

3D HISTECH

**Slide Converter 2.4**

**User's Guide**

2020. 07. 28.

Rev. 1

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## Character Types and Symbols

<i>Example</i>	Abbreviation or term that is explained in section <a href="#">Terms and Abbreviations</a> .
<b>Example</b>	Words or characters that appear on the screen. These include field names, screen titles, pushbuttons and menu names, paths or options.  Keys on the keyboard. For example, function keys (such as <b>F11</b> ) or the <b>Ctrl+O</b> key combination.
<i>Example</i>	Cross-references to other documents or sections within this document.
 <b>Warning!</b>	Indicates that you need an additional module to use the feature or that there are prerequisites for the task.
 <b>Important!</b>	Contains an important piece of information or a recommendation. The application will work if you choose not to follow the recommendation but its performance might be less than optimal.
 <b>Tip!</b>	Contains a suggestion about using the application in some other way or to some interesting purpose.

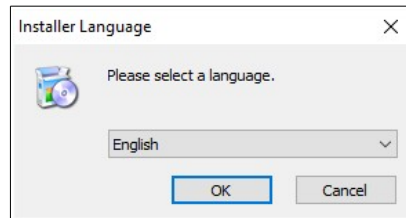
# 1 System Requirements

The following table includes the recommended minimum system requirements:

<b>CPU</b>	Intel Core i5 CPU, 4 core, 2 GHz
<b>RAM</b>	8 GB
<b>Free disk space for temp files in Temp directory</b>	16 GB

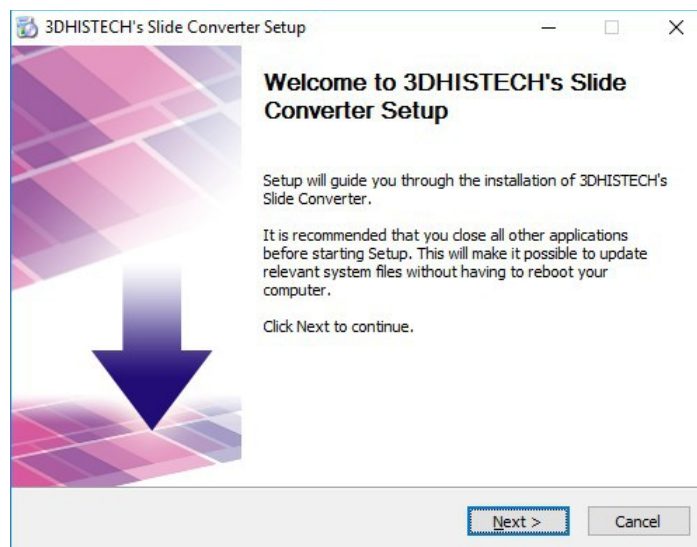
## 2 Installation

1. Upon launching the *installer.exe* file the installation wizard opens. Select the language used during installation.



**NOTE:** The selected language will be applied for the user interface.

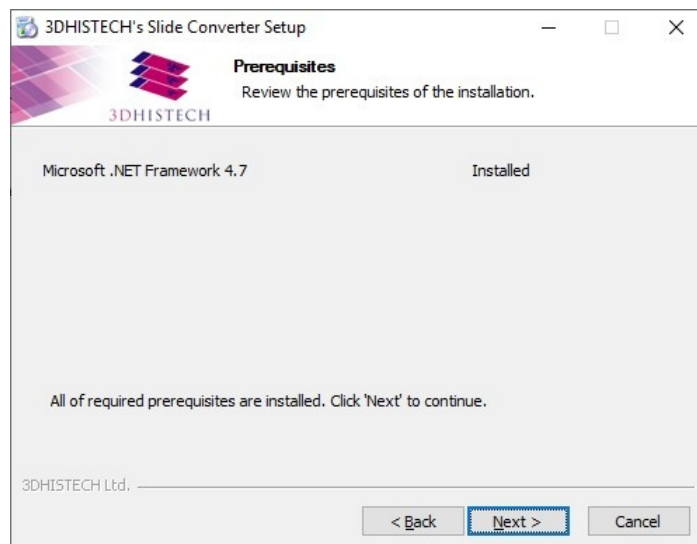
2. Click **Next** to continue.



3. Accept the EULA, then click **Next**.

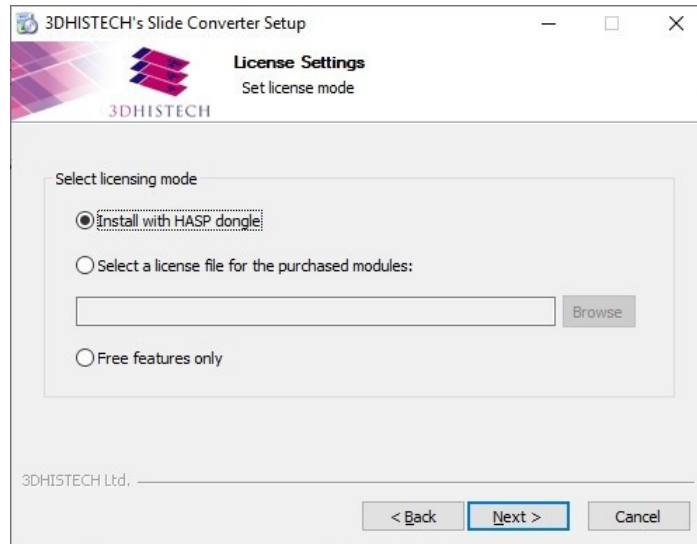


4. Install the missing prerequisite file by clicking **Install**, otherwise, if the prerequisite file has already been installed, click **Next**.



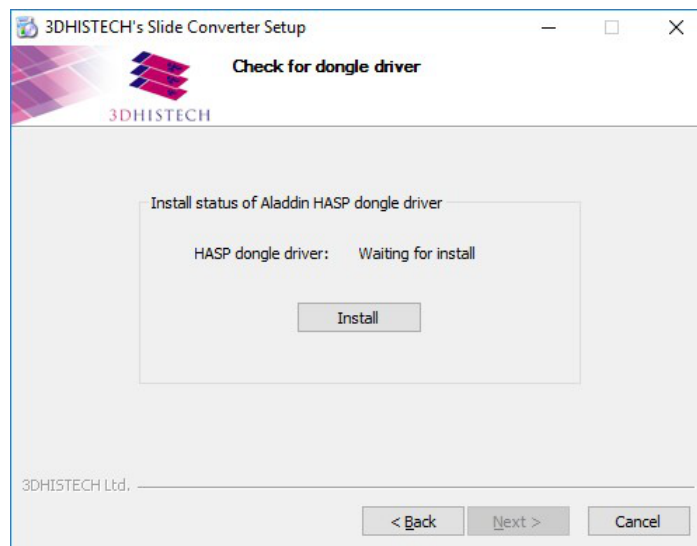


5. Select licensing mode (dongle or license file), then click **Next** to continue.

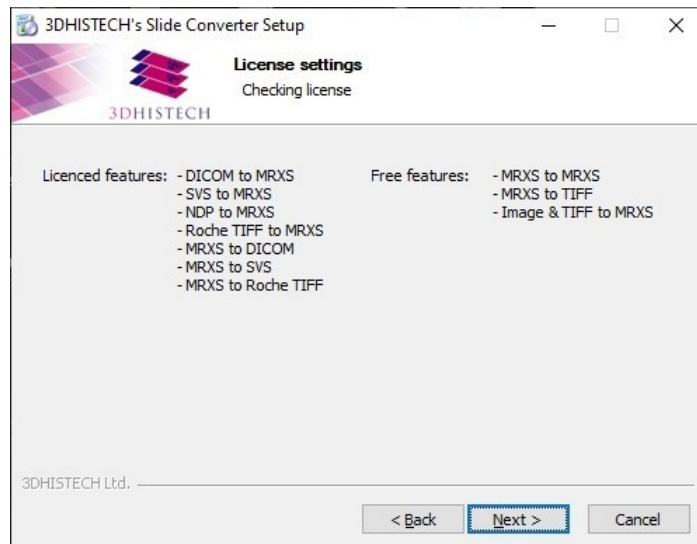


If the **Free features only** option is selected, licensing is not required for using free features of the software.

6. If you selected to use dongle for licensing, then click **Install** first to install HASP dongle driver.



7. The license information is displayed based on the selected license file or the dongle. Click **Next** to continue.

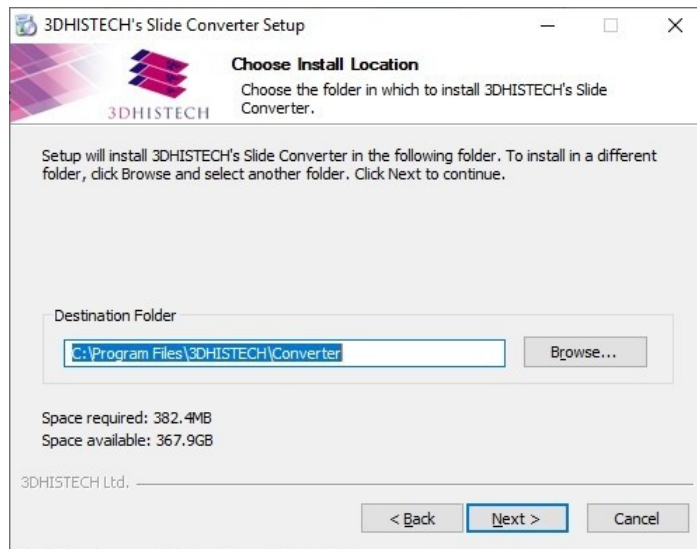


- Licensed conversion options are the following:
  - SVS to MRXS (Aperio -> 3DHISTECH)
  - NDP to MRXS (Hamamatsu -> 3DHISTECH)
  - ROCHETIFF to MRXS (Roche -> 3DHISTECH)
  - MRXS to DICOM (3DHISTECH -> Dicom)
  - MTXS to SVS (3DHISTECH -> Aperio)
  - MRXS to ROCHETIFF (3DHISTECH -> Roche)

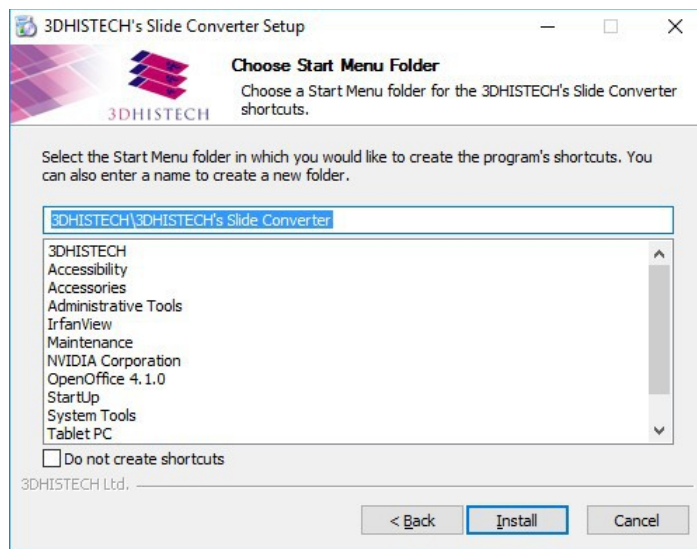
If no licensed conversion option is listed, the converter tool can be used for the following conversion types:

- MRXS -> MRXS conversion (de-overlapping)
- MRXS to Tiled TIFF (3DHISTECH -> TIFF image, separate image files are created for each FL channel and Z-Stack layer)
- Image & TIFF to MRXS (JPG, PNG, BMP, and TIFF image -> 3DHISTECH)

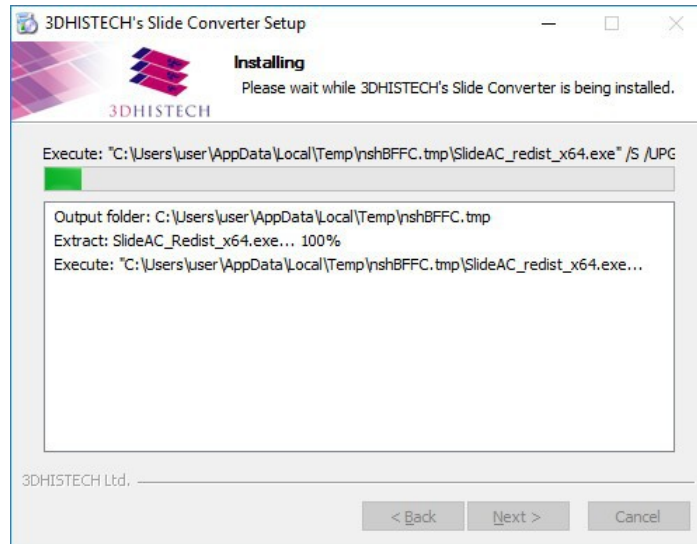
- 8. Choose program folder, then click **Next**.



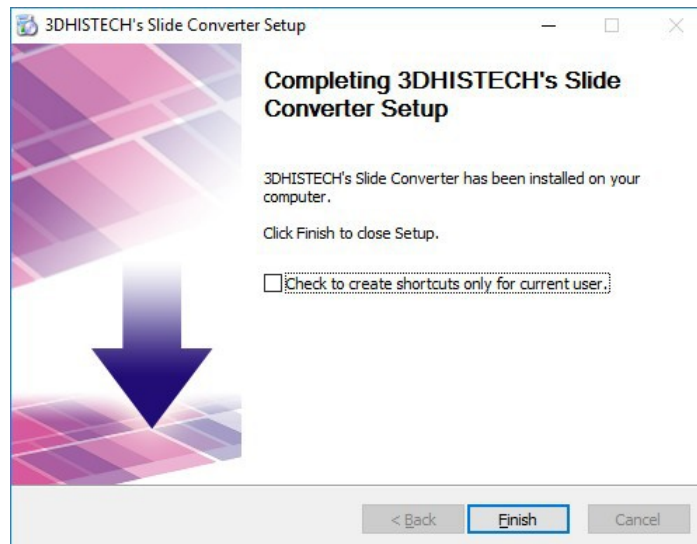
- 9. Select Start menu folder, then click **Install**.



10. Installation process is displayed with a progress bar.



11. In the final window you can activate the option to create shortcuts only for the current user. Click **Finish** to close installation wizard.

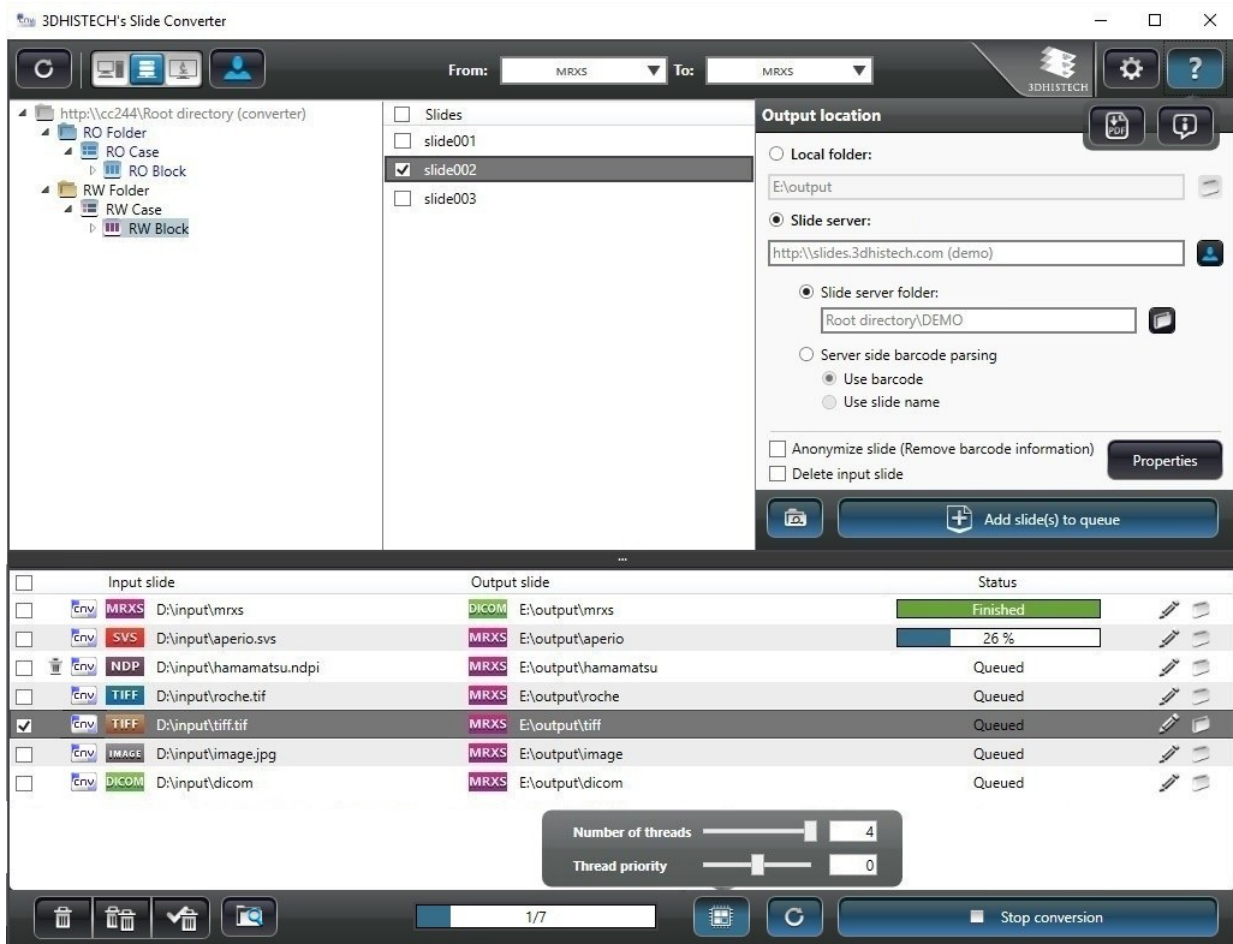


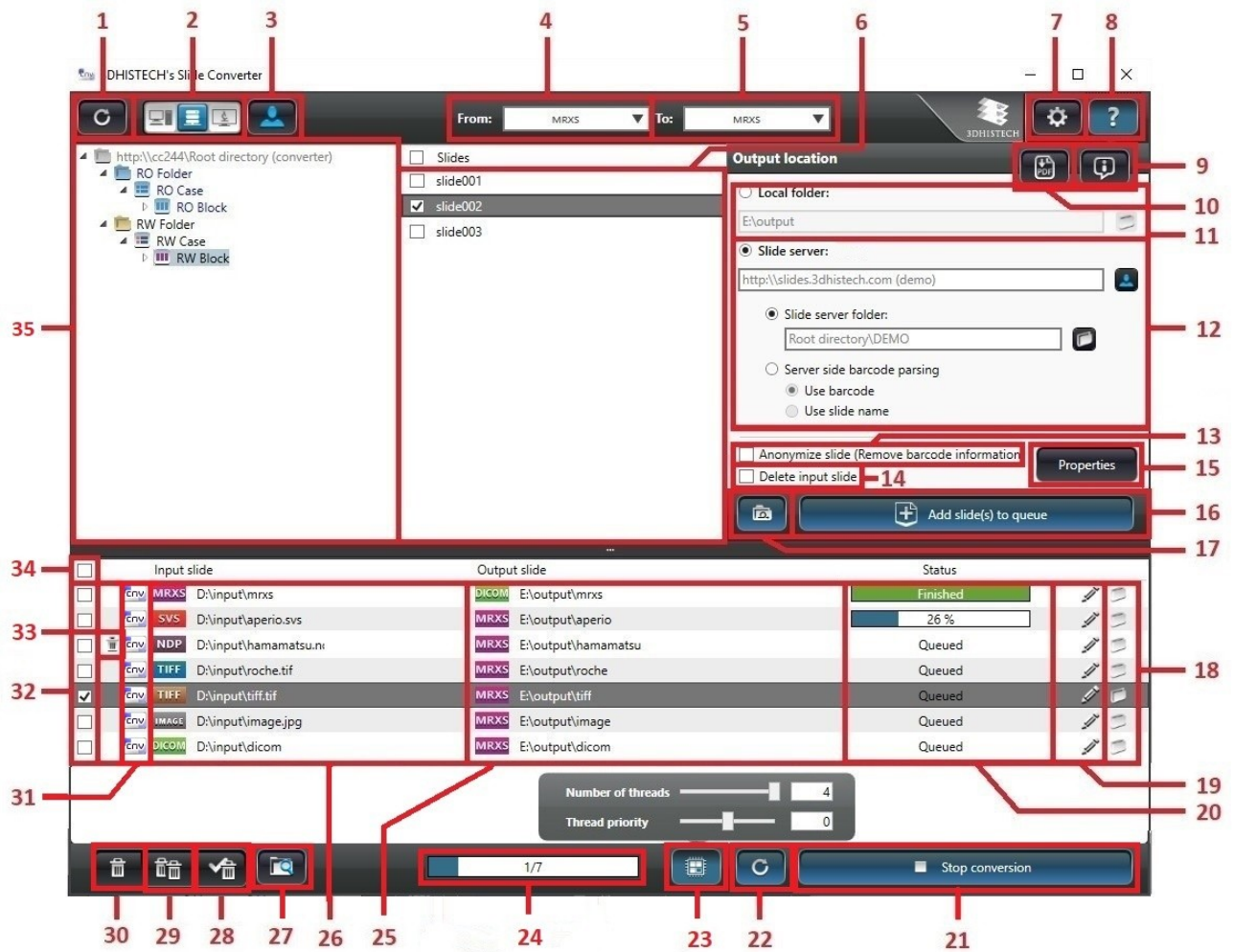
### 3 User Interface

Launch Slide Converter tool by double-clicking the desktop shortcut.



The main window of Slide Converter is opened.






1. Update folder tree
2. Select input source (local, Slide server, or 3DHISTECH's Viewer Application). 3DHISTECH's Viewer Application cannot be selected manually, and active only if slides are received from CaseViewer.
3. Switch Slide server (works only if Slide server has been selected as source)
4. Format of Input slide
5. Format of output slide (the list of selectable values varies according to the input format)
6. Slides included in the folder selected in the tree (slides of the selected format are displayed only). If Recursive slide display is ON, then the program searches for slides of the selected format within sub-folders of the folder as well (slides are displayed with their paths), otherwise slides in the selected folder will be displayed only.
7. Settings menu

8. Help drop-down menu
9. Open Info window
10. Open User's Guide in PDF
11. Select output destination (local folder)
12. Select output destination (Slide server and folder, or automatic slide upload through barcode parsing)
13. Anonymize slide (Remove barcode information): if checked, the label area image and the barcode string will be removed from the slide
14. Delete input slide
15. Define conversion parameters
16. Add selected slides to queue
17. Add the complete folder (with all slides and sub-folders) to queue
18. Open converted slide (MRXS file opens with 3DHISTECH's Viewer Application, other formats are opened with the assigned external program, folder is opened when slide is folder type)
19. Modify parameters of slides in the queue
20. Progress bar (for actual slide)
21. Start/Stop conversion
22. Retry failed slides
23. Multi-threading support (set the number of threads used during conversion process)
24. Progress bar (for total queue)
25. List of slides in the queue, displayed with their destination path and output formats.
26. List of slides in the queue, displayed with their source path and input formats.
27. Turn Directory monitoring on/off
28. Remove converted slides from the queue
29. Remove all slides from the queue
30. Remove selected slides from the queue

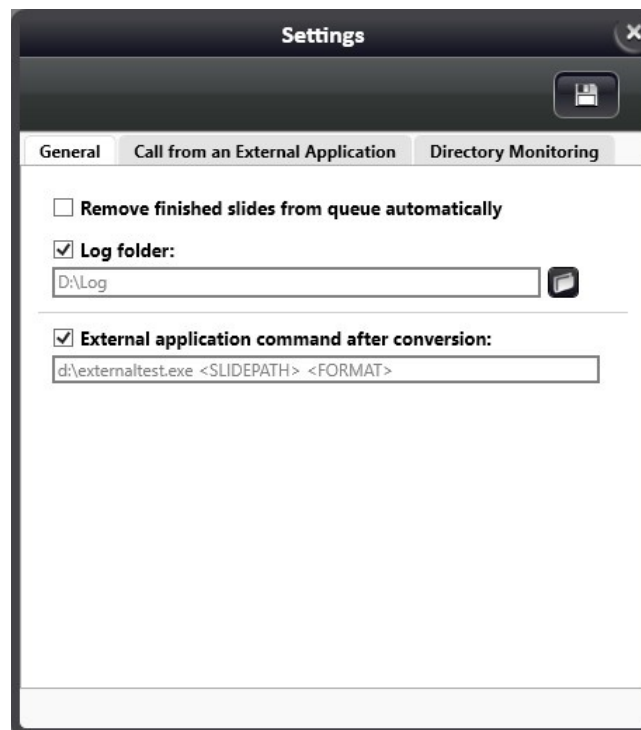
31. Source of slide (Converter GUI / 3DHISTECH's Viewer Application / External application)
32. Select slide
33. Trash bin for input slides being deleted after conversion
34. Select all slides
35. Folder tree for the selection of the source slide

## 3.1 Settings

Click  to open Settings window.

### 3.1.1 General settings

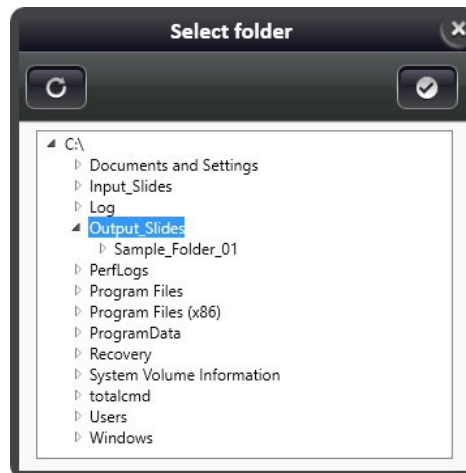
The General tab is opened by default on which basic settings of Slide Converter are available for you to modify.



- **Remove finished slides from queue automatically** – slides that have been added to conversion queue, will be removed automatically after conversion is finished (inactive by default)



- **Log folder** – Turn on logging activity by checking and selecting the location of log files.




Log files are created on a daily basis, and the name of a log file consists of the following components: „*converter\_log\_yyyymmdd*” (for example, *converter\_log\_20190317.xml*). A log file includes the data of every slide converted that specific day:

- conversion status
- input slide
- input format
- output slide
- output format
- conversion parameters (including switches used for the specific conversion)
- start of conversion
- end of conversion
- duration
- error message(s)
- conversion steps and their time

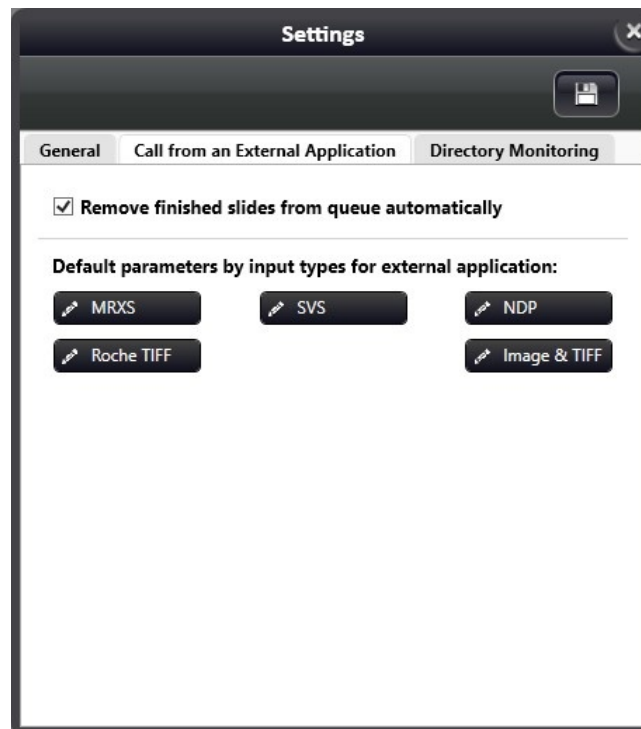
**NOTE:** Log files older than 30 days will be automatically deleted. Conversion logging enabled by default; log files are stored in the Documents folder of the user, but the destination folder can be modified if necessary.

- **External application command after conversion** – It is available for you to set an application that the software calls with which slides can be opened after conversion. The following parameters can be forwarded to the external application:
  - <SLIDEPATH>: path of the newly converted slide
  - <FORMAT>: format of the slide, can have the following values:
    - mrxs: 3DHISTECH MRXS slide
    - dicom: DICOM slide

- rochetiff: Roche TIFF slide
- svs: Aperio SVS slide
- tiledtiff: Tiled TIFF

Click  to save settings.

### 3.1.2 Call from an External Application

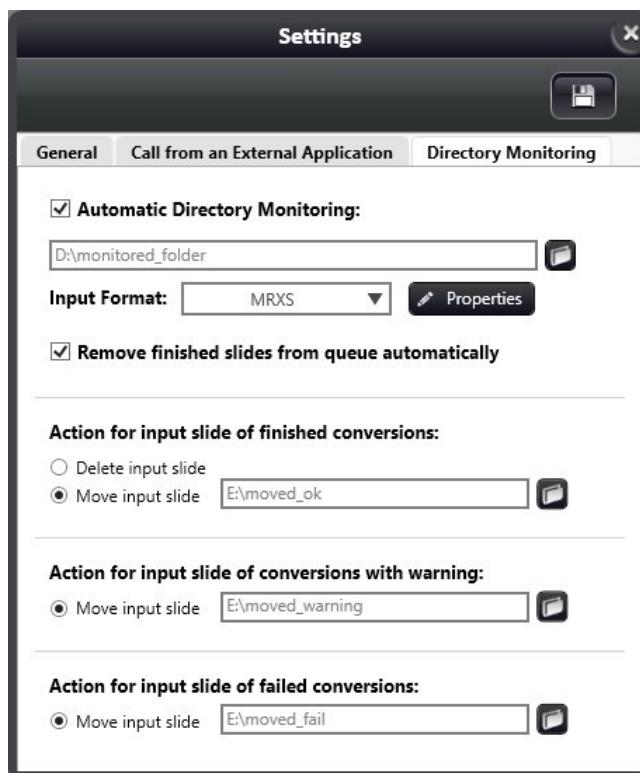


This tab includes the parametrization settings of input formats of the slides that the external application sends to Slide Converter.




- **Remove finished slides from queue automatically** – slides that have been added to conversion queue, will be removed automatically after conversion is finished (active by default)

**NOTE:** For more information on parametrization of each conversion directions, see *chapter 4*.

### 3.1.3 Directory monitoring



This panel includes settings of the **Directory Monitoring** function. A folder can be selected for monitoring, and if a slide of the set type is placed into this folder, it will be added to the converter queue with the set parameters.

- **Automatic Directory Monitoring:** Activate this function by ticking the checkbox (or, alternatively, click  at the bottom of the GUI).
- Click  to browse for the directory to be monitored (into which slides are placed for conversion)
- **Input format:** Set the format of slides the program will search for in the directory.
- Click  to define conversion properties, so that the slides of the set input format will be converted to the specified location with the specified output parameters. See chapter 4 for more information on parametrization of each conversion directions.
- **Remove finished slides from queue automatically:** All the slides added to the queue will be removed from the queue automatically, once they are converted successfully.


**Important!**

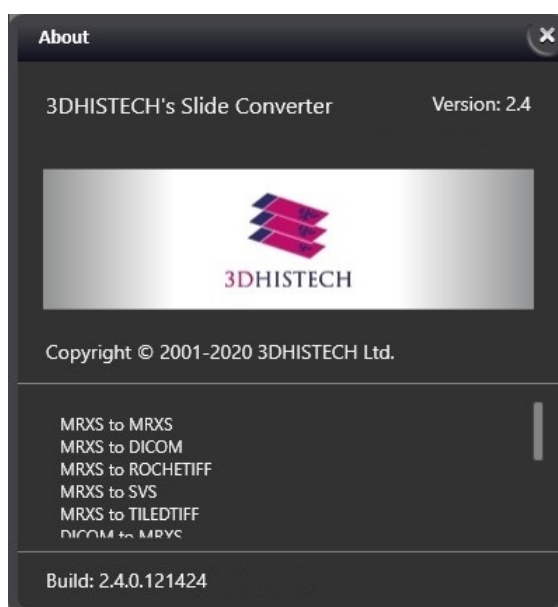
For the proper operation of the function it is required that the processed slides (the conversion being either successful or unsuccessful) will be moved or deleted from the monitored directory.

Select one of the following options to empty the monitored directory:

- **Action for input slide of finished conversions**
  - **Delete input slide:** input slide will be deleted
  - **Move input slide:** move input slide to a folder (location can be set here)
- **Action for input slide of conversions with warning:**
  - **Move input slide:** select destination folder to which the slides will be moved
- **Action for input slide of failed conversions:**
  - **Move input slide:** select destination folder to which the slides will be moved

## 3.2 Information window





This window can be displayed by clicking the  button from the help menu.

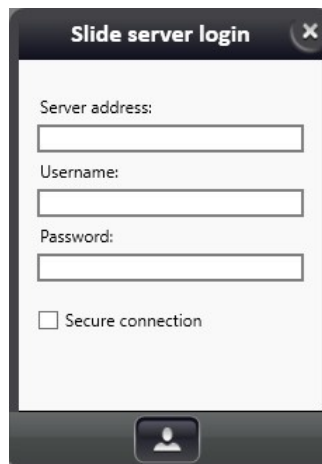




Version information and licensed conversion features are listed on this panel based on the license file or dongle and the registered DICOM.

## 3.3 Workflow

### 1. Select the source of input slides

- **Local source:** 
  - Select folder containing source slides at the top left corner.
  - Refresh tree by clicking .
- **Slide server source:** 
  - Click  to connect to the Slide server server.
  - Fill in the fields displayed in the **Slide server server login** window. Activate **Secure connection** to connect to the server through HTTPS.



- If connection is active the  button turns blue. Click this button if you want to connect to another server.
- **3DHISTECH's Viewer application as source:** 
  - Cannot be activated manually, the program switches to this mode automatically when transferring slide from 3DHISTECH's Viewer application. The tree view disappears at the left, and the slide list will include slides or annotations received from the Viewer application.

### 2. Select slides you want to convert according their types

- You can filter for the format of the source slide from the drop-down list at the top right corner of the panel.
- Selectable formats on the list depend on the license (non-licensed slide formats are grayed out)


- Format types:
  - mrxs (3DHISTECH slide)
  - dicom (DICOM slide)
  - svx (Aperio slide)
  - ndp (Hamamatsu slide)
  - roche tiff (Roche slide)
  - Image & TIFF (JPG, PNG, BMP, or TIFF image)

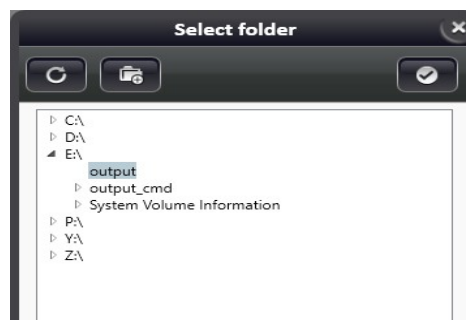
### 3. Select type of output slide


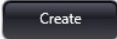
- The output formats listed depend on the type of the input slide and the license (non-licensed formats are inactive on the list)
- Slides of the same format type only can be selected for conversion at a time

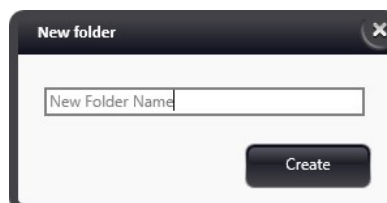
### 4. Select output destination path

In the event of non-recursive slide selection, the converted slide is created in the set output folder. Otherwise, if recursive slide selection is active, the input folder structure is created under the selected output folder automatically, and the final converted slide is generated within the identical location within the structure.


- Output slide inherits the name of the input slide, and if a slide with the same name already exists in the output directory, a date code is appended at the end of the slide name.
- Click  to define a **Local** destination folder.



- Create new folder by clicking , then type the folder name into the field. Click  to create folder.



If Slide server destination has been selected, the following login data must be entered to establish connection: server address, user name, password, and protocol type (http/https).

- Click  to connect.



The image shows a 'Slide server login' dialog box with a dark header and a light body. It contains three text input fields labeled 'Server address:', 'Username:', and 'Password:'. Below these fields is a checkbox labeled 'Secure connection'. At the bottom center of the dialog is a button with a user icon, which is the same icon mentioned in the text above.

- Server side barcode parsing

When uploading a slide to Slide server with the Slide Converter, it is possible to place slides based on barcode parsing. Select which of the following data is sent to Slide server by the Converter as barcode when uploading:

- Use barcode: the barcode information written into the slide by the scanner software (onward from version 2.0) during barcode reading. This option is available for MRXS input slides only.
- Use slidenam: slide name is sent as barcode. Only this option is available for other input formats than MRXS.

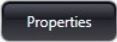
If the source slide is taken from Slide server, or if an XML file containing metadata is available for the local slide, then barcode information originated from Slide server will be sent to the destination server.

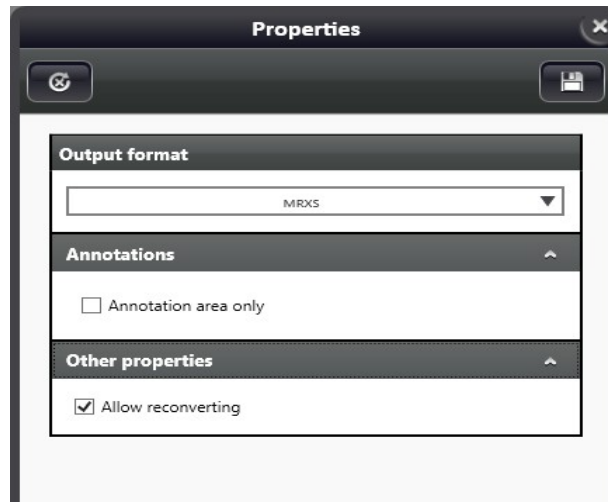
- Slide server metadata transfer



If you download a slide or a complete folder from Slide server, the metadata of slides and folders (excluding permission information) will be saved into an XML file. When uploading to Slide server, if a previously created XML is available, then all the data are taken by the destination server.

When converting to Slide server directly from Slide server, Organ and Staining information will be uploaded only if the designated switch is activated (see MRXS->MRXS conversion parameters), and with Administrator permission on the destination server.

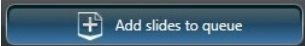
## 5. Set conversion parameters

- Click  to define conversion parameters that will be applicable for the actual conversion.





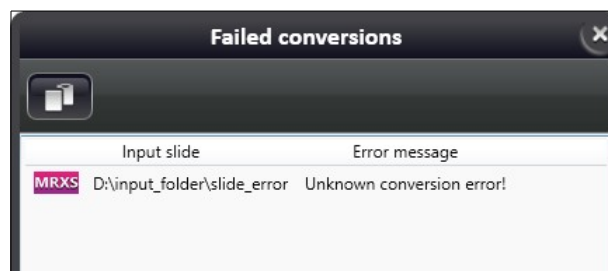
- Click  to restore default settings of the specific conversion direction.
- Click  apply parametrization settings.


## 6. Add slides to list

Click  to select slides to be added to conversion queue. Multiple slides of the same type with identical parameters can be added at a time. After conversion, input slides can be deleted without confirmation (works also for slides received from Slide server)

## 7. Add the complete folder (with all slides and subfolders) to queue

Click  to add the folder and its subfolders and all the included slides (that match the input format criteria) to the queue. The added folder is listed as one item in the queue, and if any of the contained slides in the folder cannot be converted, a  icon is displayed next to it. Click this icon to view a list of the erroneous slides in the particular folder.



Click  to copy the list to clipboard.

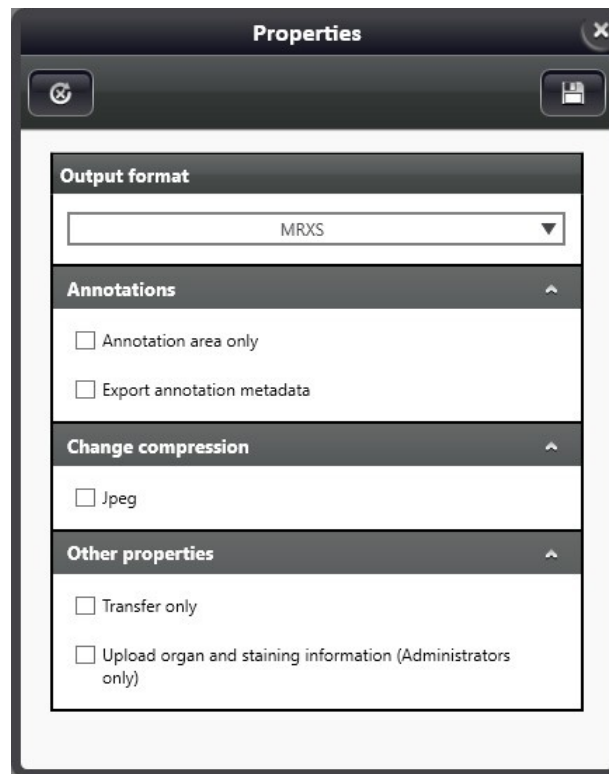


## 4 Conversion direction parameters

### 4.1 MRXS to MRXS

- De-overlapping of MRXS (3DHISTECH) slides
- The names of input and output slides are identical

Parameters:



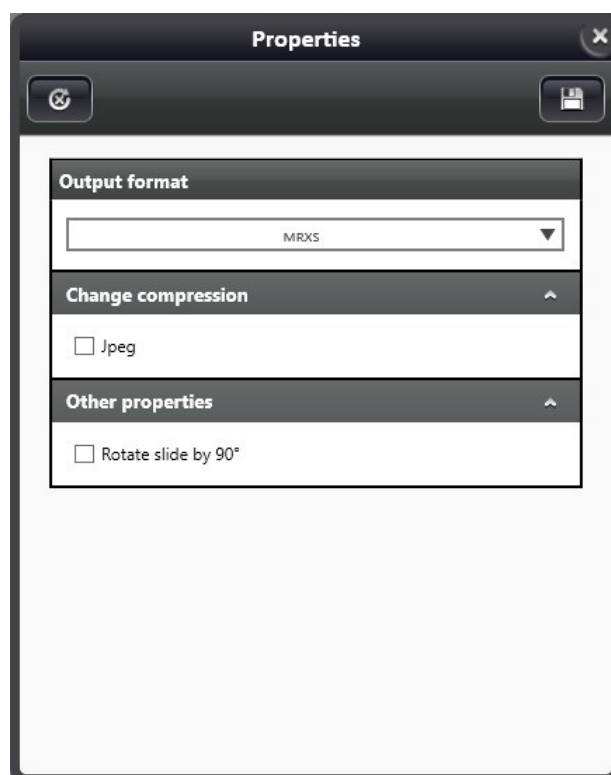
- **Annotations**
  - **Annotation area only:** only annotated area is selected as the source of the converted slide
  - **Export annotation metadata:** name, type, pixel coordinate data of the annotations are written into an XML file to supplement the created slide
- **Change compression**
  - By selecting **Jpeg** option, the result of conversion is a JPEG-coded MRXS file if this option is selected (compression factor value can be defined between 1 and 100)

- **Other properties**
  - **Transfer only** (enabled for both Slide server and local destinations by default): Slide moving is performed without conversion and de-overlapping.
  - **Upload organ and staining information** (available only when uploading to Slide server): This option can be selected by a user with Administrator permission only. If selected, the Organ/Staining information is uploaded to the slide, if an XML file of the local slide is existing, or conversion is performed directly from another Slide server server. If Organ/Staining enum does not exist on the destination server, it will be created.

## 4.2 SVS to MRXS

- Convert SVS (Aperio) slides into MRXS slides
- The name of output (MRXS) slide inherits the name of the SVS slide without the extension.

### Parameters:

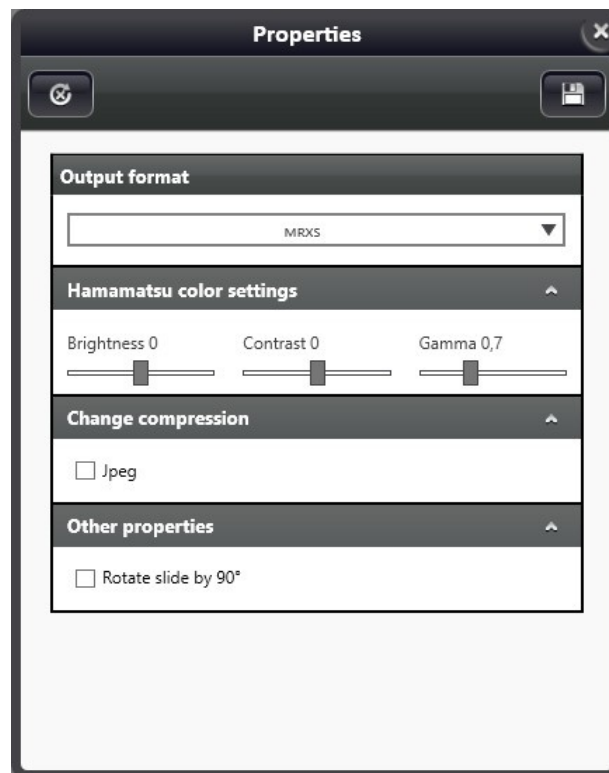


- **Change compression:** select **Jpeg** option to create a JPEG-coded MRXS file (compression factor value can be defined between 1 and 100)
- **Other properties:** select **Rotate slide with 90°** to rotate slide by 90° degrees during conversion (option is disabled by default)

## 4.3 NDPI to MRXS

- Conversion of NDPI (Hamamatsu) slides to MRXS slides
- The name of output (MRXS) slide inherits the name of the NDPI slide without the extension.

### Parameters:

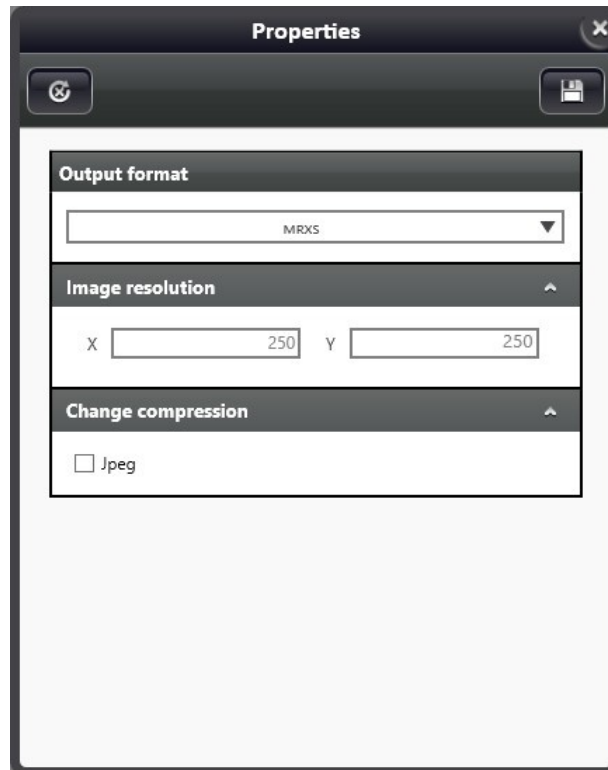


- **Hamamatsu color settings**
  - **Brightness** (default 0)
  - **Contrast** (default 0)
  - **Gamma** (default 0.7)
- **Change compression**
  - By selecting **Jpeg** option, the result of conversion is a JPEG-coded MRXS file if this option is selected (compression factor value can be defined between 1 and 100)
- **Other properties**
  - **Rotate slide with 90°** (disabled by default): slide will be rotated by 90° degrees during conversion

## 4.4 IMAGE to MRXS

- Converts image files (BMP, JPG, PNG, JPEG2000, JPEGXR, and TIFF) to MRXS slides
- The name of output (MRXS) slide inherits the name of the image file without the extension.

### Parameters:

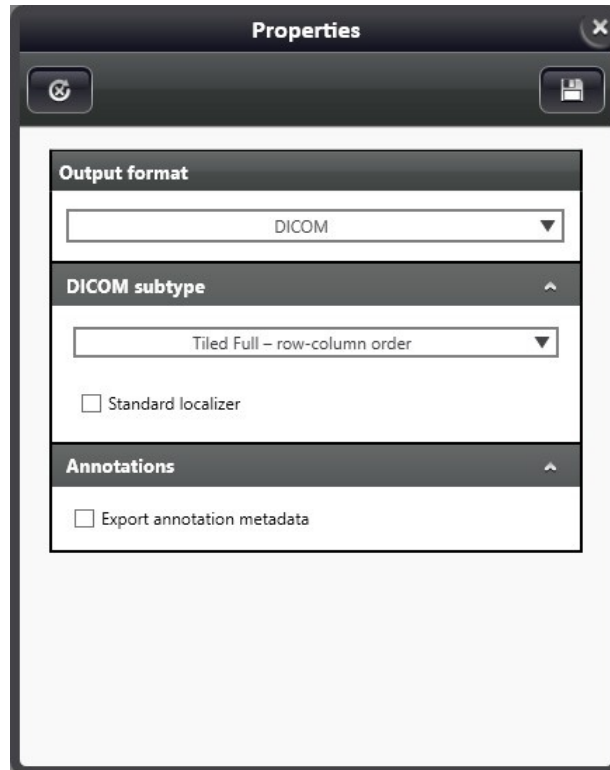


- **Image resolution**
  - Set horizontal and vertical image resolution values (x and y values – DPI)
- **Change compression**
  - By selecting **Jpeg** option, the result of conversion is a JPEG-coded MRXS file if this option is selected (compression factor value can be defined between 1 and 100)

## 4.5 MRXS to DICOM

- Conversion of MRXS slides to DICOM slides
- The folder containing DICOM files will be named after the MRXS slide name

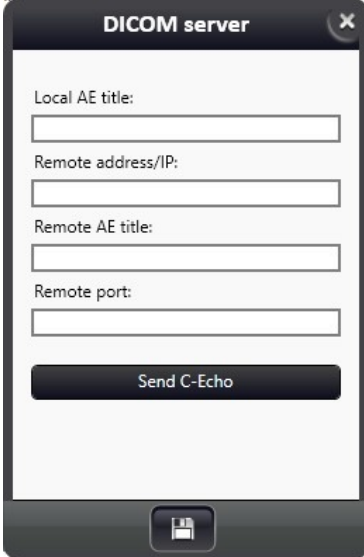
### Parameters:



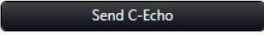
- **DICOM subtype**
  - **Tiled Full – row-column order:** This format has been standardized at the latest, and therefore, selected by default. TILED\_FULL slides require more storage space, but on the other hand, it is the most compatible with other companies' products.
  - **Tiled Sparse – row-column order (supplement 145):** TILED\_SPARSE is a previously standardized slide coding format that does not include any restriction on the order how tiles are stored, but there is a possibility to ensure higher compatibility.
  - **Tiled Sparse – Morton order (supplement 145):** TILED\_SPARSE format ensures a more effective tile ordering. Conversion is performed at an approx. 1.5x speed and requires less memory usage.

**Standard localizer:** This option enables the Multi-Resolution Navigation Module that includes a navigation image and data that can be used by a Viewer application to find the tiles within a FOV during loading it. It is not recommended to create such a module, since it may slow down the creation process of the entire DICOM slide, and it also increases the memory usage significantly, therefore, this option is not selected by default. As a substitute, the **Regionlocalizer**, a more effective solution is supported, which is not included in the standard, but can be archived with the slide.

There is an option to upload DICOM slides to DICOM Server (PACS server). Fill in the required fields in the DICOM server window:





- **Local AE title:** Identifier of the computer, this must be reported to PACS server. In case this identifier is specified incorrectly, PACS server may block the data transfer.
- **Remote address/IP:** Address of PACS server
- **Remote AE title:** Identifier of PACS server
- **Remote port:** Port of PACS server through which the data are transferred

Click  to test connection.



### Important!

The  button is designed only to test correctness of the data you entered, and the server accessibility by pinging. Click  to save data.

**Warning!**

Patient data is written into DICOM slide only **IF** the slide is received from Slide server, **AND** Track&Sign integration is selected, **AND** the slide is archived in an integrated LIS. In any other case, patient data fields become filled with default (dummy) data – and the user receives a message when slide is uploaded to PACS.

Patient data received from LIS are validated in accordance with the requirements of the DICOM standard. If a patient data that is received does not comply with the standard, an error message is displayed to inform the user. This way conversion cannot be performed either to a local or a PACS destination folder.

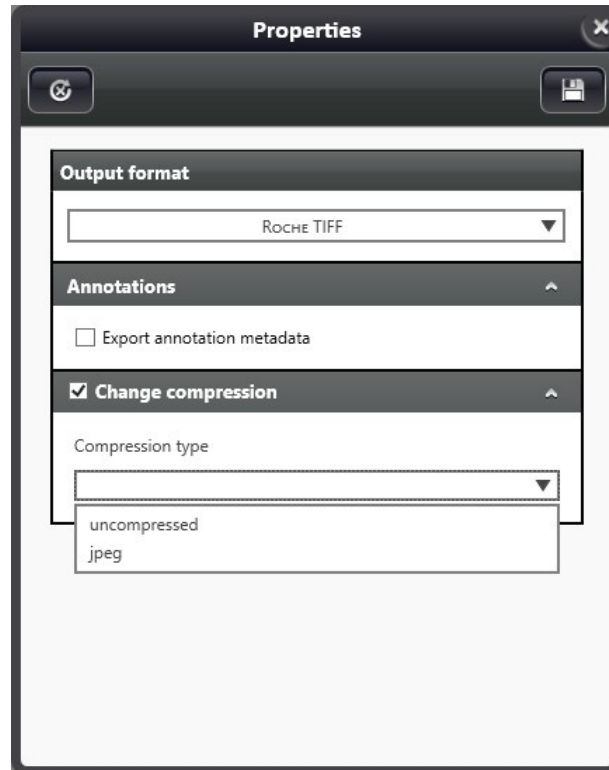
- **Annotations**

- **Export annotation metadata:** name, type, pixel coordinate data of the annotations are written into an XML file to supplement the created slide

## 4.6 MRXS to ROCHE TIFF

- Converts MRXS slides to Roche TIFF file
- The name of output slide inherits the name of the MRXS slide with TIFF extension.

### Parameters:



- **Annotations**
  - **Export annotation metadata:** name, type, pixel coordinate data of the annotations are written into an XML file to supplement the created slide
- **Change compression** (disabled by default)

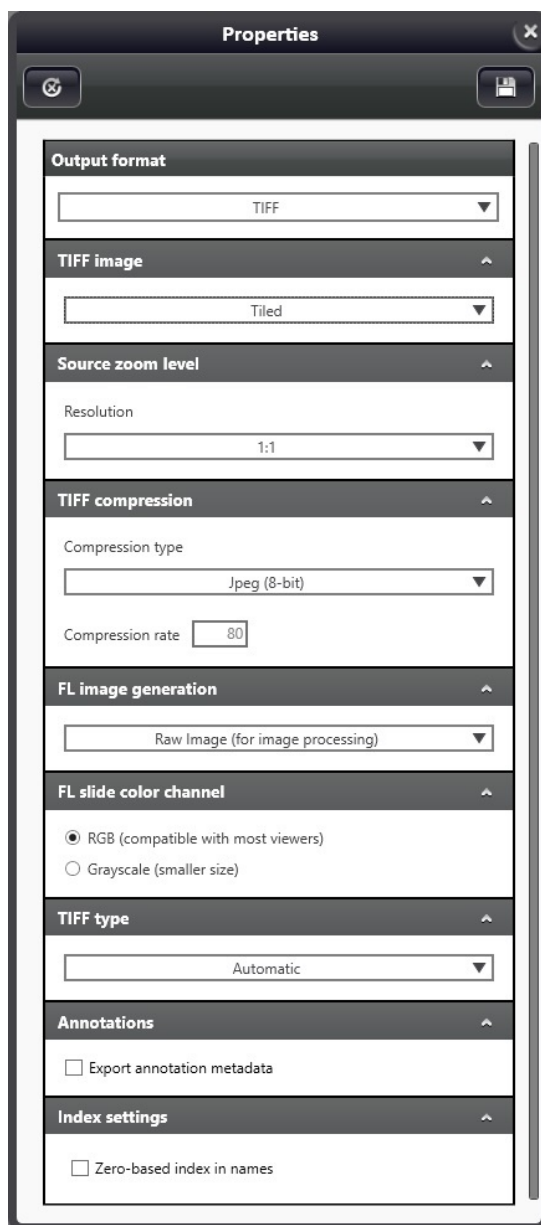
If output compression is not defined and the source slide consists of JPEG or BMP tiles, then the output tile format will be JPEG or BMP as well (inheriting compression factor of the source slide).

**NOTE:** If the format of the source slide is not JPEG or BMP, the output slide compression type will be JPEG with a compression rate of 80 percent by default.

  - Select a compression method from the **Compression type** drop-down list:
    - **uncompressed (BMP)**
    - **jpeg** – Compression rate can be set (1-100, default: 80)



## 4.7 MRXS to TIFF



Convert MRXS slides to TIFF files, separate files will be created for each FL channels and Z-stack layers. Folders of the output TIFF files will be named after the MRXS slide name, the created TIFF file names consist of the following components: *slidename\_flchannelname\_zstack*

### Parameters:

- **TIFF Image**
  - **Tiled**: default setting, slide is saved as Tiled TIFF
  - **Striped (non-tiled)**: select this type only if compatibility issues exist. There is a limit of 25 megapixel, and if the slide size is higher than this value, a lower **Source zoom level** value must be set. Automatic zoom level can be activated by selecting the checkbox.

- **Source zoom level**
  - Set the level of zoom at which the TIFF image is created in order to get the smallest file size possible.
- **TIFF compression**

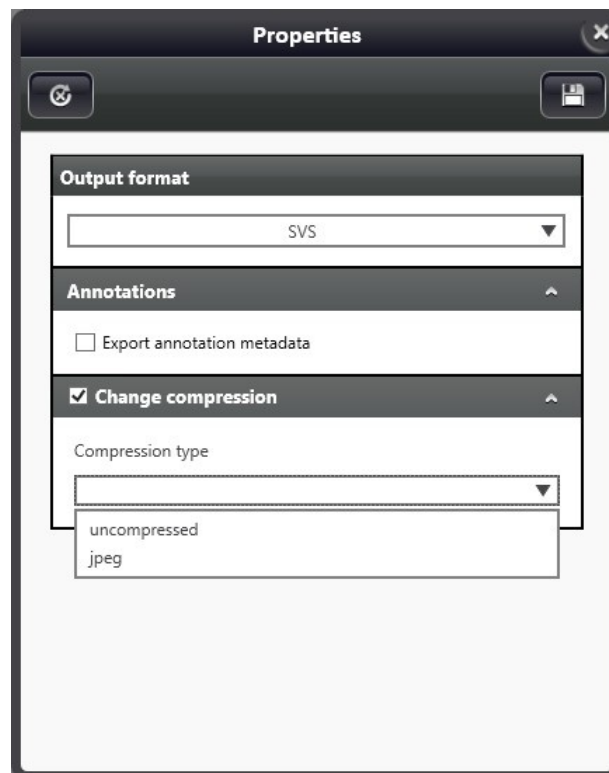
Select a compression method from the **Compression type** drop-down list:

  - **Jpeg (8-bit)**: compression rate can be set (1-100, default: 80)
  - **Lossless compression 8-bit**
  - **Lossless compression native**: color depth of the source slide is inherited (16-bit is supported)
  - **Uncompressed 8-bit**
  - **Uncompressed native**: color depth of the source slide is inherited (16-bit is supported)
- **FL image generation**
  - **Raw Image (for image processing)**: effective only if an FL slide is converted – separate TIFF gray-scale images are created for each FL channel
  - **Enhanced Color Image (for viewing)**: effective only if an FL slide is converted – Pseudo-colored TIFF image is created based on the original FL slide. If selected, the **FL slide color channel** option is inactive.
- **FL slide color channel**
  - **RGB** – a 24-/48-bit color TIFF image is created. File size is bigger, but most of the image viewers are capable to open it.
  - **Grayscale** – an 8-/16-bit grayscale TIFF image is created. File size is smaller, but some of the viewers cannot handle it.
- **Tiff type**
  - **Automatic**: the converter automatically selects the most appropriate method based on the size of the source slide
  - **Force simple tiff**: TIFF files use 32-bit offset addressing, therefore file size is limited to a maximum of 4Gb.
  - **Force big tiff**: Big TIFF files use 64-bit offset addressing allowing the creation of bigger TIFF files.
- **Annotations**
  - **Export annotation metadata**: name, type, pixel coordinate data of the annotations are written into an XML file to supplement the created slide
- **Index settings**
  - **Zero-based index in names**: Z-Stack layers of the generated TIFF files will be indexed starting with 0, and not the focus distance of the actual layer will be included (inactive by default)

## 4.8 MRXS to SVS

- Convert MRXS slides to Aperio (SVS) slides
- Output slide name will be identical with the MRXS slide name, with an SVS extension

### Parameters:



- **Annotations**
  - **Export annotation metadata:** name, type, pixel coordinate data of the annotations are written into an XML file to supplement the created slide
- **Change compression** (disabled by default)
  - If output compression is not defined and the source slide consists of JPEG or BMP tiles, then the output tile format will be JPEG or BMP as well (inheriting compression factor of the source slide).




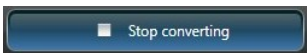
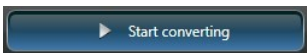
**NOTE:** If the format of the source slide is not JPEG or BMP, the output slide compression type will be JPEG with a compression rate of 80 percent by default.

- Select a compression method from the **Compression type** drop-down list:
  - **uncompressed** – in BMP format
  - **jpeg** – compression rate can be set (1-100, default: 80)


## 5 Conversion queue

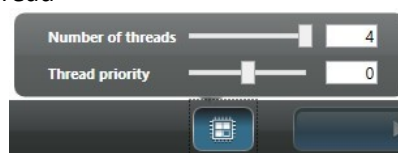
- The number of queued conversion processes is not limited
- Queued processes can be removed by the following:

**NOTE:** Not running processes can be removed only, those with the status of “In progress” cannot.

-  – Remove selected items
-  – Remove all
-  – Remove converted items
- Finished / Total conversion progress bar
-  – Stop converting
-  – Start converting

If you move the cursor over the input/output format of a queued slide conversion process, the path of the source file is displayed in tooltips. Other slide- and conversion-related data are displayed on the queue panel:

- input format (slide path in tooltip)
- output format (slide path in tooltip)
- slide name
- trash bin icon, if the source file is being deleted
- conversion status / progress
- editing of parameters:
  - Parameters of conversions that are not already finished, stopped or erroneous can be edited only (output format, folder and every other parameters), otherwise the defined parameters can be viewed only.
  - Open output slide or folder
-  – Multi-threading support
  - The number of threads used by converter processes can be set real-time during conversion.
  - Set thread priority – thread scheduler assigns processor to a thread based on priority of thread



**Conversion statuses:**

- Queued: Conversion process has been added to the list, but not yet processed
- In progress: Conversion in progress (percentage is shown in a progress bar)
- Error: Conversion failed due to an error (cause is displayed in a tooltip)
- Stopping: Conversion is being stopped
- Stopped: Conversion has been stopped
- Finished: Conversion has successfully been finished

**Start conversion:**

- Conversions are processed based on the list (from top to bottom)
- Only those listed processes will be run which statuses are not "Finished"
- Additional conversion process can be added to the end of the list during running conversion
- Processes that are not yet started can be removed from the list only.
- Editing of parameters is not possible during conversion
- After finishing a conversion process, the converter starts with the following item in the queue
- If logging is on, the log file is updated after each conversion

**Stop conversion:**

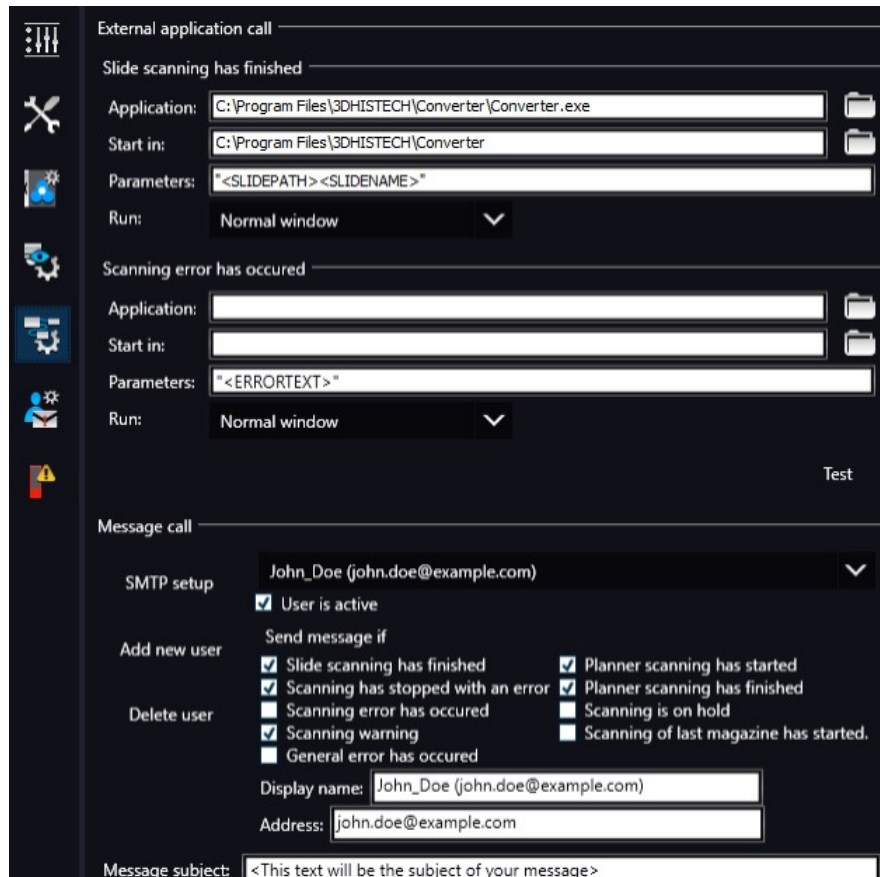
- The actual conversion process will be terminated
- The status of the terminated process will be „Stopping“ first, then „Stopped“ if termination was successful. The upcoming conversion will not be started.

**Erroneous of stopped conversion:**

- Faulty or incomplete files created during erroneous of stopped conversion will be deleted after the actual conversion is stopped

## 6 Integration with Scanner control software

The Panoramic Scanner control software can be linked with the Slide Converter, therefore, it is available for you to scan directly to different slide formats. Set a local folder as the destination of the created digital slide, and set Slide Converter as an external application that the scanner software calls once slide scanning has finished.



Set conversion parameters under the Settings menu in Slide Converter (see **Chapter 3.1**). It is advised to activate the **Delete input slide** option to save disk space by deleting input slides and store converted slides only. After conversion, another application can be called with which the converted slide can be opened, if required.