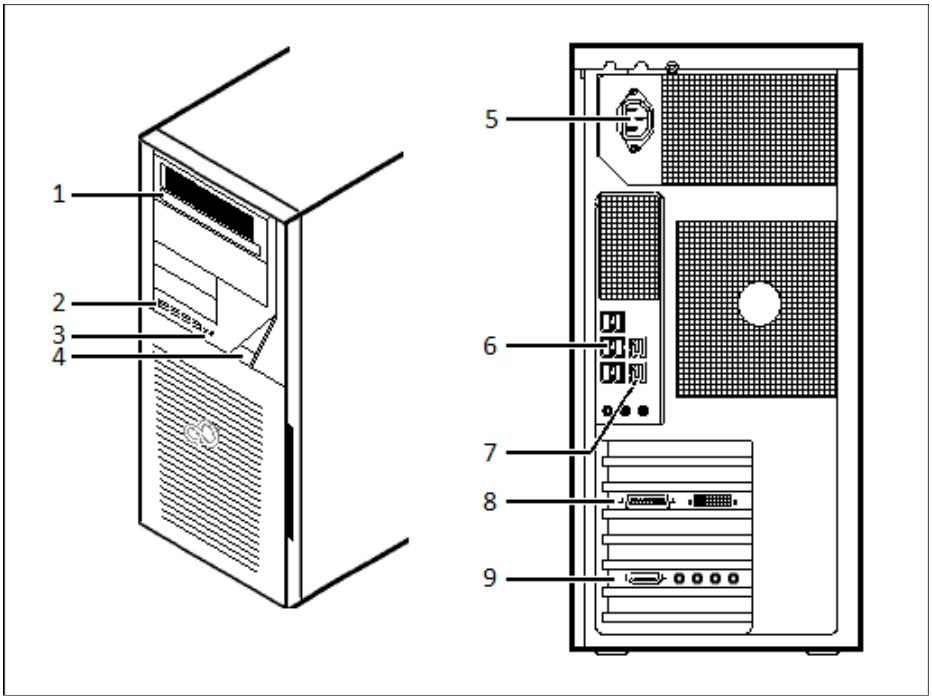


Figure 6 – Ports on control computer

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. CoaXPress Coaxlink Quad (for Adimec camera)

2.2 Connectors and cables

- Control – USB cable (between scanner and control computer)
- Preview camera – USB cable (between scanner and control computer)
- Adimec – CoaXPress cables (between Adimec camera and control computer)
- Video cable (between monitor and control computer)
- Power supply cable (between 230V/110V and monitor)
- Power supply cable (between 230V/110V and control computer)
- Power supply cable (between 230V/110V and power supply unit)

Warning!

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

3 Preparing Slides and Magazines

You can use both standard and large slides and cover slips that meet the following specifications:

	Slides	Cover slips
Length	75.0 to 76.0 mm	max. 50 mm
Width (standard slide)	25.0 to 26.0 mm	max. 24 mm (recommended: 22 mm)
Width (large slide)	51.0 to 52.0 mm	max. 50 mm
Thickness	0.90 to 1.2 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!

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 insertion 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.

Warning!

If using immersion liquid for scanning, make sure that you apply cover slips on each slide you are going to scan in a way that fluid 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.

Caution!

Do **NOT** scratch any circular marker onto the glass surface of a slide, use a soft tip pen instead for marking area of interest.

3.1 Affixing Barcode Stickers to Slides

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

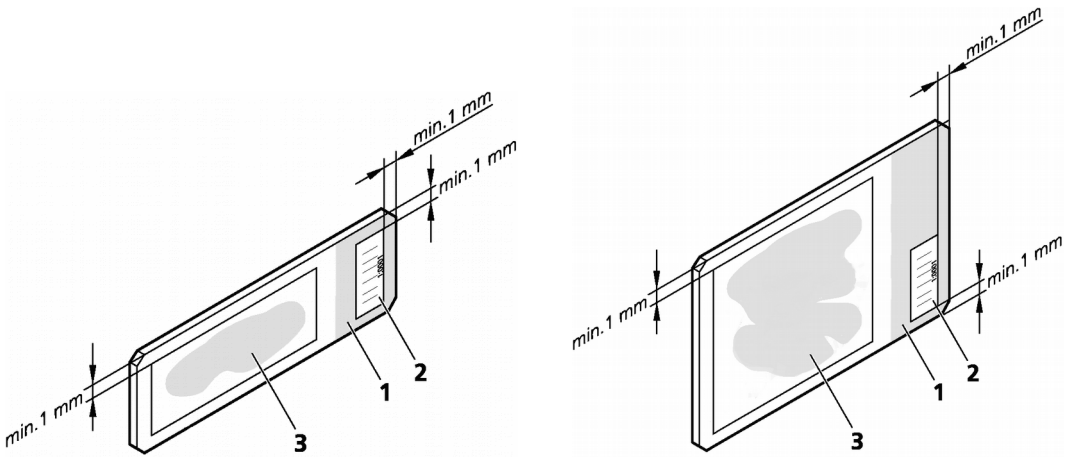


Figure 7 – Standard and large format slides with barcode stickers

The label area (**1**) 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).

3.2 Preparing Magazines

Insert slides into magazines

Pannoramic 1000 features a combined magazine panel that is capable of receiving a total of 1000 slides. Pannoramic 1000 magazines are designed to receive slides of both standard and large formats. The capacity of a magazine when receiving standards slides is 20, and 5 when loading large slides, so if the magazine compartment layout of the Pannoramic 1000 you are using is configured to receive both large and standard slides, the maximum number of slides to be loaded may differ (for devices configured to receive large slides only, a total capacity of 200 slides can be reached).

> **Caution!**
>
> To avoid jamming or breaking slides, ensure that the slide is not tilted and that it rests perfectly horizontally in the magazine.
>
> Always make sure that the slide is correctly inserted in the magazine. Incorrect slide insertion may break the glass. 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!

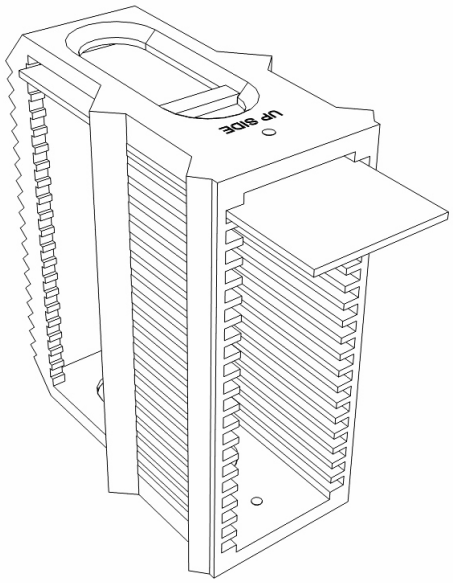


Figure 8 – Inserting a standard slide into a magazine

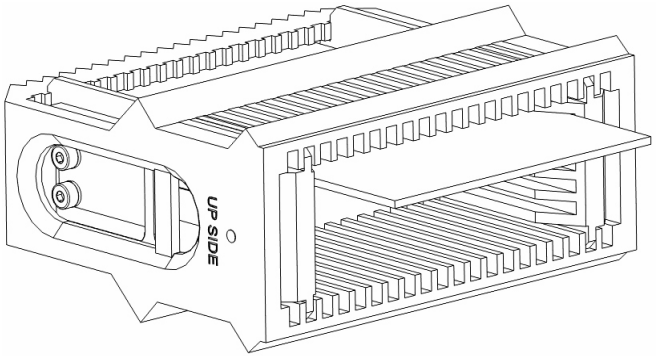


Figure 9 – Inserting a large slide into a magazine

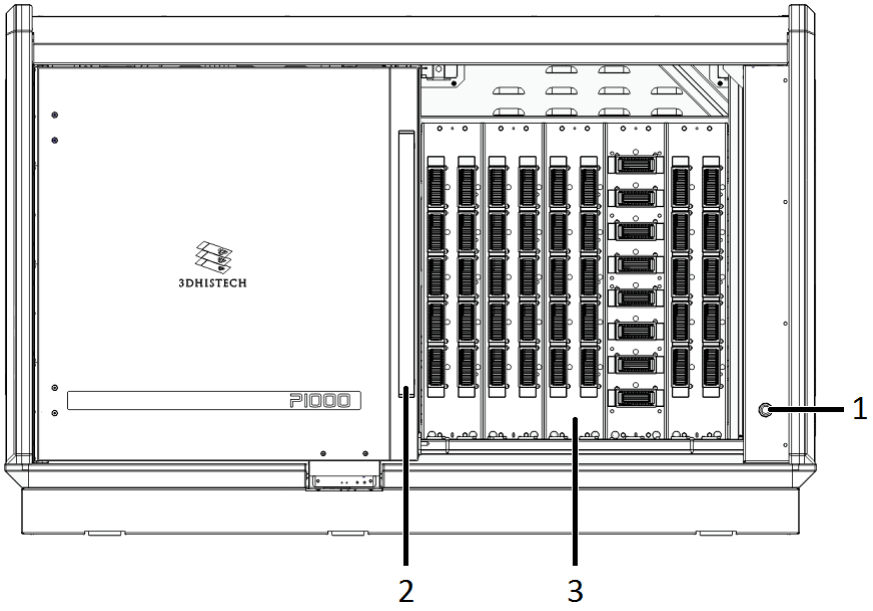
Warning!

Make sure that placing the magazine by reading **UP SIDE** at the top when inserting standard, or **at the left** of the magazine when inserting large slides. The cover slip and the label area should be on the top, with the label area pointing outwards.

Insert magazines into the device

> **Note:**
>
> Magazines can be loaded into the device once the control software has been launched.

1. If the door opener button is lit green, push the door opener button **(1)**.



2. Open the magazine compartment door **(2)** by sliding it to the left.
3. Insert the prepared magazine(s) to the desired magazine slot in the compartment **(3)**. Make sure to push magazines into the dedicated slots until you hear a clacking sound. A dedicated LED (next to the magazine by standard slides; above the magazine by large slides) is lit in blue if the magazine has been inserted correctly.
4. Once you have inserted all the required magazines, close the door **(1)** by sliding it to the right.

> **Warning!**
>
> Never open the front door unless prompted accordingly by software. When you open the door at any other time, make sure not to reach with your hands into the instrument to avoid the risk of crushing your fingers.

Remove magazines

1. If the door opener button is lit green, push the door opener button **(1)**.
2. Open the magazine compartment door **(2)** by sliding it to the left.
3. Remove magazine(s) from their slots in the compartment **(3)**. Grab the magazine firmly while removing it, but so that the inserted slides do not fall out.

> **Note:**
>
> The magazine compartment door is equipped with an interlock switch. It can be opened only if a running digitization process has ended or interrupted.

4 Software and Work-flow

I. Launch control software

Run scanner software by double-clicking the icon on the desktop, and the **Home View** window is opened.

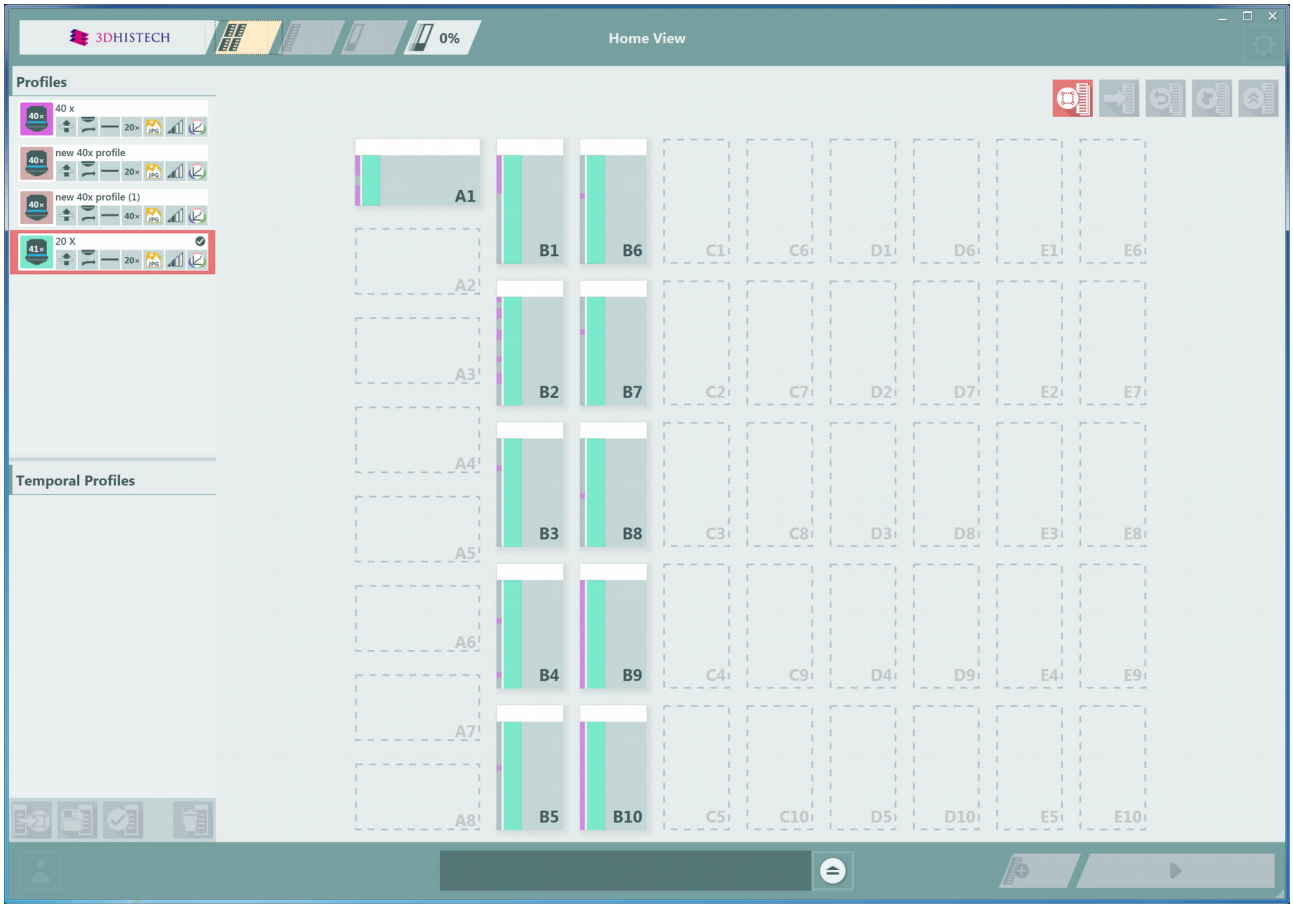


Figure 10 – Home View

The LED color of the door opener button indicates the actual status of the device:

- green if no process is running or has just been completed, thus the door can be opened for magazine loading or maintenance
- violet if the device is in standby mode – press the door open button to move gripper arm to home position

- if the LED is lit in yellow, press the button twice to finish the actual process and the door can be opened after the LED turns green

> **Note:**
>
> None of the motors can be actuated while the door is opened since their circuit breakers are tripped, therefore magazine loading and removal is entirely safe.

If the magazines are inserted properly, the LED above/at the side of the slot is lit in white. The status of the corresponding magazine position that is checked is indicated also in the Home View window – the gray status bar turns to white, indicating that the position has turned from inactive to active.

> **Warning!**
>
> A laser sensor (Laser Class 1 according to EN 60825-1:2017) detects misaligned slides in magazines, and a warning message appears on the screen informing you about the magazine column in which you should check and fix the error. The system checks for misaligned slides repeatedly unless each of the slides are inserted properly, so the device cannot be used if there is an error.

II. Insert magazines

On how to prepare and insert magazines into the device, please read ***section 3***.

III. Magazine selection

Select magazines and the required profile from the **Profiles** list

Click to launch scanning process based on the selected profiles. You can assign another profile to magazines that are not yet selected and if the scanning process is already running. After selection and profile assignment, click to add them to the processing queue, then click to start scanning process.

It is advised to generate several different profiles in advance to create an inventory list from which you can select the matching profile for your slides. If you modify a profile from the **Profiles** list, it will become a temporal profile and displayed under **Temporal Profiles** list. Temporal profiles will be deleted during software launch, but a temporal profile can be saved as a general profile by clicking after selection. The default profile is marked with a check mark on the list, and if you want to set another profile as default, click after selection. The default profile cannot be deleted. To delete a profile (except for default), first select the profile, then click .

After assigning a profile to a selected magazine, click or double click the profile to activate for processing.

The following operation buttons are available:

– Select/Deselect all

– Go to Magazine View

– Restore modified attributes to default

– Batch preview

– Give priority to selected magazine

Magazines processed in Scanning Queue receive a sequence number and are locked, therefore cannot be edited.

Processing sequence can be modified by first selecting the magazine, then clicking the button to move the magazine to the first available position in the queue.

In Magazine View, a list of contained slides and the set parameters are listed.

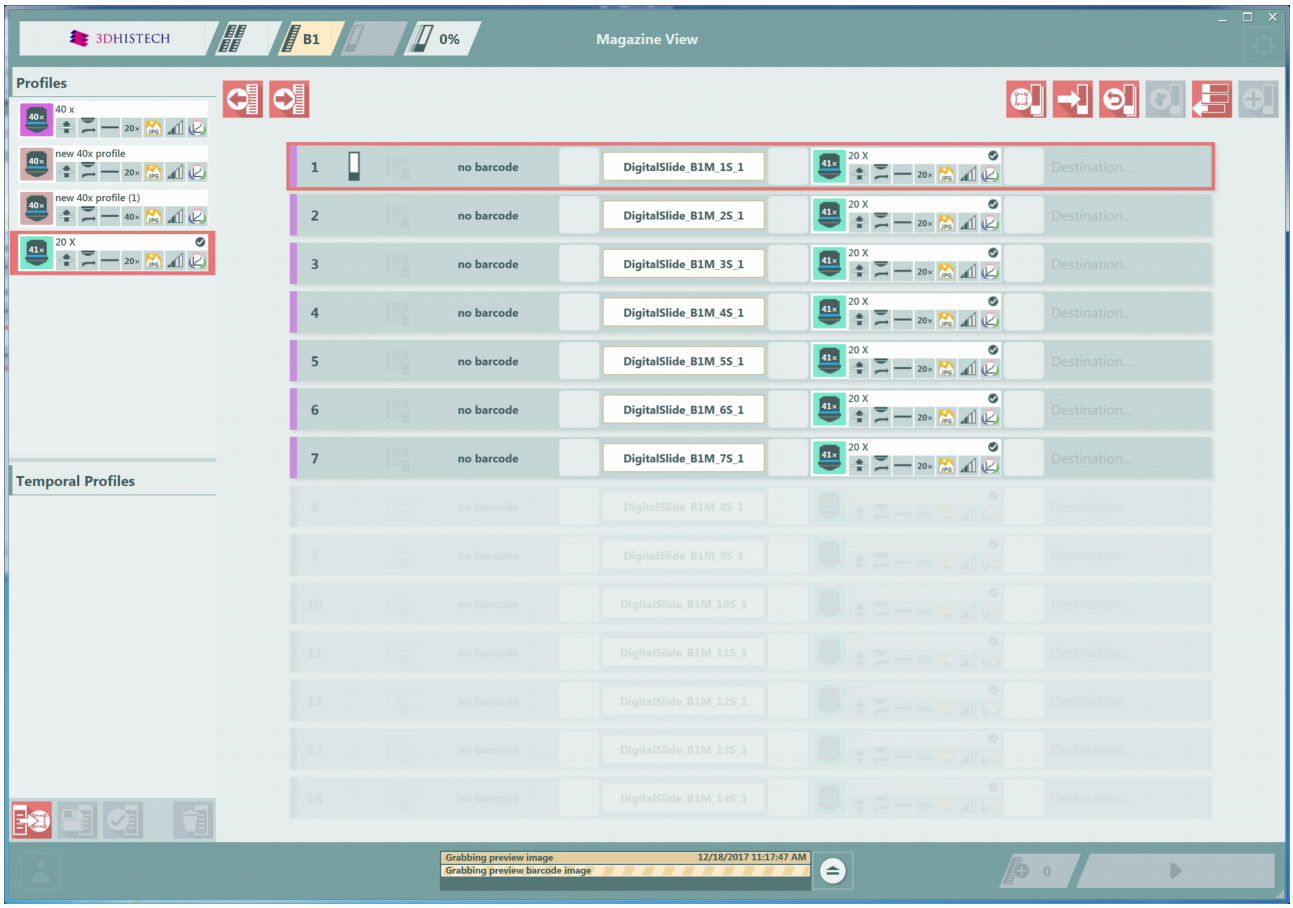


Figure 11 – Magazine View

Magazine View operation buttons

– Select/Deselect all

– Go to Slide View

– Restore modified slide attributes (name/profile) to default.

– Batch preview – slides that have been scanned for preview are represented with active slide icons on the list.

– Remove slide from list

Magazine number is displayed on the tab of the Magazine View.

You can assign different profiles to slides within Magazine View.

If a scanning progress of a magazine has been initiated, the surface becomes inactive therefore it cannot be modified, but the scanning process can be stopped by clicking .

Progress bar that can be expanded and is scrollable, lists detailed process and scanning progress information.

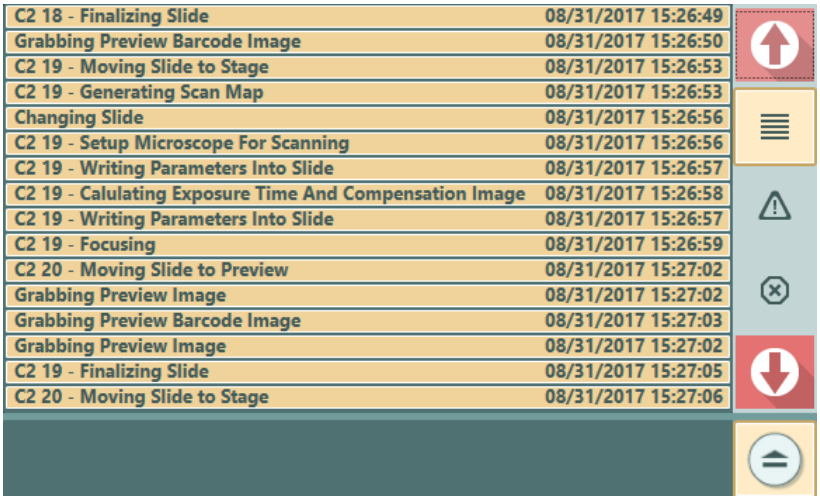


Figure 12 – Progress panel

IV. Set scanning parameters

In **Slide View** the selected profiles can be parameterized and saved as well if needed.

If a profile parameter has been modified, the modification can be applied to the profile by saving. Click  to save profile as general profile, or click  to save as a temporary profile. The resulting temporary profile is available for you to select from the Temporary Profiles list.

Change profile color by clicking the color field at the left of the profile name. Located at the right there is an indicator for Brightfield mode, and the parameters set for the profile are represented with yellow icons.

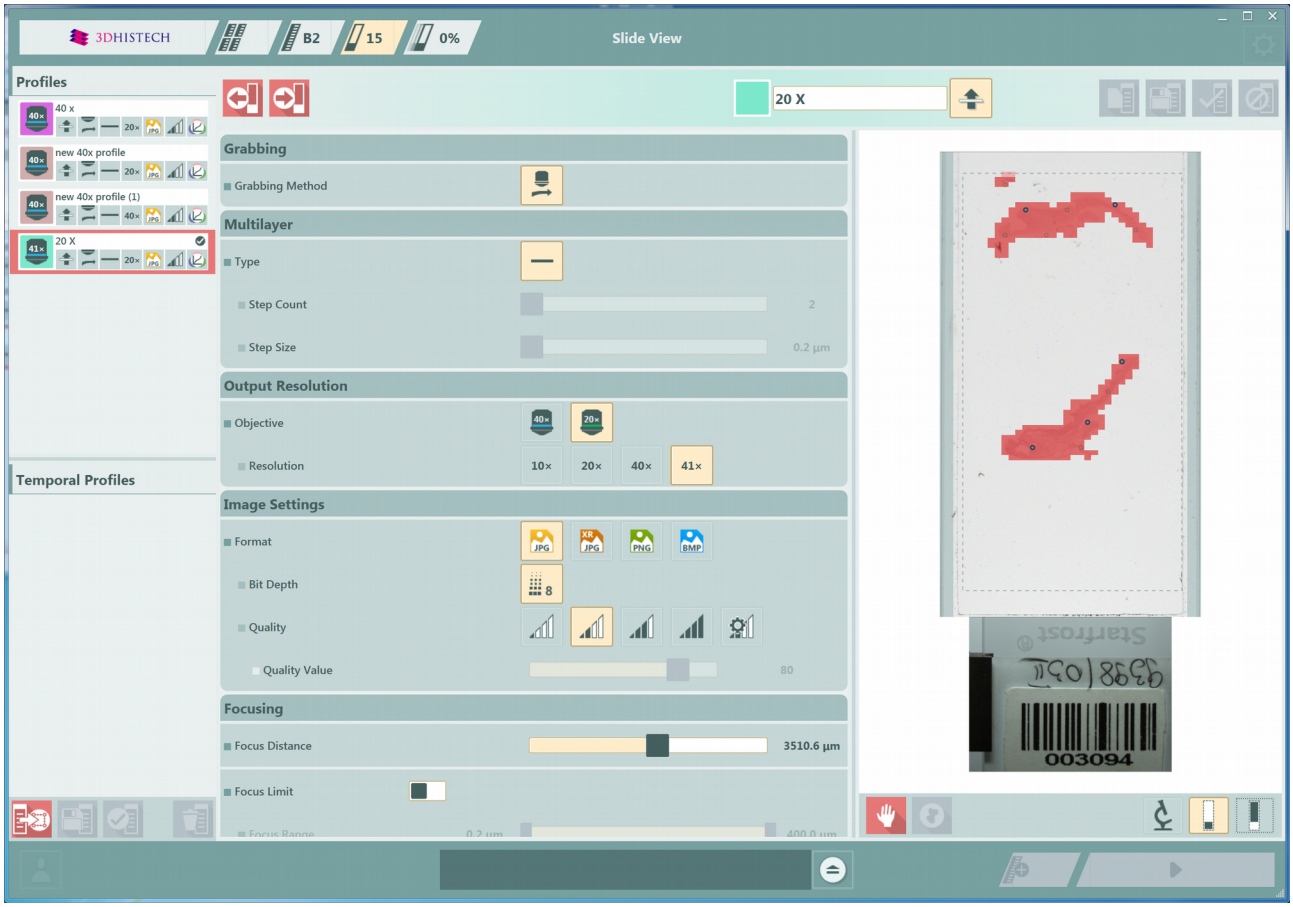


Figure 13 – Slide View

Dark spots on the preview image represent the focus points – the darker ones mark the coarse focal points, the pale ones mark the fine focus points. The grid displays field-of-views based on which the scanning will be performed.

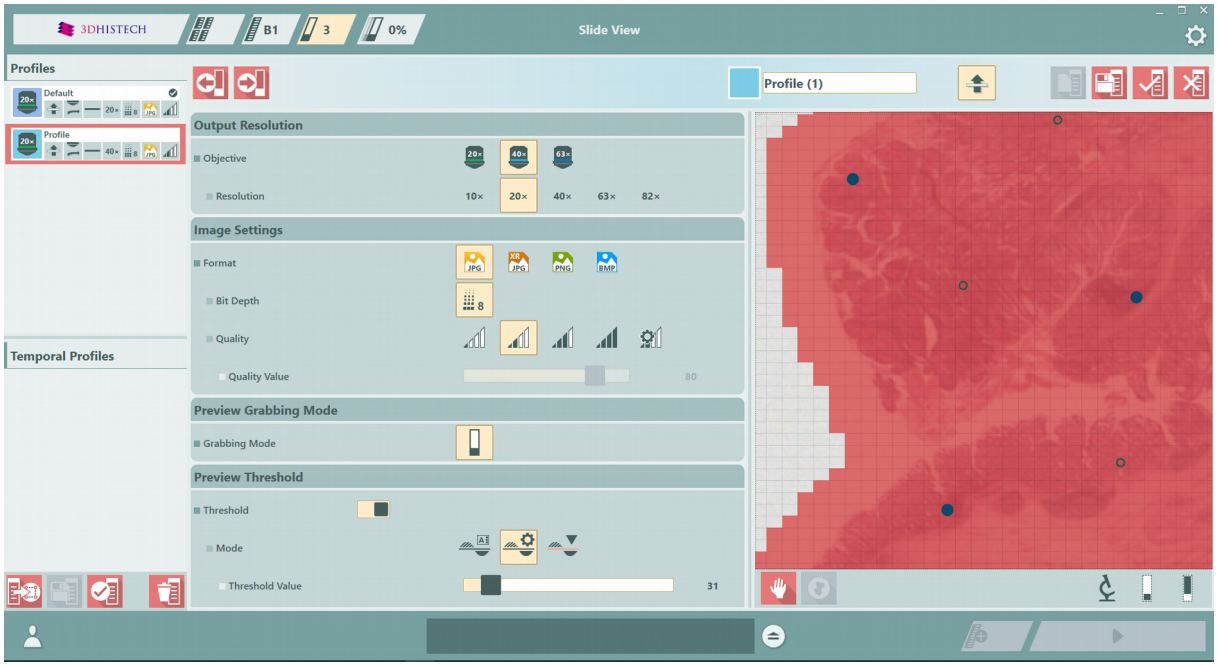


Figure 14 – Preview image with FOVs and focal points

Preview image is taken after clicking the button. If you click the button, preview image becomes movable with the mouse and zoomable by scrolling with the mouse wheel, and FOV grid becomes more visible by zooming in, and also, the drawing toolbox is displayed. The drawn shape on the preview image is movable, rotatable, and can be resized by grabbing the corners.

Click to display label area of the slide, and click to view the original slide preview.

The following options can be managed to fine-tune scanning parameters:

- **Grabbing** – Grabbing method works in FLASH / Brightfield mode only
- **Multilayer** – Select Single layer option if you want to scan a single layer of the slide. Other two options are Z-stack and Extended focus modes.
  - 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.

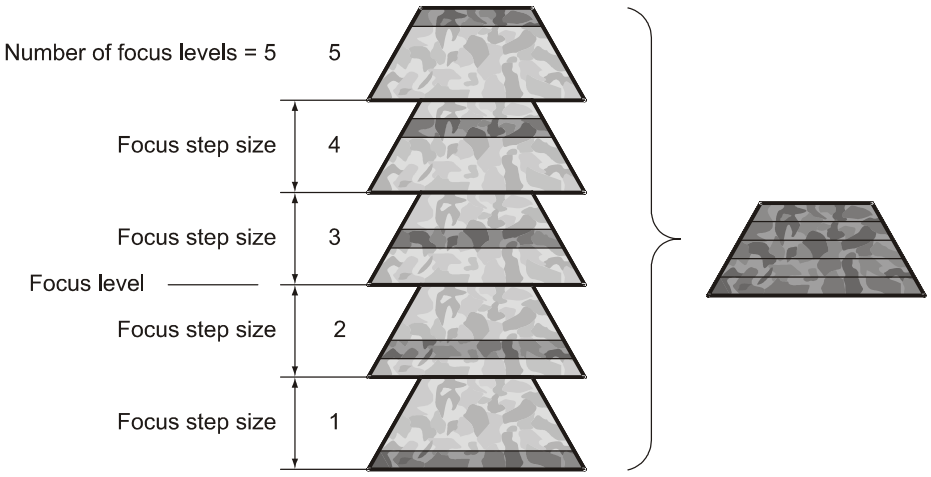


Figure 15 – Focus level and step size

- With the **Z-stack** method separate layers are created and stored, and can be opened with Pannoramic Viewer. The Z-stack slide contains the extended focus layer.

  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.

  Focus step size determines the spacing between focus levels. One step is around 0.1 µm.

  The default settings are: **Number of focus levels**: 7; **Focus step size**: 5.

- **Output resolution** – The resolution of the output digital slide can be modified to result a smaller file size. You can select the objective and its output resolution, where **Native** is the raw resolution of the slide, and other values (10x, 20x, etc.) depending on the size native resolution.

- **Image settings** – You can select from the following image formats:
  - **JPEG**
  - **JPEG XR**
  - **PNG**
  - **BMP**

  There are four predefined **Quality** types, and a custom settings option on the list:
  - **Medium (60%)**
  - **Good (80%)**
  - **Fine (90%)**
  - **Excellent (95%)**

- **Custom** by which unique quality setting can be achieved as follows:
  - **JPEG** – The quality can be adjusted with the **Quality value** slider. Greater values result in better quality, but larger files. The default setting is 80%.
  - **JPEG XR** – Available in 16 bit mode. The quality can be adjusted with the **Quality value** slider.
  - **PNG** – Lossless compressed image format.
  - **BMP** – Lossless uncompressed image format, but larger files due to less effective compression. It is a raw data file.

Greater values result in better quality, but larger files. The default setting is 80% (good). The JPEG XR compression process is much faster than of the JPEG.

- **Focusing**
  - **Focus Distance** – This value determines the distance of focus points in µms instead of FOVs. This value should be selected depending on the unevenness and size of the specimen.
  - **Focus Limit –** You can define focus limits by selecting this option
    - **Threshold Values / Limit range** slider is designed to set threshold limitation values (upper and lower limits). This is useful if focusing was not targeted on the specimen, but on a spot on the coverslip.

- **Preview Grabbing Mode** – Use this option to select the mode in which the preview image is taken
  - Brightfield Preview mode

- **Preview threshold** – Set On/Off in **Auto**, **Manual**, or **Marker** modes
  - **Scan specimen with auto threshold –** This automatically detects the specimen in the preview image.

Important!

Make sure that the result of detection is acceptable for you. Otherwise set the threshold value manually or append missing areas with the help of **Scanned area / Preview tool** function located at the preview toolbar.

- **Scan specimen with user set threshold –** This sets the sensitivity of the specimen detection. To set the desired threshold value manually, change value by dragging the **Threshold value** slider in the range of 0-255. The default value is 35. By setting a smaller value results in a more sensitive scanning, meaning that more areas will be digitized. However, the final image may include specks or other imperfections of the slide. If setting a greater value results a less sensitive scanning, but it is possible that some of the smaller specimen areas will not be digitized.
- **Scan area inside the marker –** 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 by dragging the **Threshold value** slider 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, drag the **Threshold value** slider in the range of 0-255. The default value is 35.

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

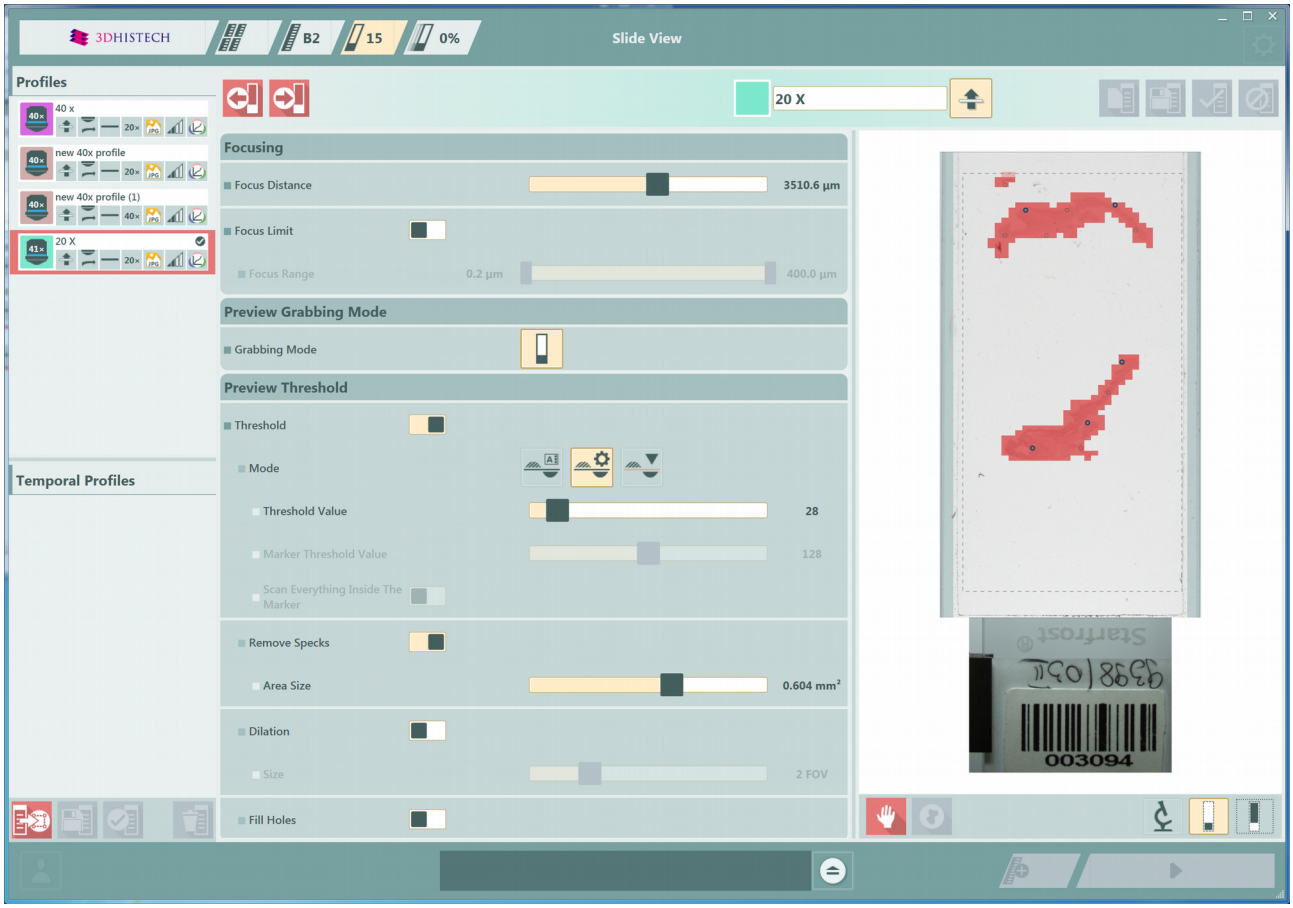


Figure 16 – Slide View settings

- **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.
  - **Area Size** – Set the maximum size of specks not to be digitized by adjusting the slider
- **Dilation**
  - **Size –** Adjust the slider to the desired value to enlarge or decrease the scanned area. The edge is extended discretely by 100 µm each time. The recommended value for this setting is 1000 µm in Flash scanning mode.
- **Fill Holes** – If selected, the holes inside the specimen will also be scanned. Often these holes contain small sample objects that otherwise would not be scanned.

- **Preview Areas** – The preview image shows the area to be digitized with a light coral colored mask.
  - **Coverslip Area**
    - **Coverslip Mode** – Select Auto or Manual
    - **Coverslip Selection** – can be selected in Manual mode only (Width / Height / Area / Angle)

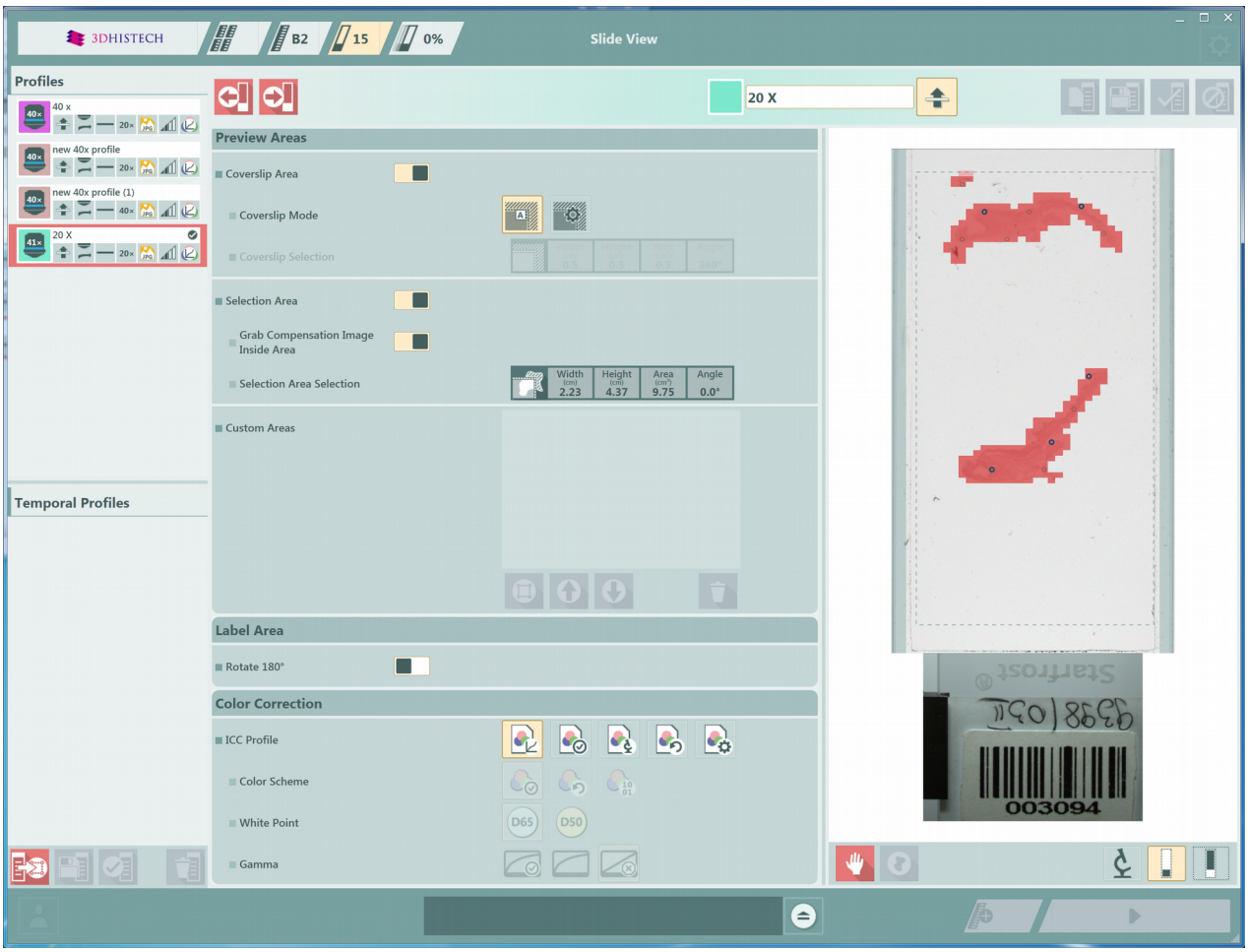


Figure 17 – Selection box on the Preview image

- **Selection Area** – 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.

  - **Grab Compensation Image Inside Area (On/Off)**

  - **Selection Area** – Manual settings: Width / Height / Area / Angle

- **Custom Areas** – Enable manual selection options. If several objects are laid on each other, the layer order can be modified if necessary by clicking the up or down arrow buttons. Manual selection can be used as well – area size is displayed.

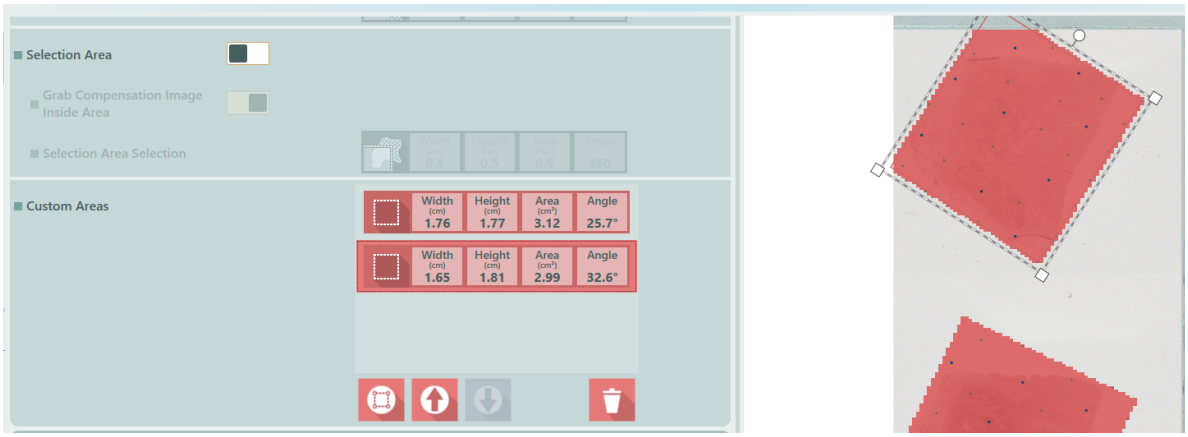


Figure 18 – Custom area selection on the preview

- **Label Area** – Modify slide label settings if necessary. Turn on **Rotate 180°** to rotate label by 180 degrees.

- **Color Correction** – Different color profiles can be assigned to each slide.

  - **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 -2.2- 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**: 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

V. Follow-up scanning progress

Progress View displays the actual progress in details. Scanning queue is listed where the performed actions can be seen.

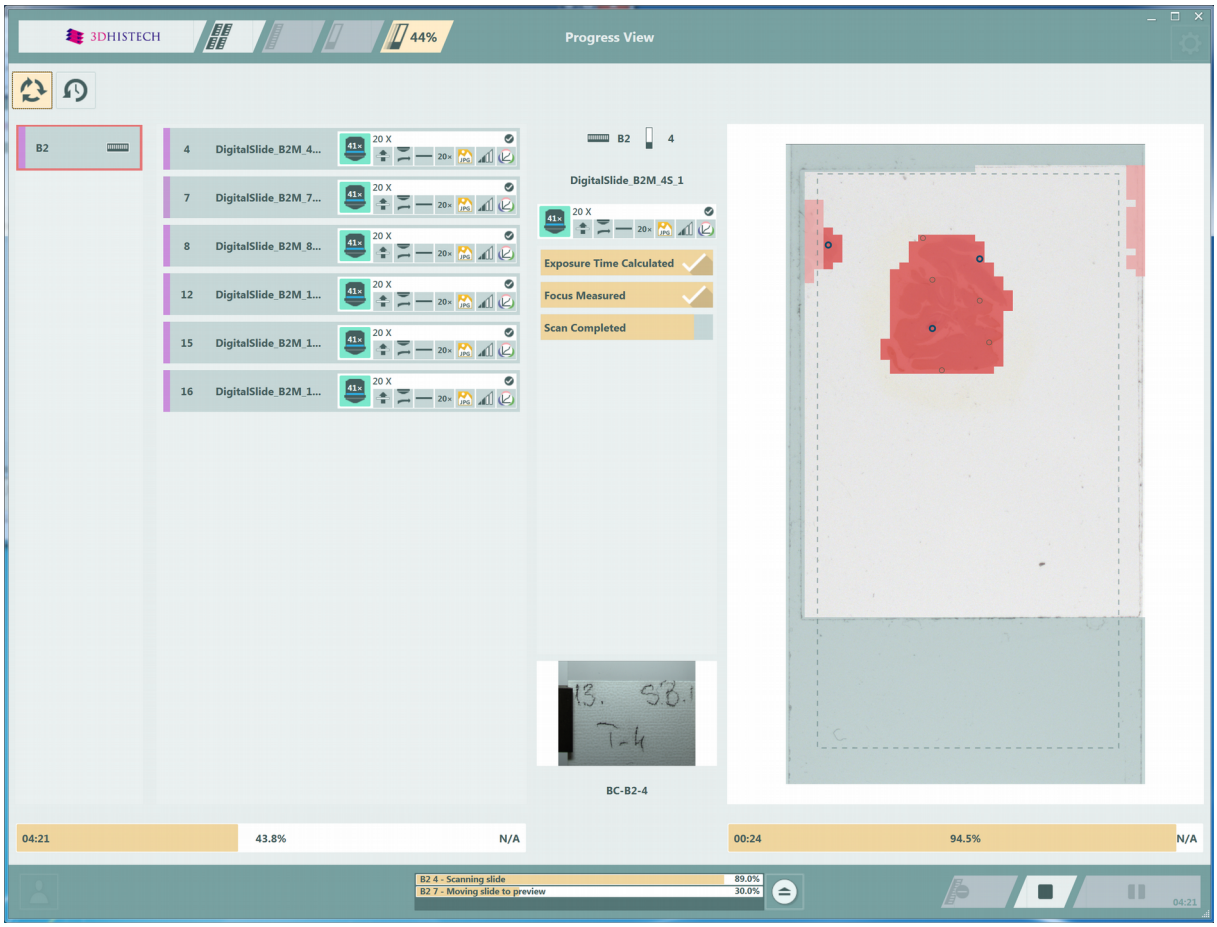


Figure 19 – Progress View with preview

Scanning History View includes detailed scanning information per year / month / batch by selecting the appropriate time frame at the left side of the window.

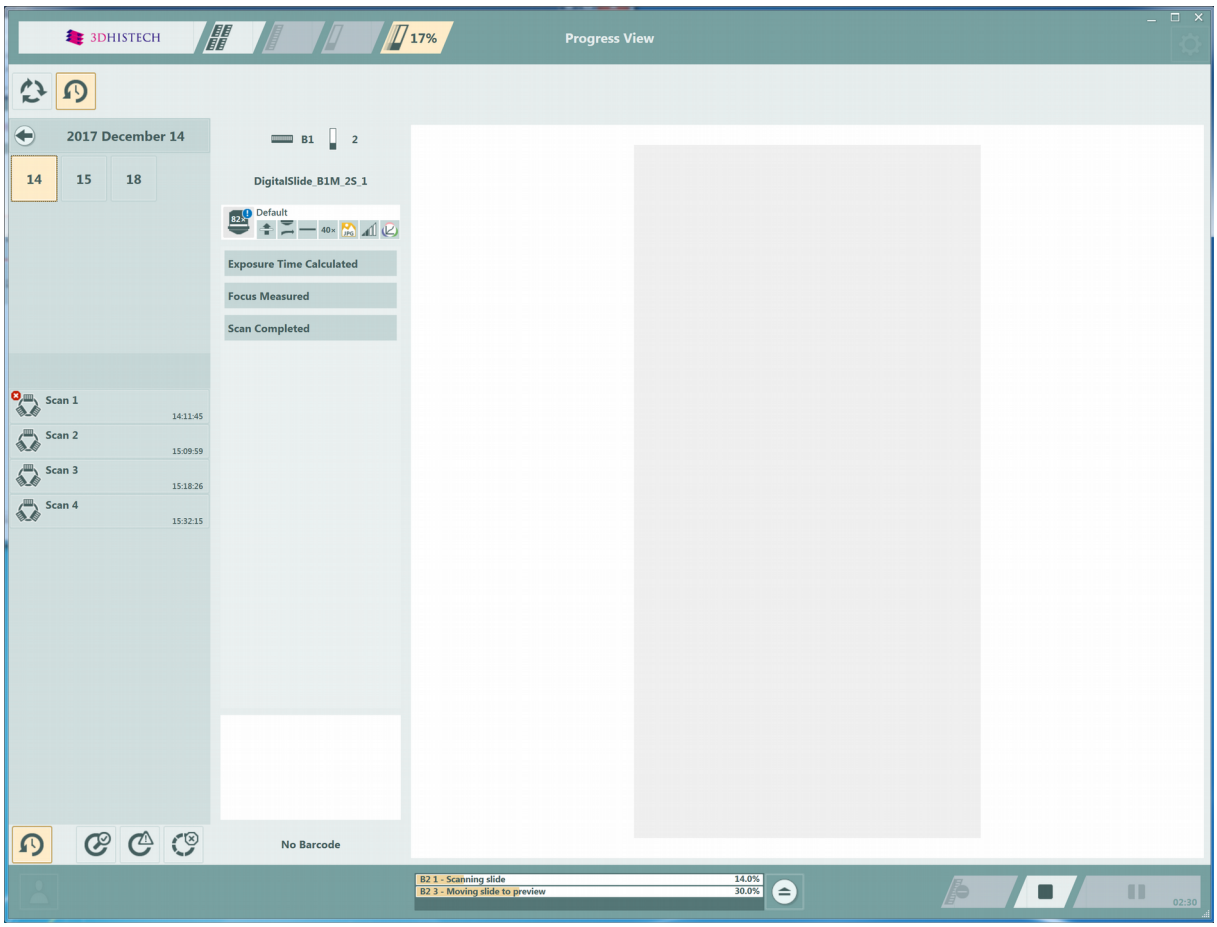


Figure 20 – Scanning history panel of Progress View

The following views are available to select by clicking the buttons at the bottom left corner of the panel:

-  – All events
-  – Scanned successfully
-  – Different from planned (non-erroneous event has occurred)
-  – Unsuccessful scan progress

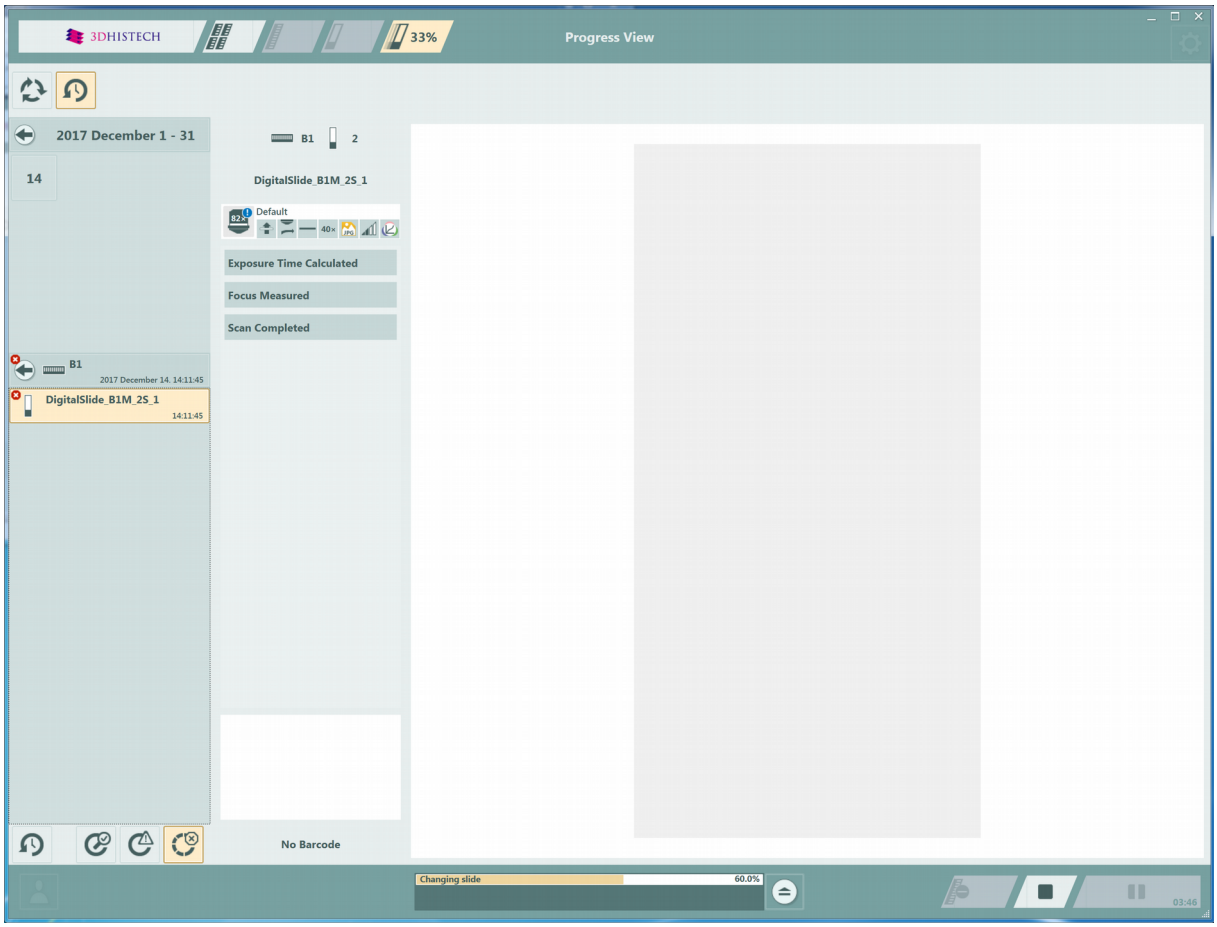


Figure 21 – Scanning history panel of Progress View

5 Using Profiles

Note:

Saved profile settings cannot be applied if using a different type of Pannoramic scanner.

The following settings are saved in a profile:

Scan Mode

- Brightfield

Scan Options

- Focus frequency
- Compression procedure
- Use of a fixed compensation image (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
- Remove coverslip function (ON/OFF)
- Use of scan everything within marked area function (ON/OFF)
- Filling of holes (ON/OFF)
- Use of removing specks according to the set value (ON/OFF)
- Use of saved scan area
- Use selection box (ON/OFF)

Other settings

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

6 Troubleshooting and Maintenance

6.1 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.

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

6.1.1 Cleaning the device

Before cleaning, switch off the device and pull the plug out.

Do not let liquid penetrate into the system.

To clean liquid from the device, use a lint-free cotton cloth. You can moisten the cloth with water.

To clean greasy surfaces, it is recommended to apply **Isopropanol** on a piece of lint-free cotton cloth and gently rub the surface.

6.1.2 Cleaning the condenser

Warning!

Before cleaning, switch off the device and pull the power cord out of the connector.

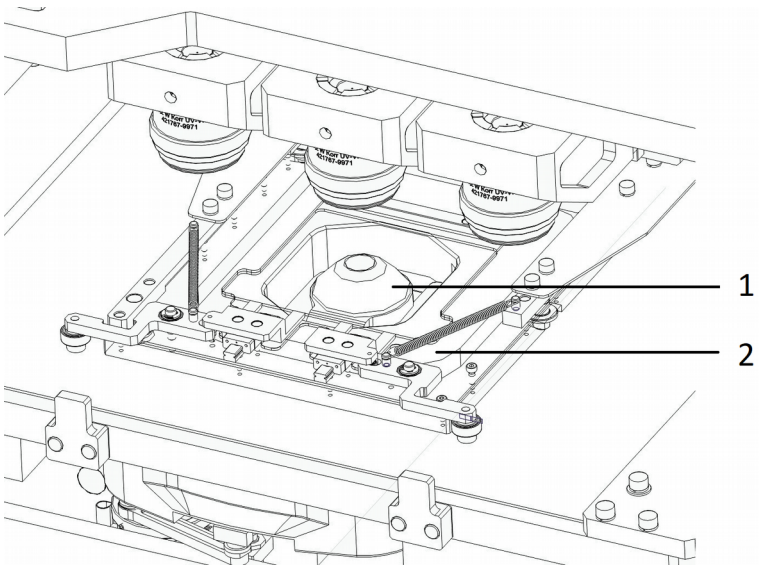


Figure 22 – Condenser unit

1. Open service door.
2. Gently move the slide holder (**2**) into the middle above the condenser (**1**).
3. Do not let liquid penetrate into the system.
4. Use compressed air to lay the dust.

   To clean the glass surface of the condenser from any other contamination (such as immersion liquids), it is recommended to apply Isopropanol on a piece of lint-free cotton cloth and gently clean the surface.

6.1.3 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 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.

6.2 Troubleshooting

This section describes the most common troubleshooting solutions for the Pannoramic products. 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 main switch of the internal power supply is on.
  2. Check cable connections.

Virtual slide is improperly focused almost across its entire surface

- **Focus range enabled**
  - Disable **Limiting focus range**.

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.

Virtual slides show poor stitching in Viewer

- **Scan camera not properly adjusted (for example, due to loose fixture)**

- Contact Thermo Fisher Scientific Service 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

- **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

6.3 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.

6.3.1 Removing the protective cover

To perform any maintenance work on the device, the protective cover of the Pannoramic 1000 is needed to be removed.

Caution!

Only instructed persons or service technicians can remove/reattach the cover of the device!

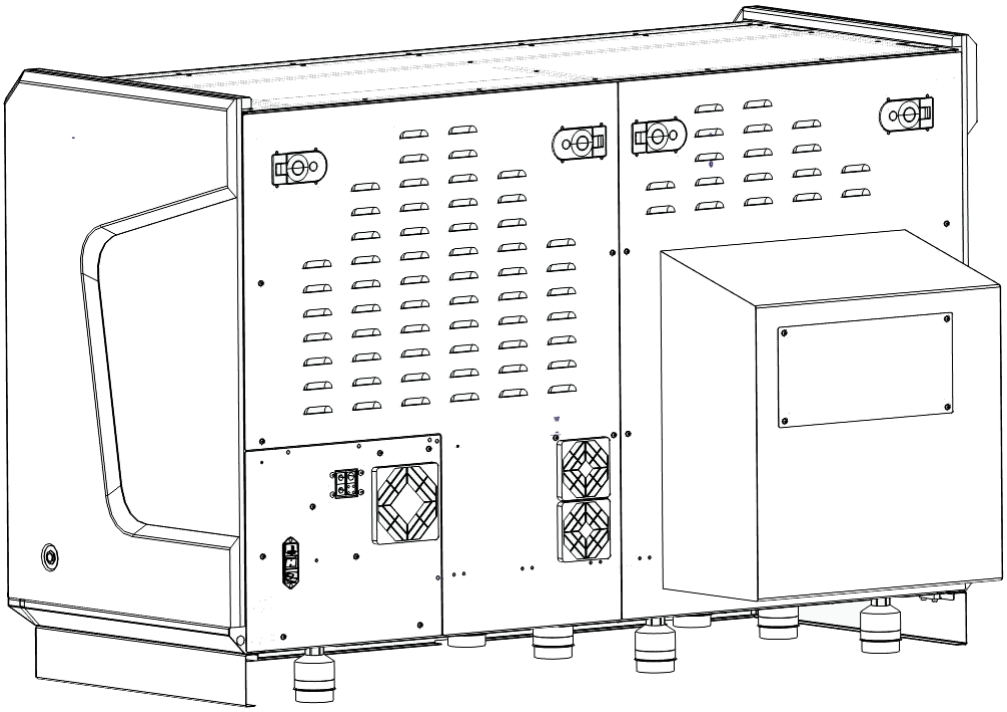


Figure 23 – Removing/reattaching the cover

1. Release the four latches at the top of the two cover plates at the back of the device.
2. Remove covers carefully.

6.3.2 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 1000.
3. Release lock (**1**) by pushing the lever upwards, so the insert (**2**) can be pulled out.

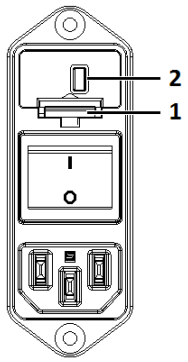


Figure 24 – Fuse compartment

4. Remove insert from the compartment.

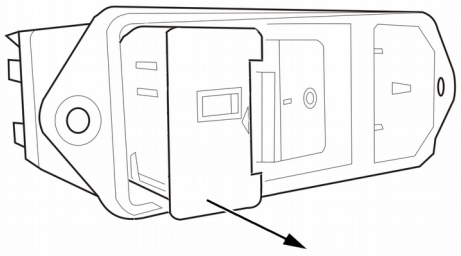


Figure 25 – Removing the fuse insert

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

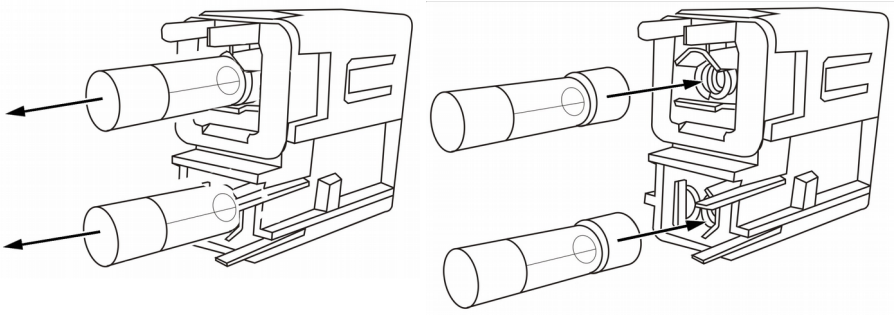


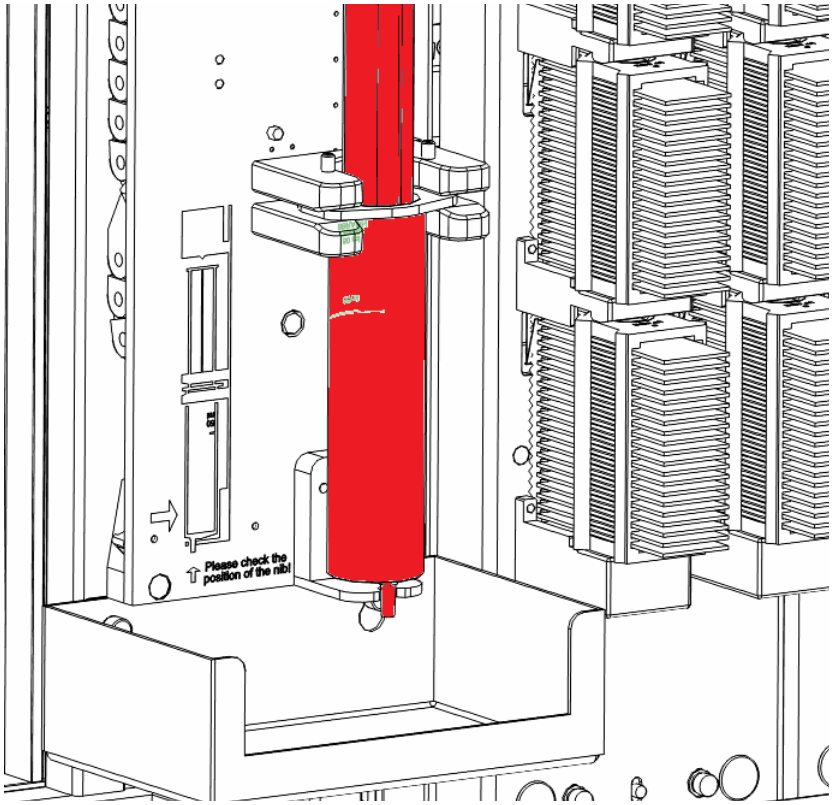
Figure 26 – Replacing the fuses

6.3.3 Removing and refilling the pipette

The pipette is designed to store distilled water or oil as immersion fluid for the wet 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 µS/cm) or oil is used.

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

1. Open the service door.
2. The pipette is located in the center area of the device, next to the magazine compartment (marked with red on the below image).



3. Firmly grab the pipette at the top, then pull/tilt 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 can be performed by an experienced and trained person only. If the pipette unit is removed with not enough care, the skin on your hand can be bruised.

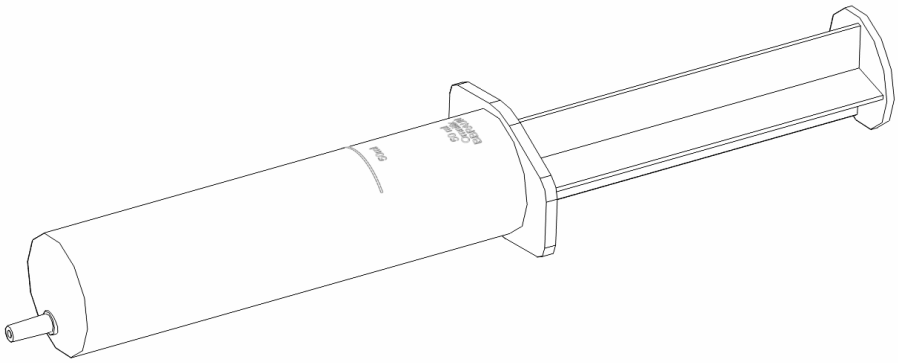


Figure 27 – Pipette

4. Empty the pipette (syringe) entirely. Pump up same type and necessary amount (max. 50 ml) of immersion fluid by pulling the „knob" of the syringe outwards. If you want to change the type of immersion fluid (e.g. from oil to water) please use a new syringe. Please be aware of the type of the objective too during scanning to take high quality pictures.
5. Place the pipette back to its seating by placing the nib to its stand first then tilt back the syringe's neck. Make sure to stand the pipette perfectly vertical. Check the position of the nib. On the supported **B.Braun Omnifix 50 ml** syringe the text should be on the back side.
6. Close the service door.

6.3.4 Removing a slide

If a slide got jammed, fell down from the arm of the grabber or has suffered breakage during the process of digitization, stop the process and, if possible, move the slide holder/grabber to a position where the slide can be easily removed.

Warning!

Crush hazard! Before you remove a jammed/dropped 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).

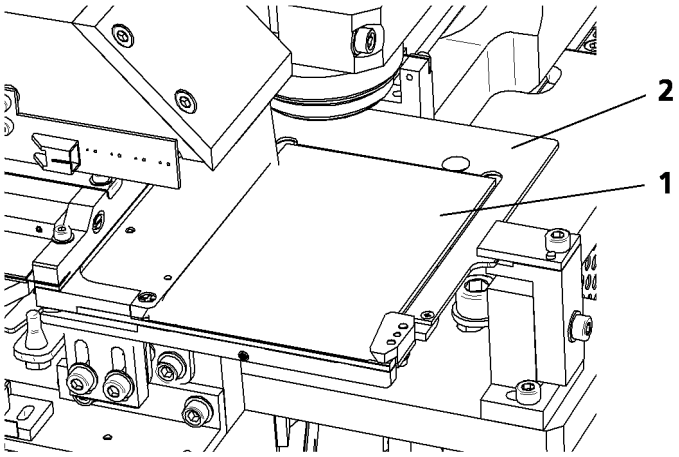


Figure 28 – Removing a slide

1. Exit control software.
2. Switch off power supply and disconnect power cable.
3. Open magazine compartment door or service door depending on the position of the slide during the digitization process.
4. Remove the slide.

> **Warning!**
>
> 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!

5. Close the door(s).
6. Connect the power cable of the power supply to the power outlet and switch on the power supply.
7. Launch control software.

7 Transporting Pannoramic 1000

The below sequence of steps demonstrate how to move Pannoramic 1000 to another location within a building:

Caution!

The base unit does not have carrying handles for transporting. At least 4 or 6 persons can carry the base unit by holding it by its base plate. 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 ***9. Technical Data***.

To transport Pannoramic 1000 do the following:

1. Turn power supply off and detach all cables.
2. Move Pannoramic 1000 by rolling on its desk.
3. After finishing transportation, reestablish cable connections.

8 Packaging instructions for Pannoramic 1000

8.1 Preparations

1. Unload slides (if there is any) from the slide holder unit by using the scanner software.
2. Close the scanner software normally.
3. Apply fixtures for transportation at the specified locations (I - II - III)

   Use the service software to send the units to the transport positions (Transport positions button)

   I. Microscope

   (a) Focus unit

   Mount the fixing block (A) for the piezo focus unit to the top of the microscope (vertical plate) with 2 pcs of M4x25 mm socket head cap screws and washers (B). Use a 3 mm hexagon wrench tool.

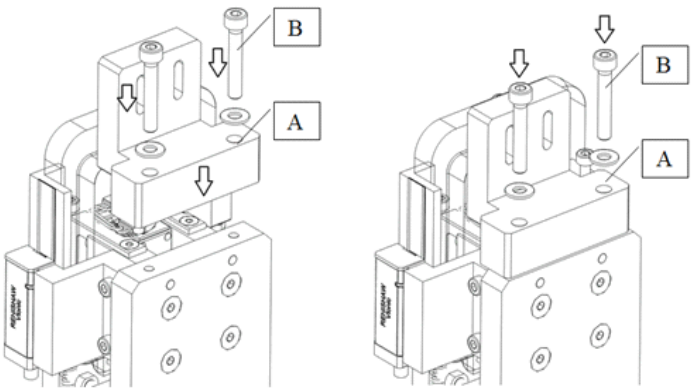


Figure 29 – Mount fixing block on focus unit

Select the objective in the middle with the software.

The piezo (Z) motor should be in a position when the 2 threaded holes are somewhere in the holes shaped like a race-track (HOME position).

- Turn off the scanner with the switch located on the cover of the device. Disconnect all the cables of the scanner.
- Remove all the magazines with your slides.

(b) Objective changer

Mount the transport fix (A) for the objectives (B) to the upper horizontal plate of the microscope (C) with 2 pcs of M5x25 socket head cap screw (D). Use a 4 mm hexagon wrench tool.

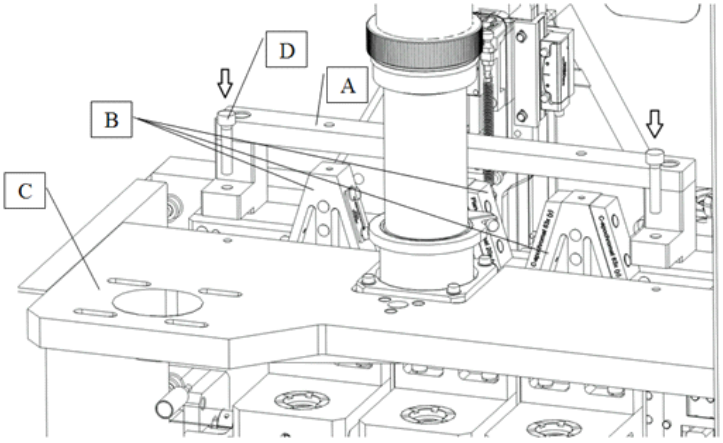


Figure 30 – Mount fixing blocks on objective changer

Lift each objective holder (B) by hand and mount them with M4x20 socket head cap screws (E) (3x). Use 3 mm hexagon wrench tool. (***Figure 30-32***)

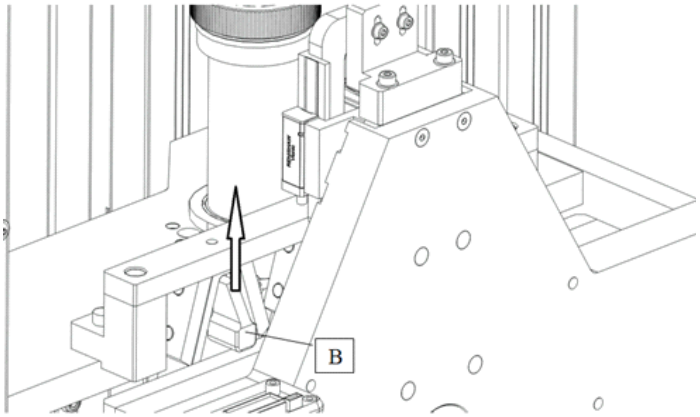


Figure 31 – Mount fixing blocks on objective changer

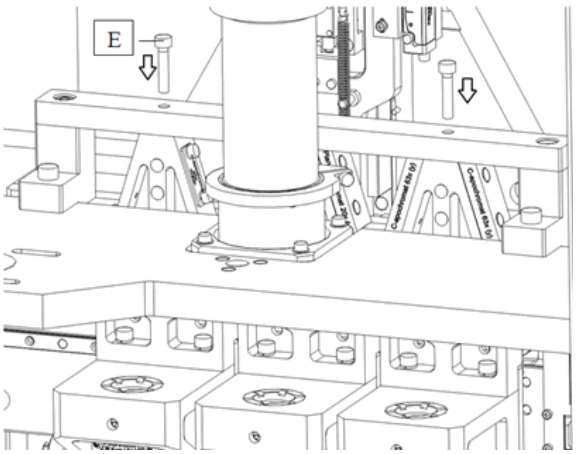


Figure 32 – Mount fixing blocks on objective changer

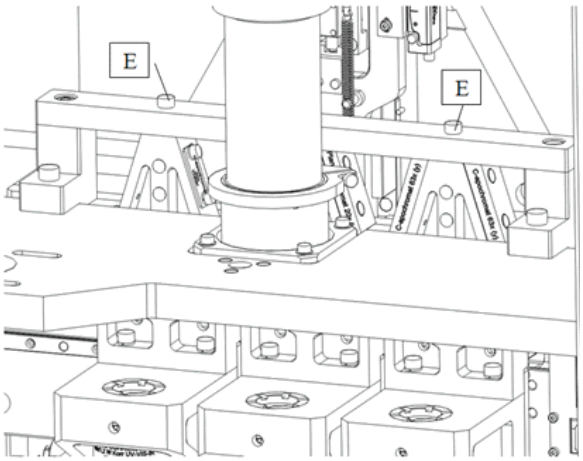


Figure 33 – Mount fixing blocks on objective changer

Mount the focus unit (A) with M3 spacers (B) and M3x16 socket head cap screws (C). Use a 2,5 mm hexagon wrench tool. (***Figure 33-34***)

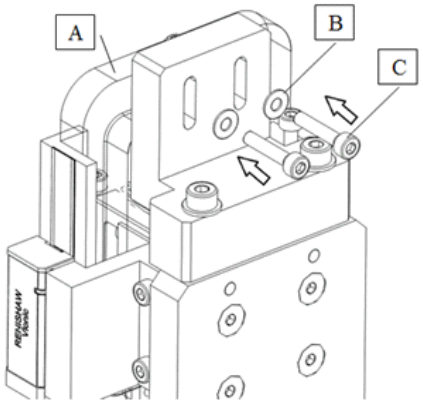


Figure 34 – Mount focus unit

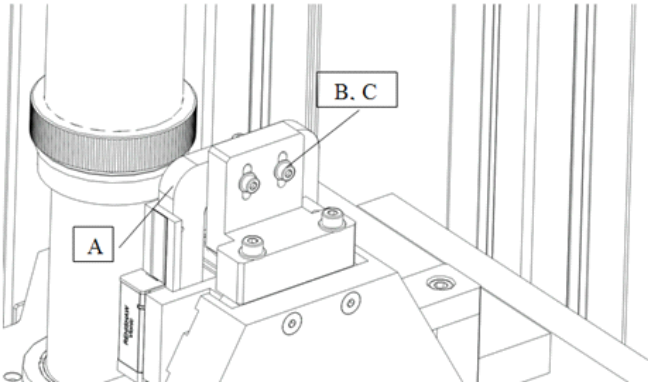


Figure 35 – Mount focus unit

(c) X-Y stage, slide holder

The stage should be in the transport position.

Mount the transport fix (A) (shaped like a bridge) above the stage with M5x30 socket head cap screws (B). Use a 4 mm hexagon wrench tool. Pay attention to the sponges (C) at the bottom of the transport fix. They should be above the 2-2 screws (D) at the left and right side of the stage next to the extension springs. (***Figure 35-39***)

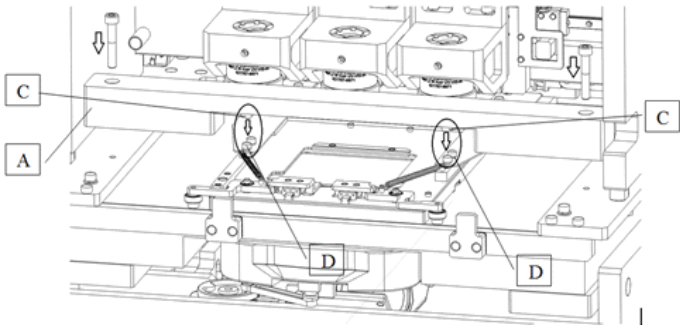


Figure 36 – Mount fixing to stage

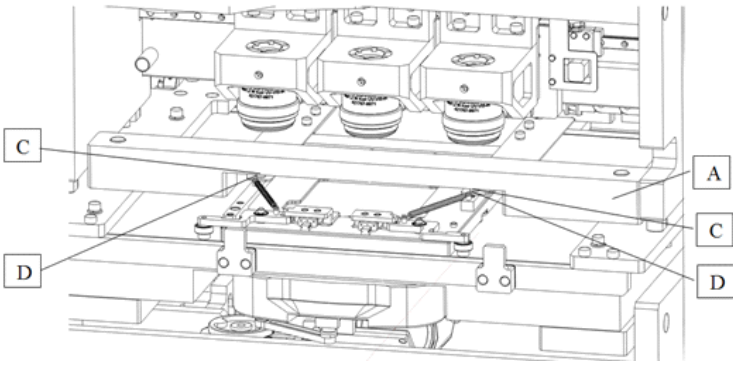


Figure 37 – Mount fixing to stage

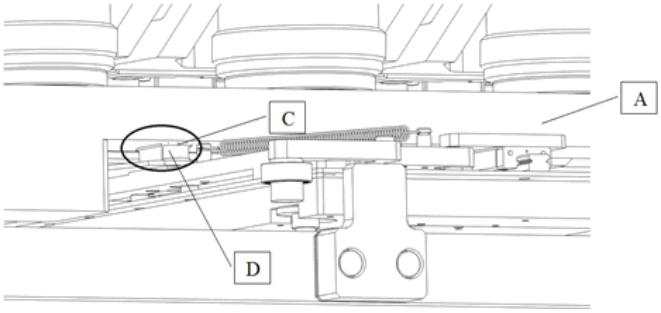


Figure 38 – Mount fixing to stage

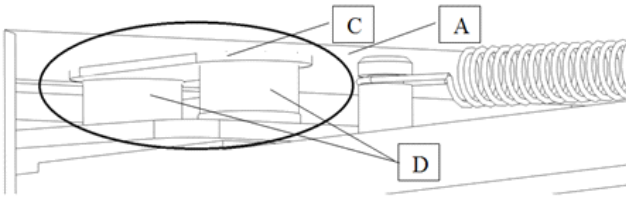


Figure 39 – Mount fixing to stage

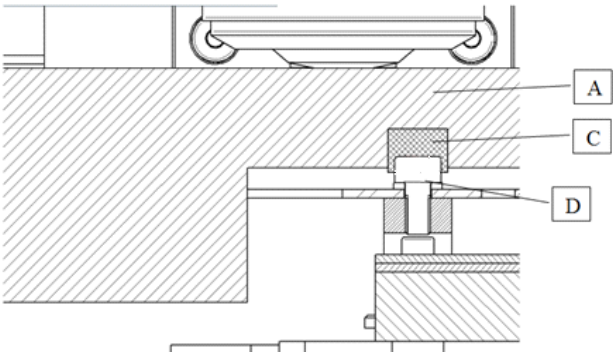


Figure 40 – Mount fixing to stage

II. Slide loading unit

(a) X-Y (horizontal/vertical) movement

Move the X-Y slide loading unit (contains also the gripper unit) (B+C) by hand to the transport position (to the bottom right hand corner).
Mount the red fixing to the aluminum frame (A) next to the X-Y slide loading unit with M6x20 hexagon socket cap head screws and washers (D). Use a 5 mm hexagon wrench tool.

Lift the gripper unit (C) to the position of the holes of the fixing. Screw them together with M3x10 hexagon socket cap head screws and washers (E). Use a 2.5 mm hexagon wrench tool. (***Figure 40-41***)

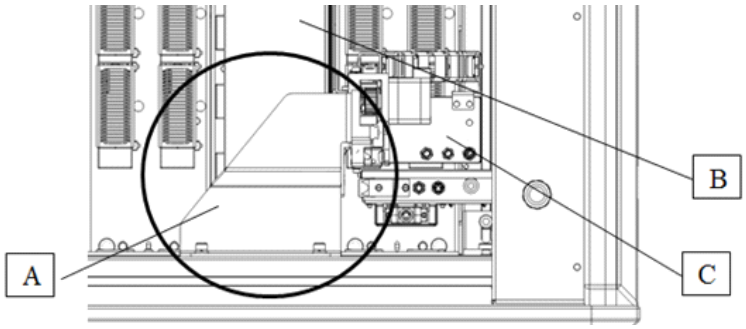


Figure 41 – Mount fixing to frame

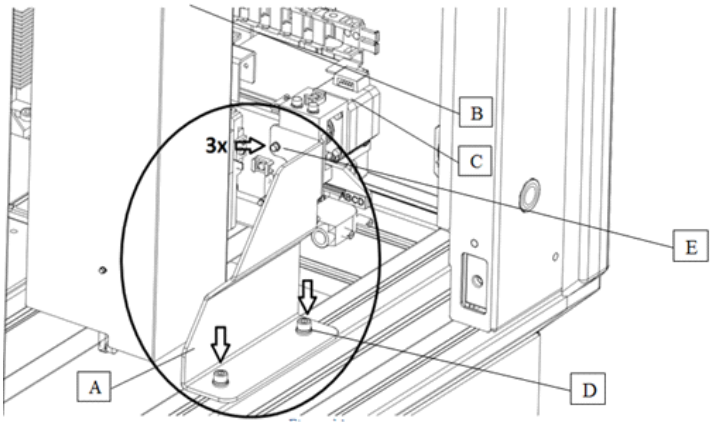


Figure 42 – Mount fixing to frame

(b) Gripper unit (slide in-out)

Bind the tooth belt fixing (A) to the stepper motor (B) with a red strap (C). (***Figure 42***)

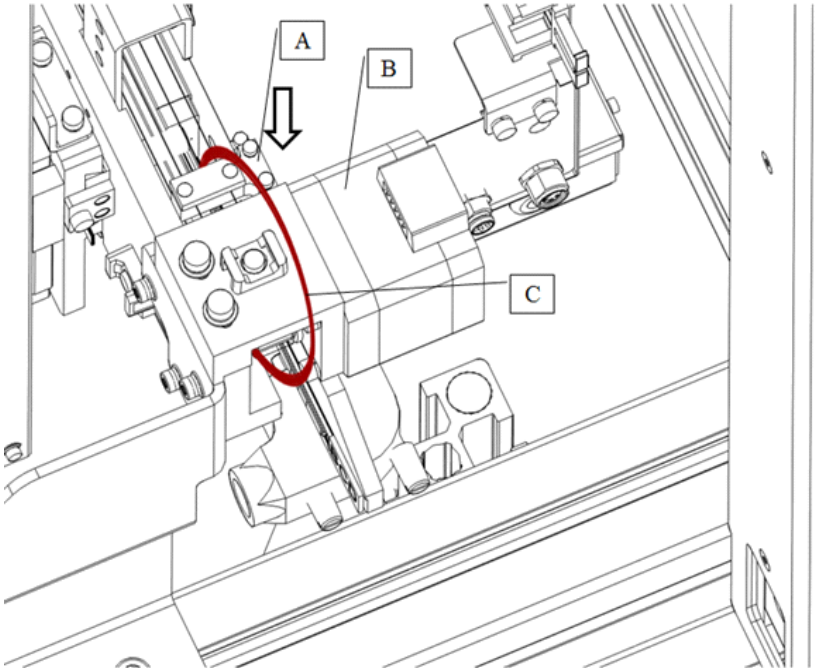


Figure 43 – Mount fixing strap on tooth belt

III. Cover

To lock magazine loading door (at the right), first open the service door (at the left).
Use a 3 mm hexagon wrench tool to screw the door fixing unit (A) with 2 pcs of M4x16 socket head cap screw (B).

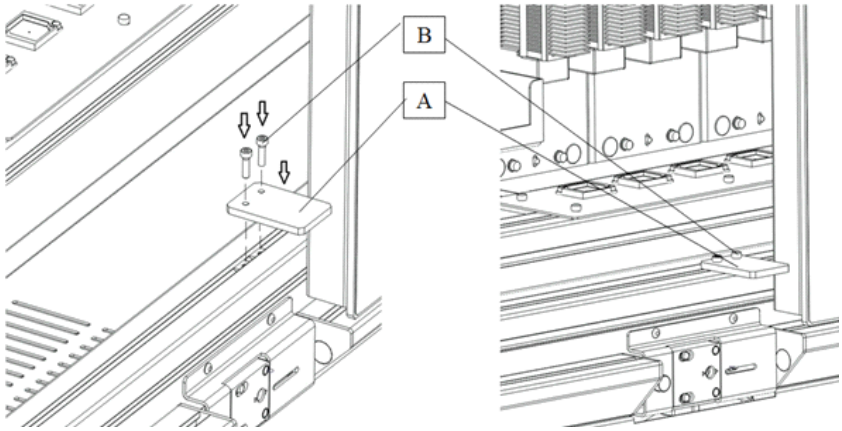


Figure 44 – Lock magazine loading door

4. Take off the rocker panels (if any) from the sides and from the front. Just pull them outward. They are mounted/hold by magnets.

5. Turn off and disconnect all the cables of the workstation and display.

6. Place the workstation, the monitor, and all accessories to their dedicated place.

8.2 Main parts and their accessories

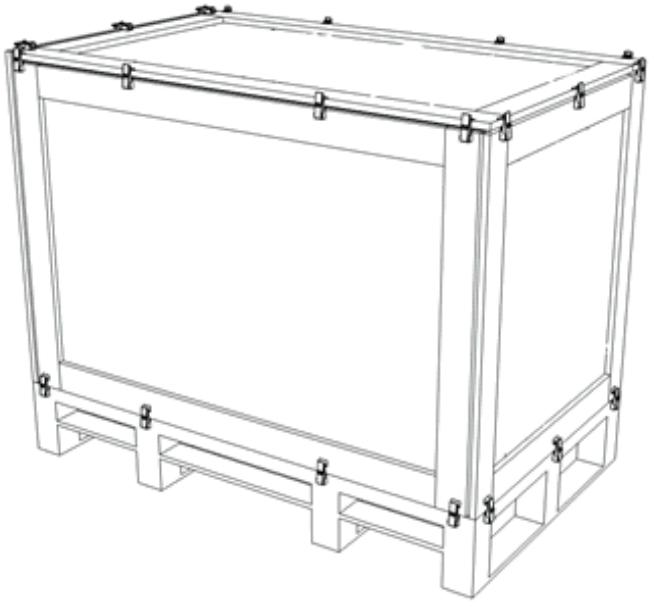


Figure 45 – BOX 1

1. BOX 1 – Transportation box

a) fixing foams for the scanner

b) P1000 scanner

c) objective(s) (in scanner)

d) camera adapter(s) (in scanner)

e) camera (in scanner)

f) BNC-DIN PROFILE cable

g) microscope USB cable (in scanner)

h) USB 3.0 cable (in scanner)

2. BOX 2 – Accessories

a) power supply cable

b) magazines for P1000

c) 3DH SW box

d) install disc (in SW box)

e) dongles

3. BOX 3 – Carton box dedicated for the PC

a) PC (placed inside the dedicated foam)

b) coax express Radient card (in PC)

c) display port to DVI adapter

d) power supply cable for PC

e) drivers, manual and utilities CD

f) keyboard and mouse (has a separated small carton box)

g) DVI-HDMI cable

h) 3DH mouse pad

4. BOX 4 – Carton box dedicated for the display

a) display

b) power supply cable

c) power supply

d) USB cable

e) audio cable

f) VGA cable

5. Documents

a) packing list

b) license report

8.3 Packaging

The scanner is packed in a huge wooden box. The computer and monitor have separate boxes (as seen above).

Detailed images of the wood box can be found at the end of this document.

8.3.1 Packing the P1000 scanner

The most sensitive and most heavy unit is the P1000 scanner. Please handle it with care, the weight of the device is more than 250 kg.

The structure of the BOX 1 including the foams is shown on ***Figures 45-48***, and ***52-55***. The fixing points on the bottom of the box and the circles marked on the base for the instrument's feet (see ***Figure 48***) defines the orientation how the scanner should be placed inside, so first please examine it! Where fixing points are closer to the edge is the front side. Front side is signed too with text.

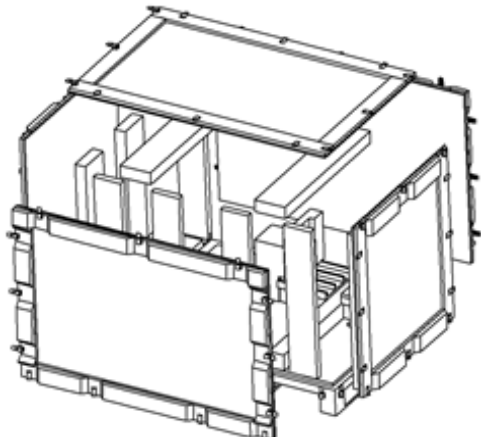


Figure 46 – BOX 1

The scanner should be lifted up by holding the machine with a forklift or a mini-stacker at its bottom between its feet and taken inside the BOX 1's lower part onto the beams. Please check the position of the instrument.

On the right there should be about 50 mm space from the edge of the bottom wood plate on the base. (You can take Side B to its place on the right for a try – the foams should fill the ~50 mm gap – but after checking the position you should remove Side B because of the steps below.)

Put rocker panels (if any) to their place into the foams behind the scanner. First slide the long front panel then put the foam to the corner (***Figure 46***) then place the left and right panels into the foam on the other side. (***Figure 47***)

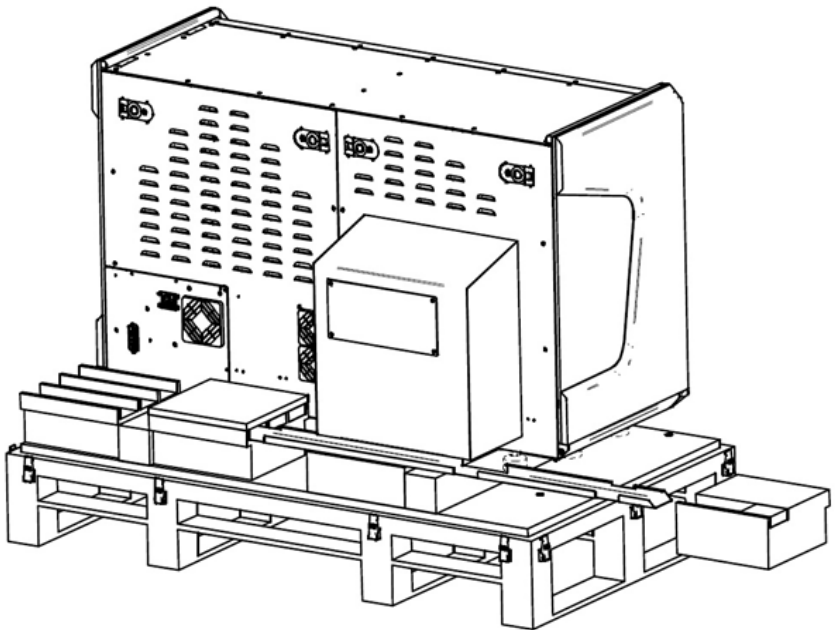


Figure 47 – BOX 1

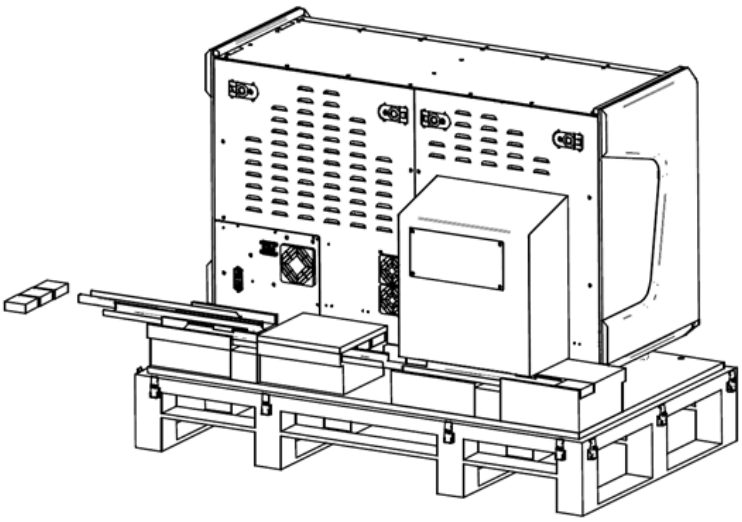


Figure 48 – BOX 1

Please take Side B to its place on the right. The foams should fill the ~50 mm gap. Use the latches to fix the side wood panel. Secure the machine with straps to the fixing points (***Figure 48***) on the base. Use edge protectors under the straps on the machine.

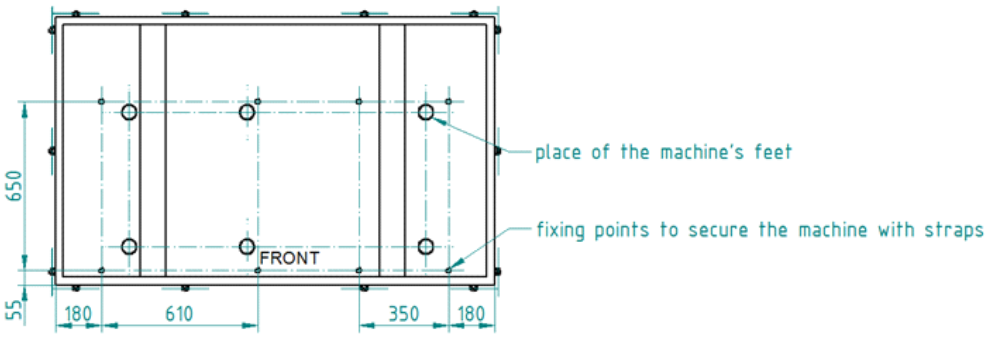


Figure 49 – BOX 1

Put the foams for the transport plates on the top of the rocker panels' foams. Place in the transport plates. (***Figure 49***)

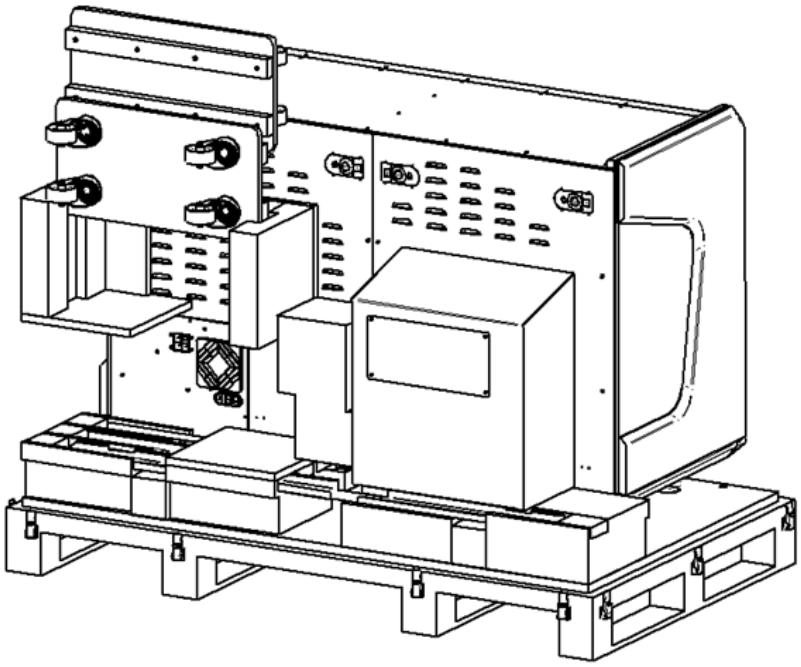


Figure 50 – BOX 1

Stand the other side wood panels on the basement one at a time then fix them with the draw latches. Pay attention to the secondary lock buttons.
Put all the other fixing foams to their place.

8.3.2 Closing the package

Place the top panel to BOX 1. Secure it with the latches.

8.3.3 Packing the accessories

Place inside computer and its accessories into BOX 2 and display and cables into BOX 3. Secure them with straps.

8.4 Handling of the package

Please be aware to observe the following instructions on ***Figure 53***.:

Designation	Symbol	Explanation
Top		The package must always be transported, handled and stored in such a way that the arrows always point upwards. Rolling, swinging, severe tipping or tumbling or other such handling must be avoided. The cargo need not, however, be stored "on top".
Fragile, Handle with care		The symbol should be applied to easily broken cargoes. Cargoes marked with this symbol should be handled carefully and should never be tipped over or slung.
Keep dry		Cargoes bearing this symbol must be protected from excessive humidity and must accordingly be stored under cover. If particularly large or bulky packages cannot be stored in warehouses or sheds, they must be carefully covered with tarpaulins.
Recycling		This indicates that an object is capable of being recycled.
CE		The symbol shows that the device complies with the essential requirements of the relevant European health, safety and environmental protection legislation, in practice by many of the so-called Product Directives..
Do not stack		Cargoes marked with this symbol should be handled so that so no one loads one on top of the other to avoid crushing.

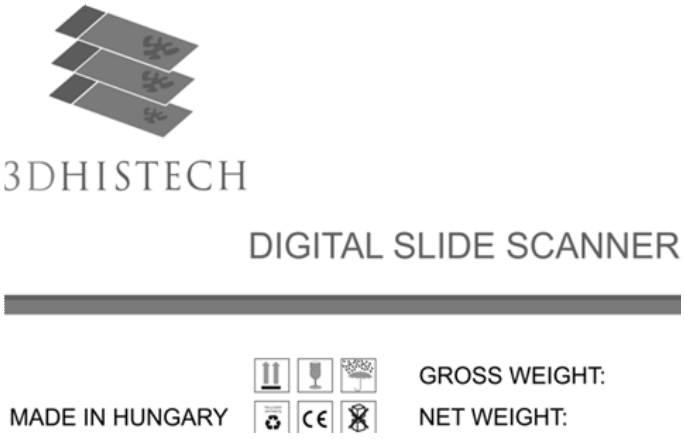


Figure 51 – Box labeling

Package must be stored and transported between the temperature and humidity rates on ***Figure 51***.

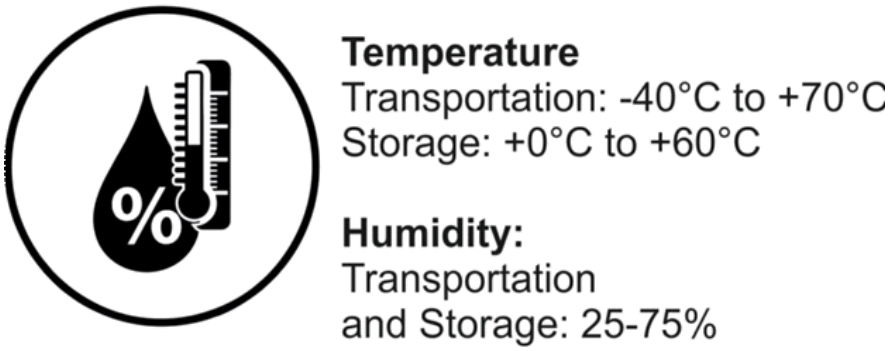


Figure 52 – Transportation- and storage-related labeling

8.5 Construction of the wooden box

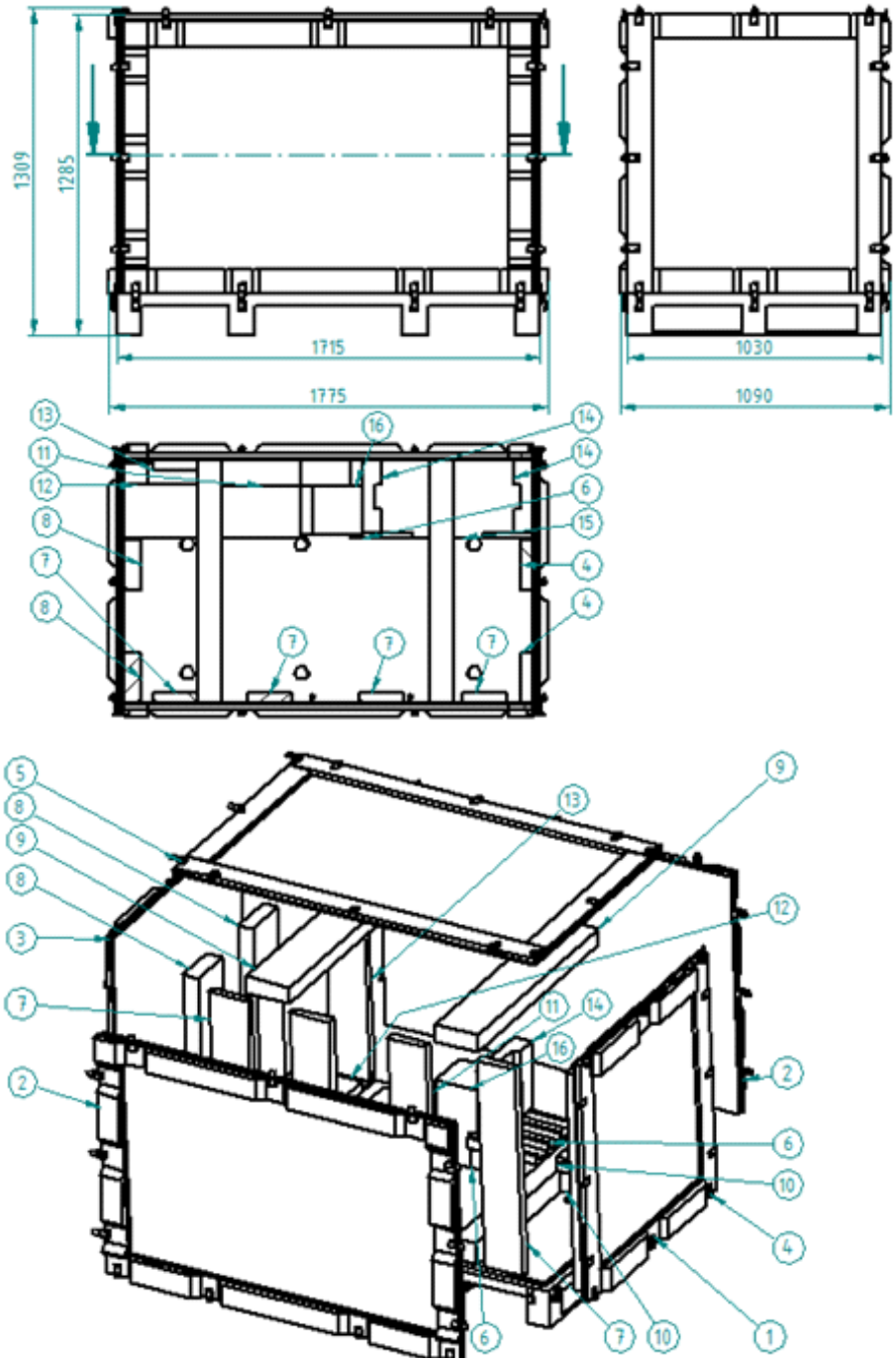


Figure 53 – Construction of the wooden box

1. Base
2. Side A
3. Side D

4. Side B
5. Top of BOX 1
6. Foam for fixing the scanner - G
7. Foam for fixing the scanner – C
8. Foam for fixing the scanner – E
9. Foam for fixing the scanner – F
10. Latch - 1
11. Latch – 2
12. Foam for fixing the scanner – B
13. Foam for fixing the scanner – H
14. Foam for fixing the scanner – I
15. Foam for fixing the scanner – J
16. Foam for fixing the transport plates
17. Rocker panel – right
18. Rocker panel – front
19. Rocker panel – left
20. Transport plate
21. P1000

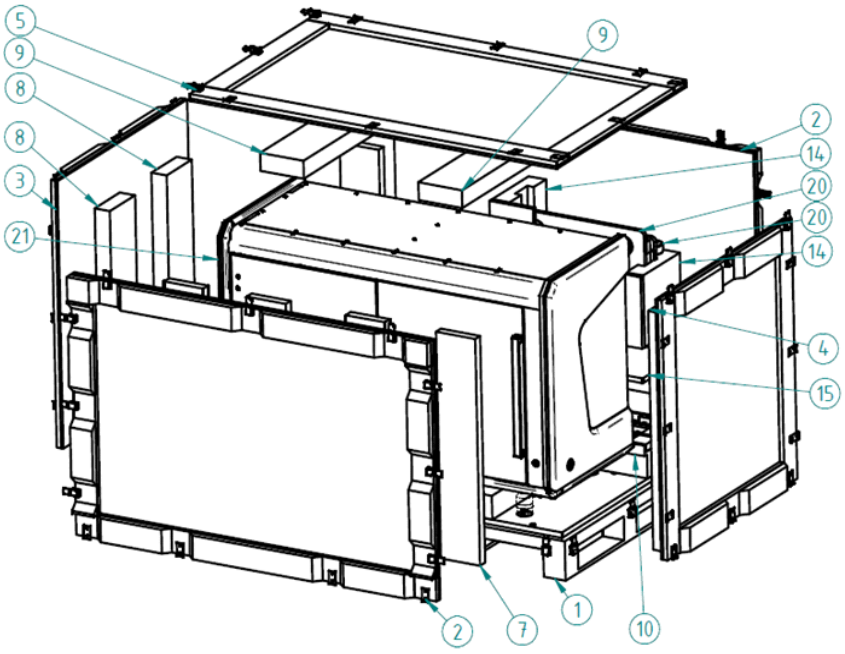


Figure 54 – Construction of the wooden box

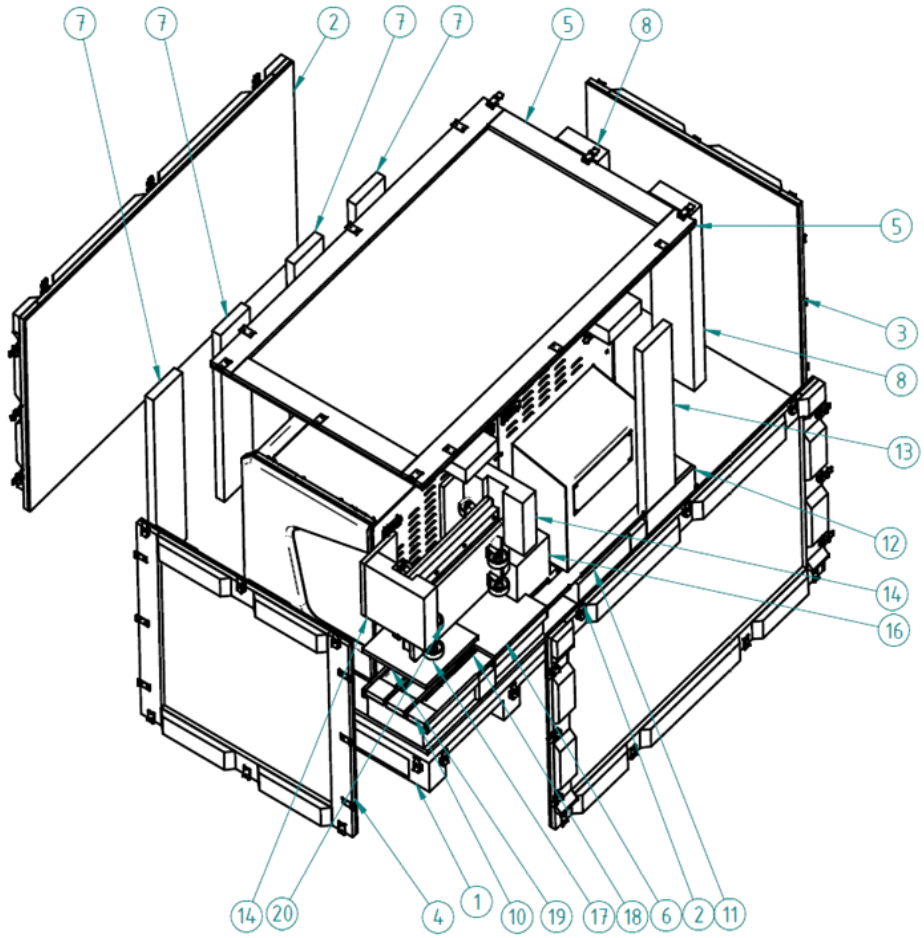


Figure 55 – Construction of the wooden box

9 Technical Data

Dimensions (width x depth x height)

Base unit	Approx. 1540 x 902 x 1004 mm

Weight

Base unit	Approx. 270 kg

Ambient conditions

Transportation / shipment (packed)

Permissible ambient temperature	-40°C to +70°C

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	I
Internal protection degree	IP 20
Electrical safety	in compliance with EN61010-1:2010, EN61010-2-081:2015, EN61010-2-101:2017
Over-voltage category	II
Electromagnetic compatibility	in compliance with EN31326-2-6:2013
Base unit input voltage	90-264 Vac
Power consumption of the complete device	400 VA

Light sources

Brightfield illumination	Excelitas PAX-10 Precision Aligned Xenon pulsed light source
Average service life of ARC	>1.0 x 10^9 flashes

Scan camera

Adimec QUARTZ Q-12A180 camera **Global Shutter CMOS**	
Pixel size5.5µm × 5.5µm	5.5µm × 5.5µm
Camera resolution	4096 (H) × 3072 (W) pixel
Camera max. speed	187 frame per second
Bit-depth	8 bit / 14 bit (16 bit in High SNR mode)
Pixel resolution with 20× objective and 1.6× C-mount adapter	0.24µm
Connection type	CoaXPress – 4 lanes

Control computer, minimum system requirements

Operating System	Microsoft Windows 10 64-bit EN
CPU	Intel Xeon Gold 5120 14C 2.2 GHz
RAM	6x8 GB DDR4-2666 rg ECC
Hard disk	1+2 TB
Optical drive	DVD SuperMulti SATA slim
Display	96 dpi
Graphics	SXGA (1280 × 1024, True color)
Input devices	keyboard, mouse
Ports	4 x USB 2.0, GB Ethernet

Index

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