Radmedix

Your Prescription For Digital Radiology

AccuVue Software User GUIDE

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Warnings and advisory symbols

To ensure the safety of patients, staff and other persons, any changes to the software and hardware delivered by Radmedix) may only be made with prior written permission from OR Technology.

Please read the respective manuals of the connected devices, such as of the X-ray generator, sensor/ detector or scanner, before using ***AccuVue***.

The following symbols will be used throughout this manual:

DANGER

The „Danger" icon advises of conditions or situations that if not heeded or avoided will cause serious malfunction to the software. The functionality of the software can be destroyed in the case of incorrect use.

If unauthorised changes have been made to the delivered software and hardware components, the warranty by Radmedix becomes void. Radmedix will not accept any responsibility or liability for the correct functioning of the product in such a case.

CAUTION

The „Caution" icon points out important information, that is relevant for the correct functioning of the product.

NOTE

The „Note" icon gives information that is generally important to know, but does not affect the functioning of the software.

PRACTICAL HINT

The „Practical Hint" is a recommendation on how the workflow can be simplified within the software.

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Chapter 1. Introduction

Thank you very much for deciding on ***AccuVue*** - our X-ray acquisition software for DR (flat panels) and CR systems.

The ***AccuVue*** software is an independent product for the acquisition, processing and optimization of X-ray images (raw images) provided by flat panel (DR) systems or CR systems. In principle, the brand of the particular DR or CR device makes no difference to the operation of the software. The open architecture of the software allows the integration independent of the producer.

This user manual provides detailed information about the operation of AccuVue and the use of the range of facilities included in the software to make the processing and administration of your medical X-ray images as efficient as possible.

Quality management

The product development process is subject to a quality management system in accordance with DIN EN ISO 13485.

Safety instruction

To ensure the safety of patients, staff and other persons, any changes to the software and hardware delivered by OR Technology may only be extended with prior written permission from OR Technology.

Liability

If unauthorized changes have been made to the delivered software and hardware components, the warranty by Radmedix becomes void. Radmedix will not accept any responsibility or liability for the accurate functioning of the product in such a case.

PRACTICAL HINT

Please read the complete manual carefully before starting to use ***AccuVue*** system.
Our support team will be glad to help you, if you have any queries.

Enjoy reading the manual as well as working with ***AccuVue***.

Radmedix

1.1. Operating requirements

Processor:	Intel Core Duo / Core 2 Duo or comparable with AMD Dual Core Processor
RAM:	Minimum 2GByte RAM
Hard drives:	Minimum 80GByte for software and for the archive Hard drive C:\ (for installation) and D:\ (for acquired data, minimum capacity of 25GByte) is required
Network:	Minimum 100MBit
Graphics card/ Monitor:	Colour screen with resolution of minimum 1,280 x 1,024 pixel, using the true-colour mode Resolution of 1,024 x 768 pixel is recommended for embedded systems
Operating system:	Windows XP, Windows 7 und 8, either 32 or 64 bit Whereas AccuVue works on Windows 7 und 8 without restrictions, there can be restrictions concerning the flat panel. A minimum of 2 GB RAM is necessary to ensure a smooth workflow.
Flat panels:	Please note the requirements for the different flat panels and generators, e.g. additional network cards or serial ports!

Table 1. Operating requirements

1.1.1. Monitor requirements

The acquisition software is primarily designed for viewing monitors to overview the acquisition process and must thus only be used on colour monitors.

CAUTION

AccuVue is not designed for b/w monitors!

A viewing monitor should satisfy the following requirements:

1. VGA and/ or DVI connection
2. Resolution of at least 1,280 x 1,024 pixels
3. TFT-colour from 17" with high contrast ratio (450:1)
4. High fidelity of grey tones and good luminance distribution
5. Optional preset DICOM LUT

For diagnostic purposes, we recommend separate workstations, where qualified, diagnostic monitors are available. The minimum requirements for monitors that are used for diagnosis are described in the country respective directives regarding diagnosis on monitors and medical products laws. **All monitors** must **conform to the requirements of the IEC 61223-2-5** and **pass the acceptance and display test**.

The size of the screen depends on the type of images.

We recommend that a diagnostic monitor should satisfy the following requirements:

1. DVI connection (no VGA)
2. Resolution of at least 1,280 x 1,024 pixels for embedded systems
3. Special b/w monitors from 18,1" TFT with high luminance and contrast for embedded systems
4. High fidelity of grey tones and optimal luminance distribution
5. Preset DICOM LUT

NOTE

A b/w monitor can only be used as an additional diagnostic monitor, not for primary use!

1.1.2. Software installation

Please run the included setup „*_setup.exe". The setup creates the latest version of the ***AccuVue*** software on the C:\ drive of your PC.

After the installation, a AccuVue icon is displayed on the desktop. ***AccuVue*** starts by double clicking on the icon. The software is started in the demo mode; a message will be displayed that the programme uses a temporary license. Please confirm this information by clicking on „OK"; the installation may then be finalised and used. The demo license is only available for 20 days; within this time frame a valid license has to be obtained. You may obtain a license either via a dongle or the request key issued by the license manager.

1.2. Important software information

The ***AccuVue*** software is an independent product for the acquisition, processing and optimization of X-ray images (raw images) provided by flat panel (DR) systems or CR systems.

In general, such software is also called „console software" as it is installed on the so-called „console PC" of the imaging device. ***AccuVue*** carries out the image processing of the raw images provided by the particular device and provides the radiographer / X-ray assistant with an optimum workflow for their work.

The large range of functions includes a professional image viewer and a detailed multimedia radiographic positioning guide to support the correct preparation of exposures. During the development of the software, strong emphasis was placed on a smooth workflow to simplify and shorten procedures and to eliminate potential sources of error.

The X-ray images provided by AccuVue are stored in a database and are made available to picture archiving and communication systems (PACS). The option of communicating with patient management systems (HIS, RIS, etc.) to exchange patient data is also integrated.

In short, ***AccuVue*** is a comprehensive, independent software for the complete integration of DR/CR systems, X-ray generators, image processing and patient management systems. It enables the simple and fast creation of professional X-ray images and further processing of these images in both human and veterinary medicine.

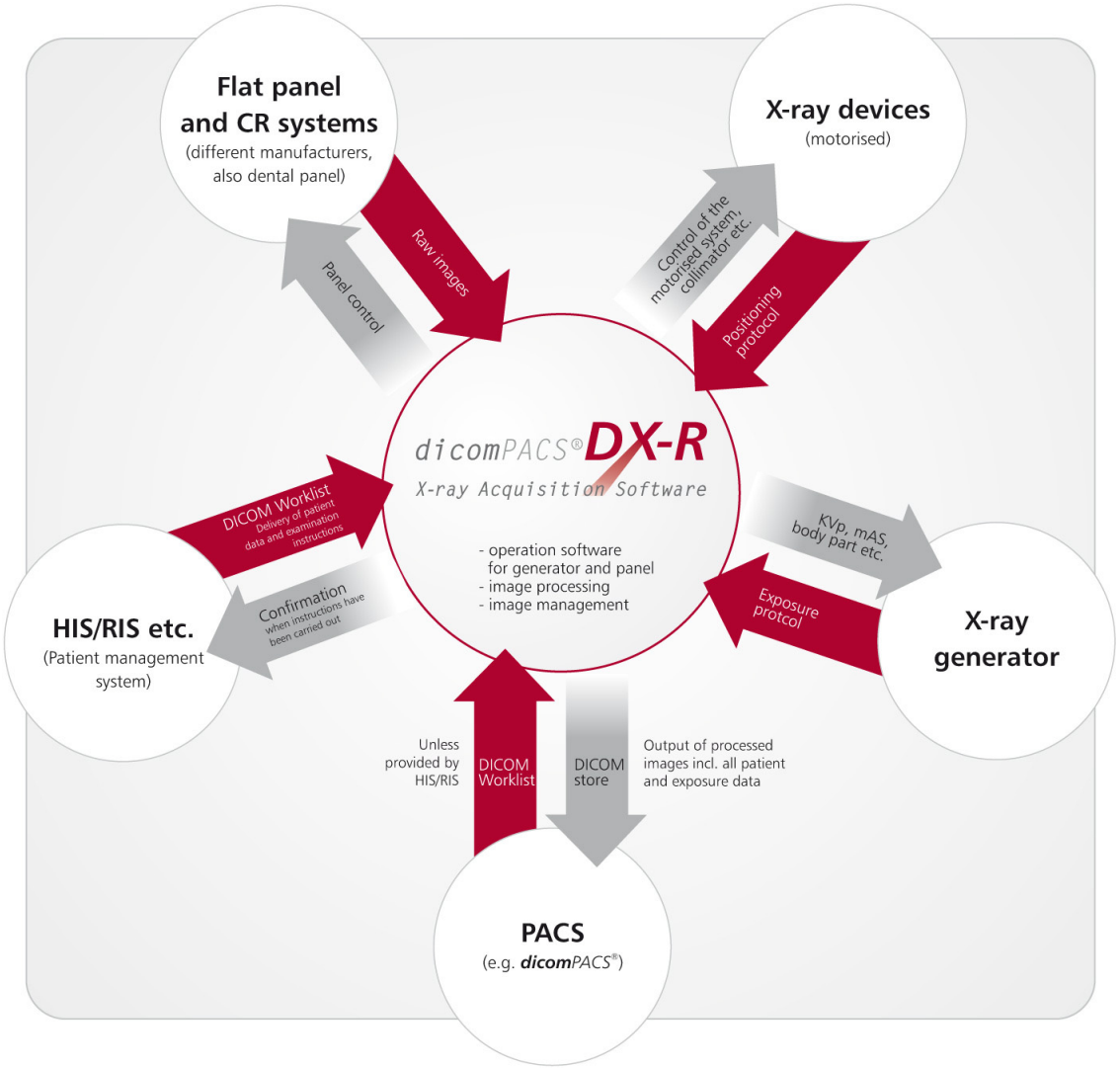

Figure 1. Functional principles of ***AccuVue***

1.2.1. Application area

AccuVue is meant to be used by qualified medical personnel only. All users must be qualified to create and diagnose radiological image data.

AccuVue is not approved for the acquisition of mammographic image data.

1.2.2. Measuring

In addition to acquiring and displaying images, the application also allows them to be measured.

CAUTION

Measurements can be taken of lines (in millimetres) and angles (in °, degrees). The length of a line can only be given in millimetres if the DICOM image contains the reference scale of pixels to the resulting length.

1.2.3. Compatibility

When processing ***AccuVue*** orders, the compatibility of hard- and software is ensured. During the installation this will be finally checked.

1.2.4. Monitor quality

Medical X-ray images may only be examined with ***AccuVue*** on approved diagnostic monitors. The relevant certification is ensured according to IEC 61223-2-5.

CAUTION

In order to test the consistency of these parameters during the operation, the monitor consistency tests must be performed at regular intervals. The regularity of these tests is laid down in the acceptance protocol. In general, a daily visual check must be performed. This check is described on page 166. In particular, the 5% and 95% greyscale areas must be clearly discernible.

1.2.5. Image resolution

Images with a high resolution have to be scaled down to be displayed as a whole image on the screen (adjustment to screen size). After this adjustment, not all of the image information available is displayed on the screen. Please use monitors with the required high resolution and the 100% display function of the ***AccuVue*** viewer.

1.3. The use of grids

NOTE

The grid filter for the processing is designed for stationary grids with 60 LP/cm. The grid filter functions optimal only for these and finer grids.

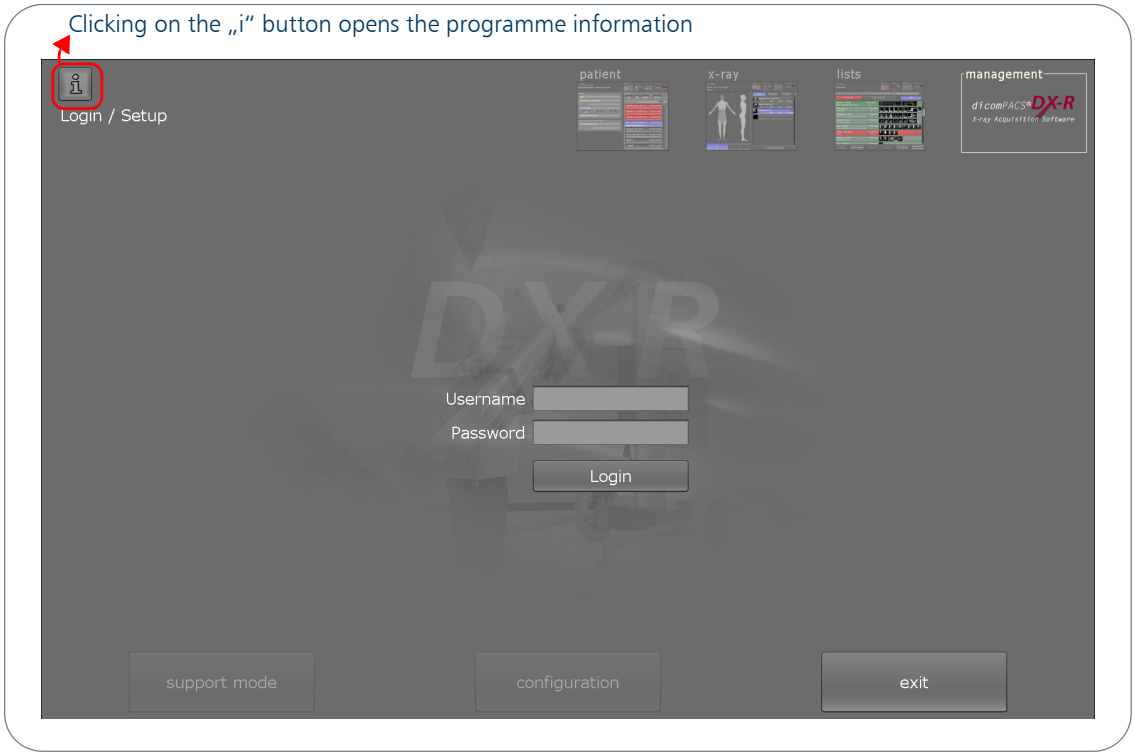

Figure 2. Login screen

The software ***AccuVue*** is divided into different screens which are passed through successively. The first screen is the patient view, the second is the X-ray view and the last screen, which belongs to the workflow, is the lists view. A further screen is the management view.

NOTE

For the usual work with the software, the demo version does not require a special login. If you do not need to use the support mode or the configuration mode, please just confirm the boxes „user name" and „password" by pressing the ENTER key.

2.1.1. Programme information

An information button „i" is integrated in the start screen. When clicking on this button a window is displayed with all relevant information about the software version and manufacturer.

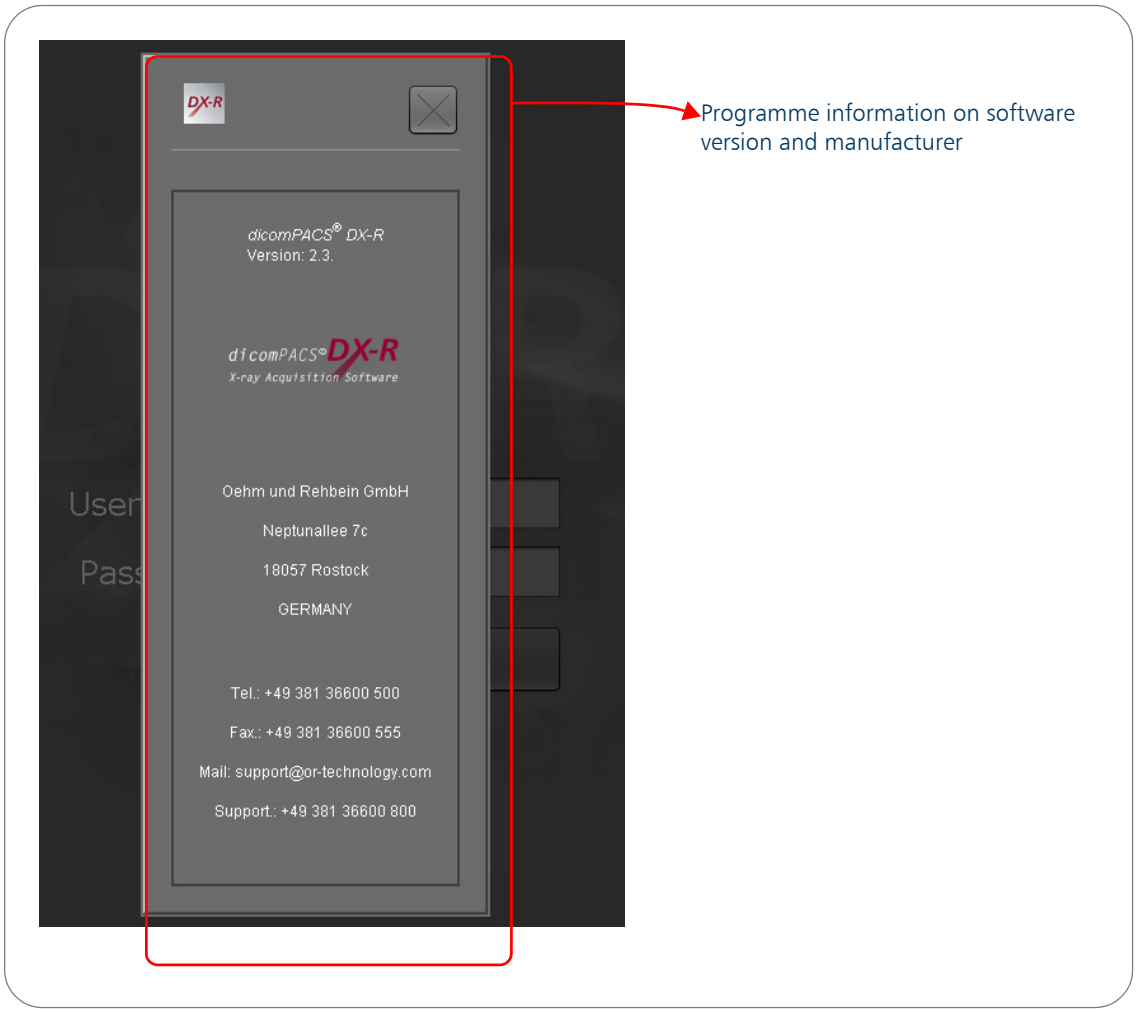

Figure 3. Programme information

2.1.2. Virtual keyboard

The entire interface is designed for touch screen operation, with the exception of special measuring functions. In this case the data cannot be captured with the virtual keyboard. The virtual keyboard appears after activating an input field.

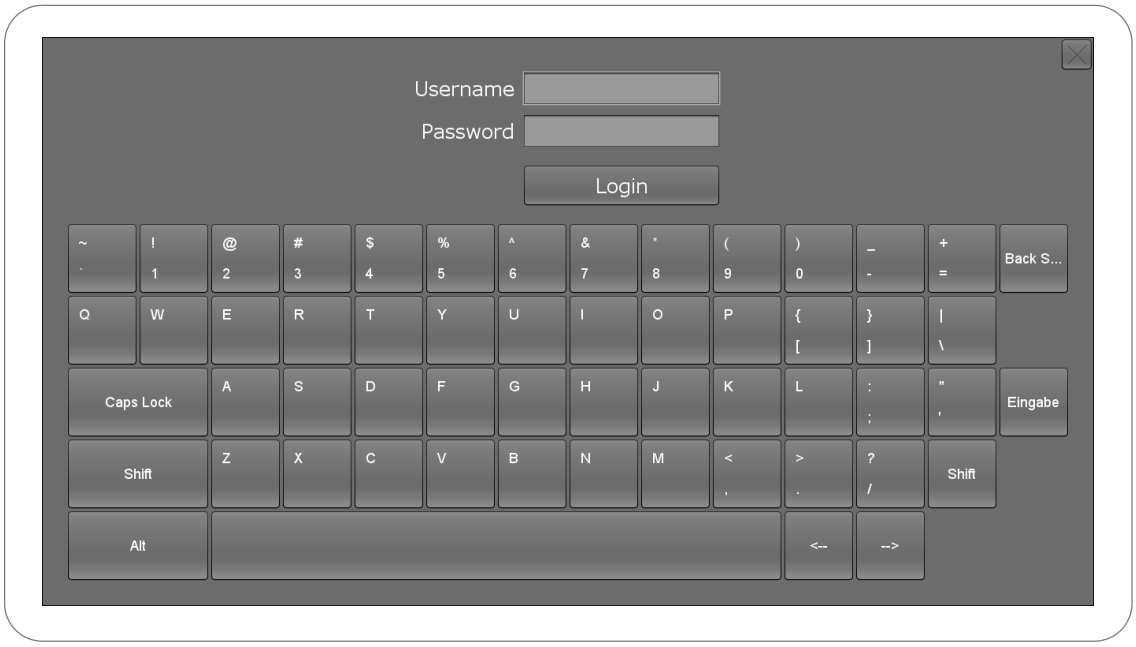

Figure 4. Virtual keyboard

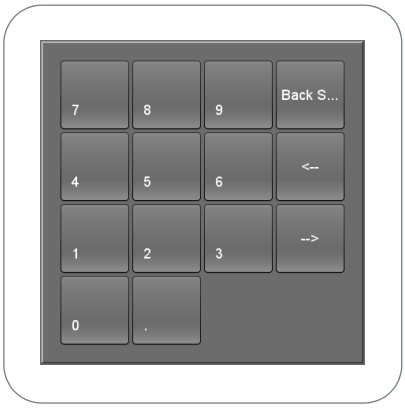

Figure 5. Virtual keypad

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2.2. Patient view

After the login to ***AccuVue***, the programme starts immediately with the patient view. This is where patient data and X-ray assignments are recorded. On the left hand side of the screen, all data of a patient is displayed or to be entered. The right hand side of the screen shows the worklist. If the system has been newly installed or if all patients have been dealt with, this list will be empty.

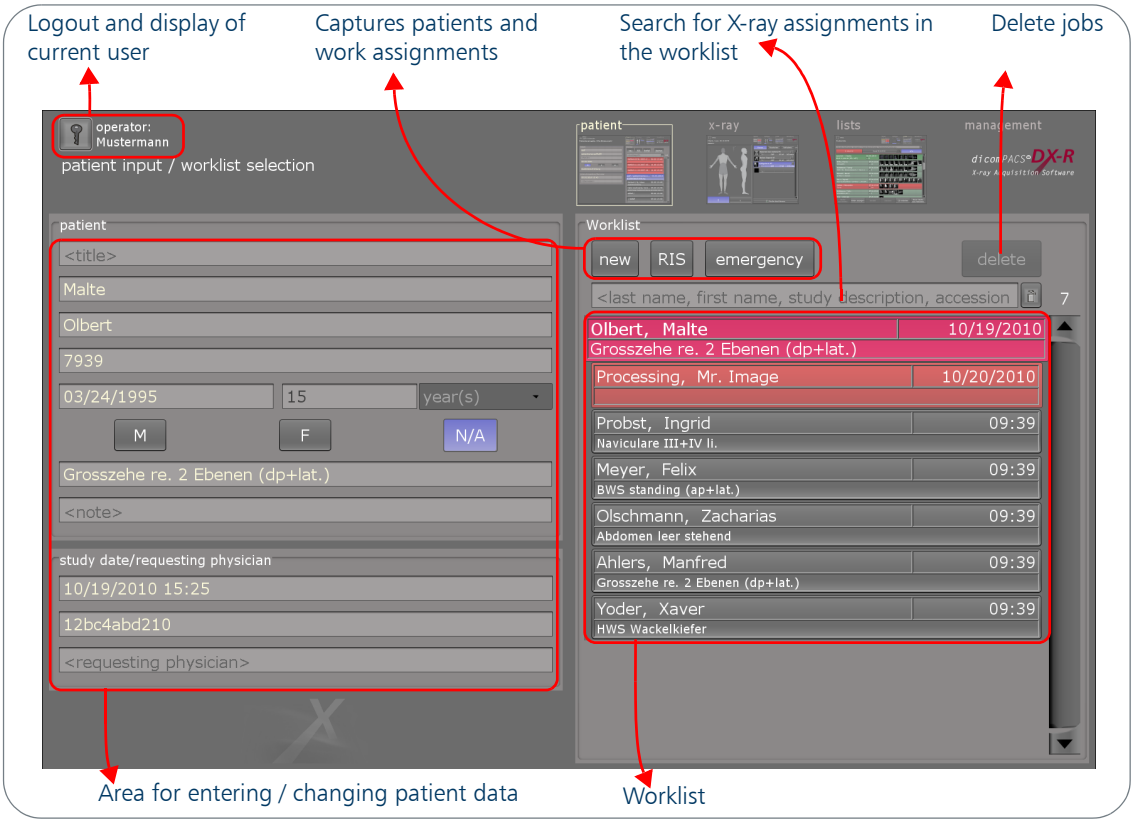

Figure 6. Patient screen

When using a touch screen, the patient data will be captured via the virtual keyboard. The keyboard appears after activating an input field. To start a patient workflow, three options are available:

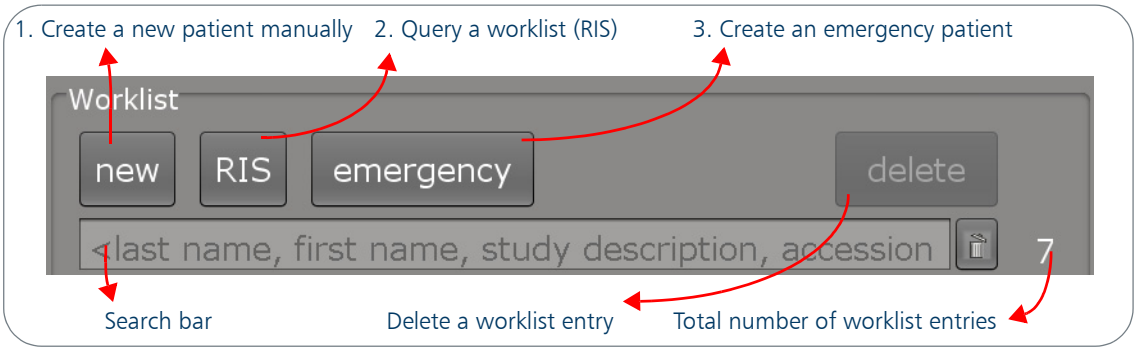

Figure 7. Worklist

2.2.1. Create a new patient

new A click on the „new" button allows the user to enter data of a new patient in the input fields on the left hand side of the screen. The input fields are optional fields. The input fields marked in red are compulsory fields. The buttons „F", „M" and „N/A" denote the gender of the patient.

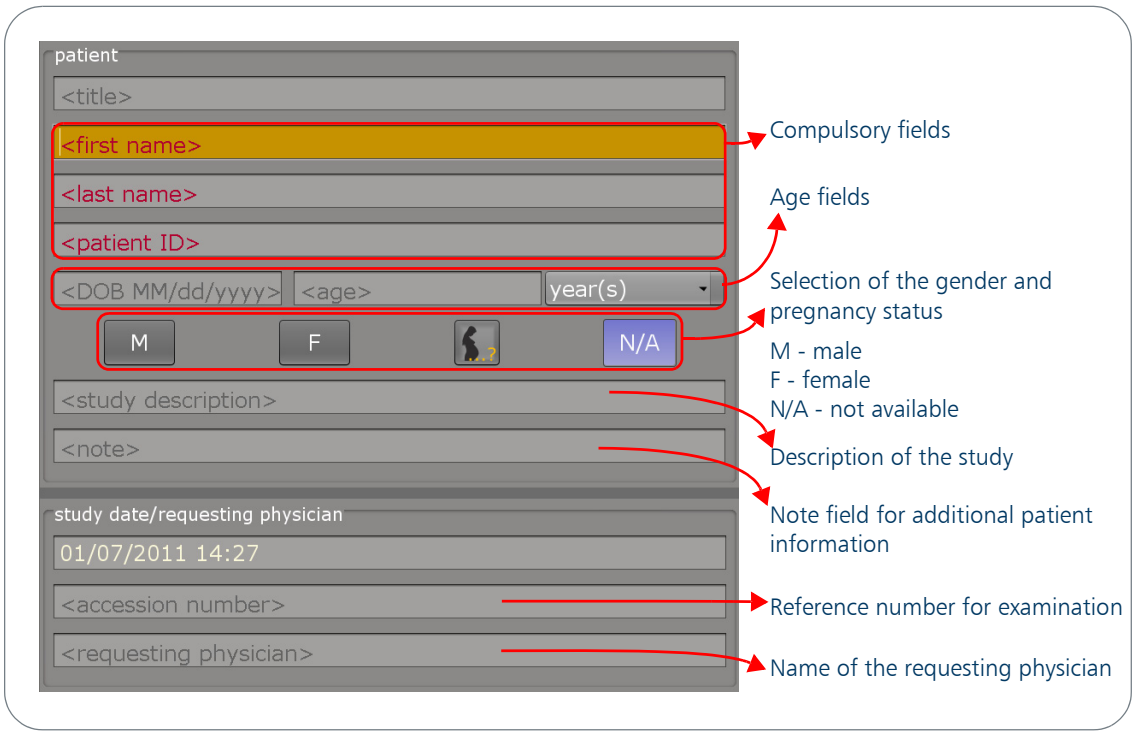

Figure 8. Create a new patient manually

The pregnancy status is set during the creation of a new patient. The selection menu of setting the pregnancy status appears by clicking on the pregnancy status button.

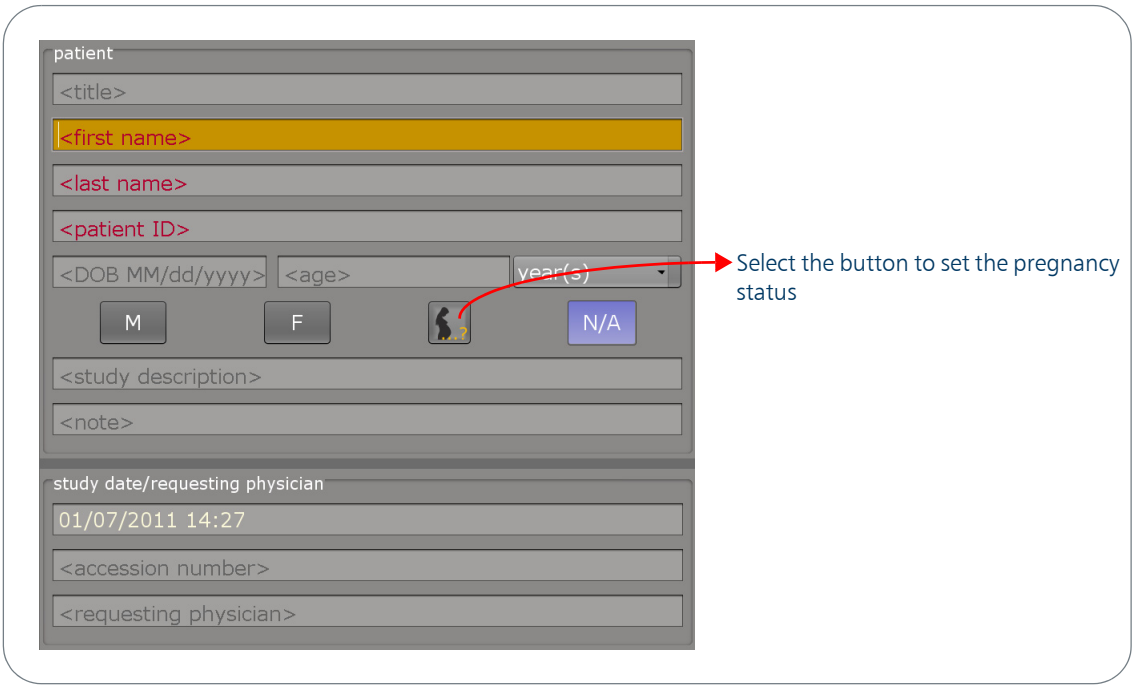

Figure 9. Patient input field with pregnancy button

The recording of the pregnancy status can take place in the patient as view well as the X-ray view. The default setting always asks the user for the pregnancy status of females in a pre-defined age group. This constant inquiry is automatically activated, but can be configured in the support mode.

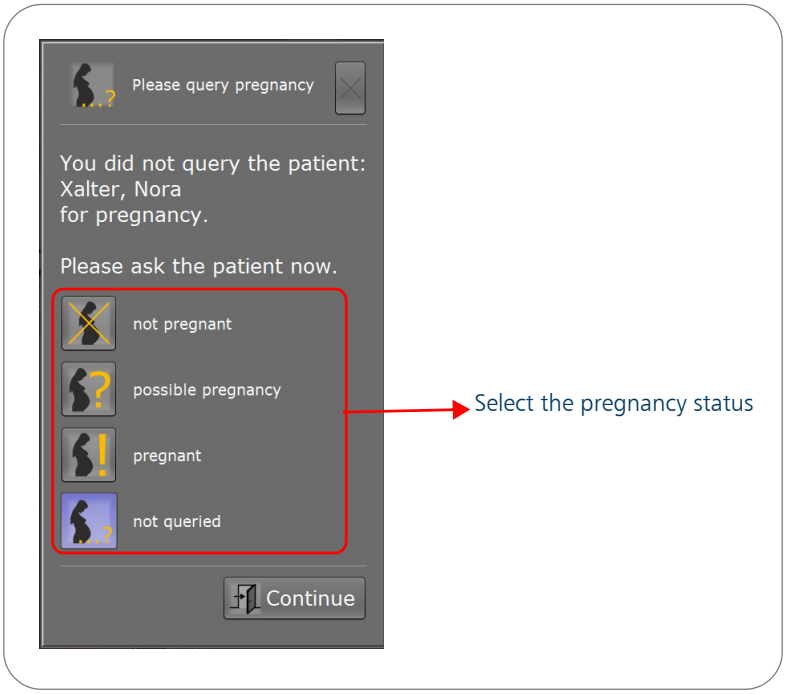

Figure 10. Pregnancy status

NOTE

The pregnancy status may not be set to „not queried" as a final status. In this case it would pop up again, e.g. after the processing of the image when switching back to the X-ray tab. Please select one of the first three options.

2.2.2. Query a DICOM worklist (optional)

After having clicked the „RIS" button, a DICOM worklist is queried and the results are entered into the worklist. The worklist has to be configured beforehand. Alterations or additions may be made at any time by clicking on the data fields on the left hand side of the screen.

NOTE

When clicking the RIS button in the demonstration mode, some virtual patients are inserted into the worklist already.

2.2.3. Create an emergency patient

It is always possible to interrupt an ongoing examination if necessary, for instance due to an emergency. Simply switch to the patient view and press the „emergency" button. This function is useful if there is no data available on a patient or an examination must be carried out very quickly. After clicking on the emergency button, the system automatically creates a new patient called „emergency". The patient ID consists of the date and the time of the record (*#-<timestamp>*), so that the correct patient data can be entered at a later stage by reopening the study (see page 56). The correct patient data can be insert in the patient view and the study can be closed and send to the archive again.

2.2.4. Delete a patient

This button allows to delete a selected patient from the worklist.

NOTE

The option „delete" is only available if there are no images or planned examinations associated with this patient. Otherwise the button will be disabled by the system.

2.2.5. Search for a patient or an examination

The search bar is located above the patient entries. By using this bar it is possible to search for data across several fields. The software always searches through the fields „last name" and „study description" simultaneously. Patients in the worklist that are marked red are interrupted patients.

Figure 11. Search bar

Example:

If the search word is only the letter „A", the software lists all entries in the fields „first name", „last name", „accession number" and/or „study description" where the letter „A" is included.

2.2.6. Worklist entries

Each worklist entry has a status and will be displayed in a certain colour in accordance with its status.

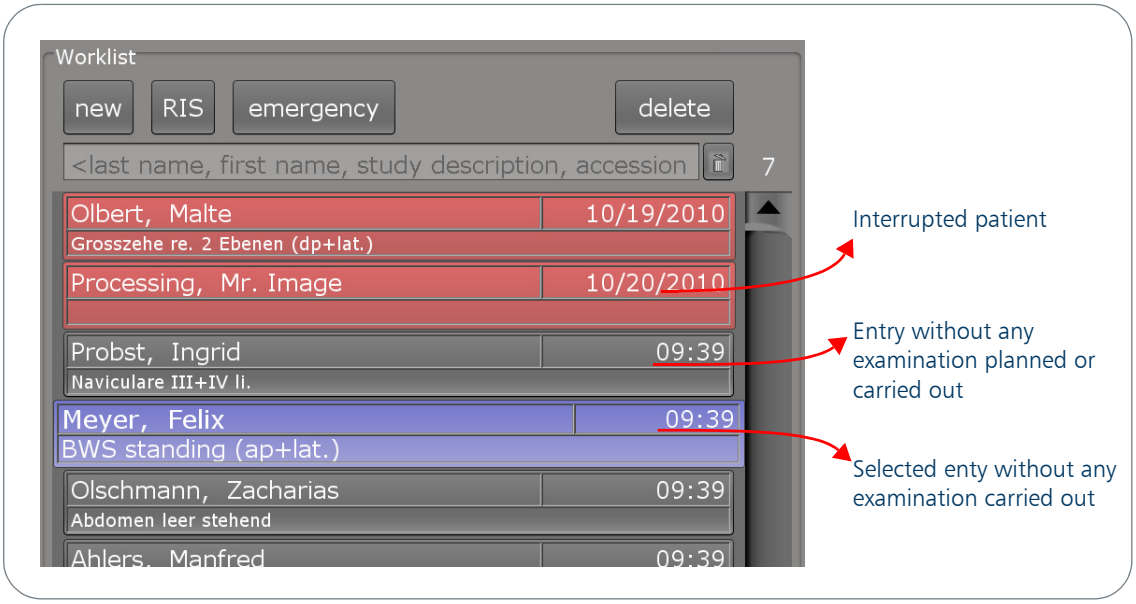

Figure 12. Worklist entries

Interrupted worklist entries are displayed in red. They are always located at the top of the list and are sorted by time. An interrupted worklist entry is a special feature. It means that images for a patient have been planned or taken, but further processing has not taken place. It can be necessary to interrupt a patient if a sequence of examinations requires repeated breaks or to deal with an emergency. New worklist entries, without any planned examinations, are displayed in grey, the selected entry is displayed in blue. New worklist entries are located below the interrupted worklist entries and are also sorted by time.

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2.3. X-ray view

In the X-ray view it is possible to plan, edit and take exposures.

Figure 13. Selection fields in the X-ray view

2.3.1. Plan

After selecting or creating a patient, there are two ways to switch to the X-ray view. The first option is to double click on the patient. The second is to select the patient and to click on the X-ray icon.

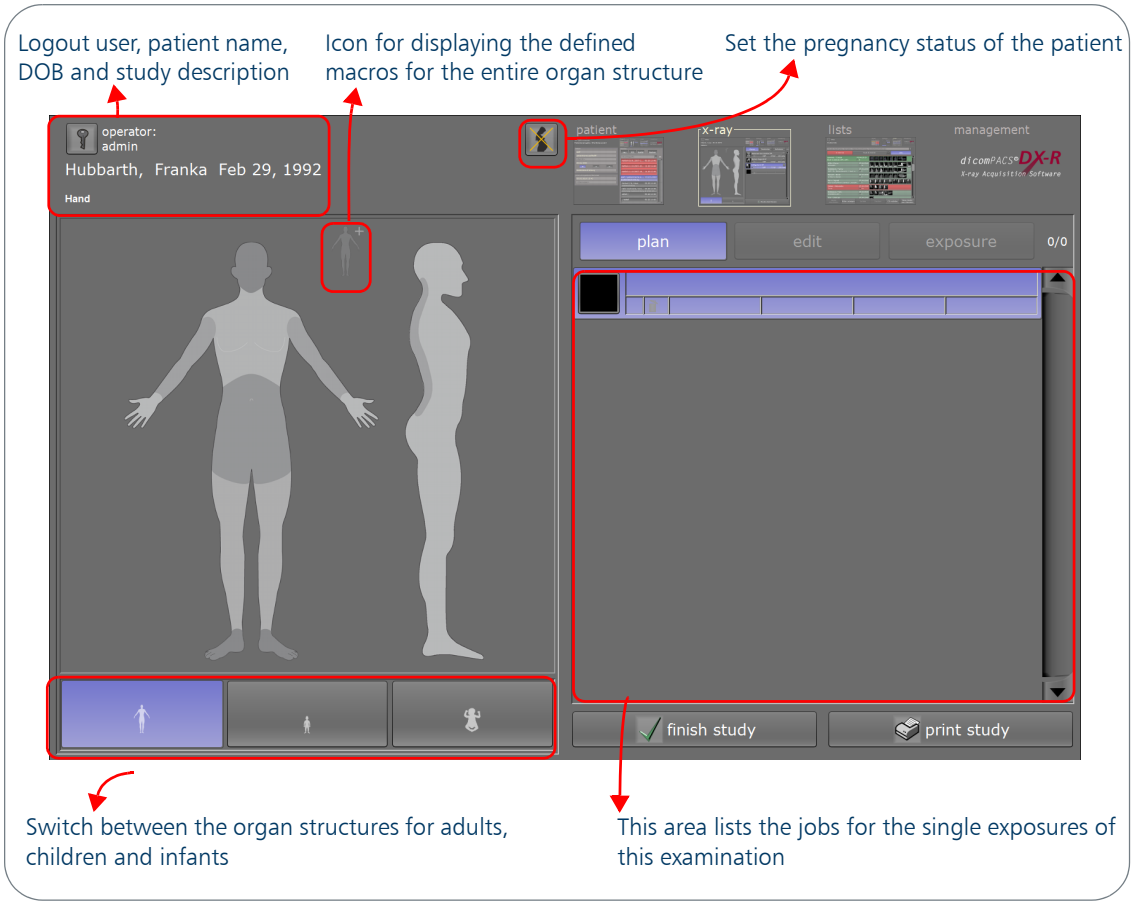


Figure 14. Planning mode of the X-ray view

The first illustration for the planning of X-ray exposures is displayed on the left hand side. The complete selection of organ structures is shown underneath. Click on the respective icon (adult, child or baby) to activate the corresponding organ structure.

Each organ structure is divided into different sections (body parts). When clicking on a body part, e.g. the skull, all available standard examinations of the selected body part will be shown. A new examination can be added to the worklist on the right hand side with a click on the required examination.

The information about the pregnancy status has to be entered via the icon in the upper centre. Different statuses can be selected.

NOTE

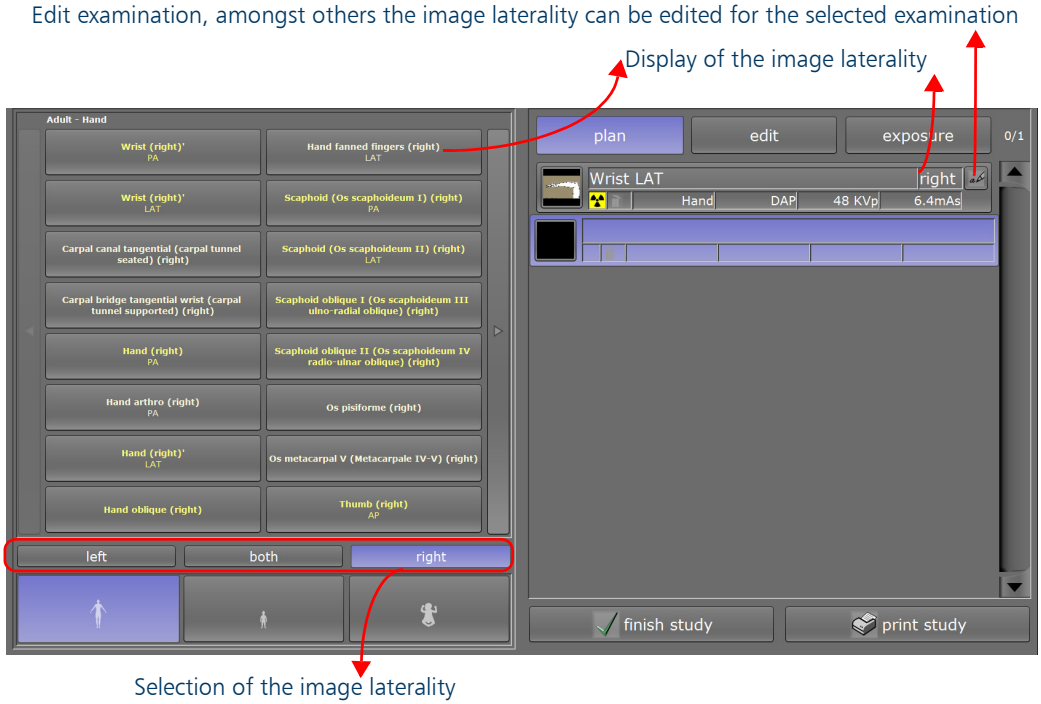
The macro icon with the „+" sign is displayed at the upper centre of the illustration. This is where several macro buttons for recurring examination procedures can be configured. Such procedures may for instance be screening examinations, examinations of organs in several planes or even consistency checks. Macros may also be stored directly in a body part section, e.g. „skull". Pre-configured macros are highlighted in red in the individual body part section.

Image laterality function

When selecting the X-ray view of the application, a body front overview is displayed e.g. an adult organ tree. This organ tree is virtually departed into a left and a right side. Choosing either side will display the exam overview with preselected image laterality, if this is activated in the „support mode" by a technician. The selectable values will be displayed as a group of three buttons below the list of exams, if enabled 

. The captions in the exam selection, as well as the components in the worklist, will also contain the assigned image laterality. If the value is unpaired or the function is disabled, the image laterality value will not be included.

Edit examination, amongst others the image laterality can be edited for the selected examination



NOTE

The function „Image Laterality" must be activated in the „support" mode to be displayed in the X-ray view.

If the image laterality is changed using the corresponding buttons 

, the captions of the exams, which derive their laterality state from their body part, will change accordingly.

The laterality value, which is assigned to a certain examination/exposure, can be changed for the selected examination anytime using the edit examination data dialogue, see page 33. The dialogue can be opened using the edit button with the pen aside the displayed laterality value. If the functionality is deactivated, the default value is not defined, which means that no value will be entered into the according DICOM tag. Changing this value to a valid one will ensure that a value will be written to the final file when the study is finished.

The configuration of the standard image laterality settings for all examinations can be edited in the „configuration" mode, see page 67.

Planning mode

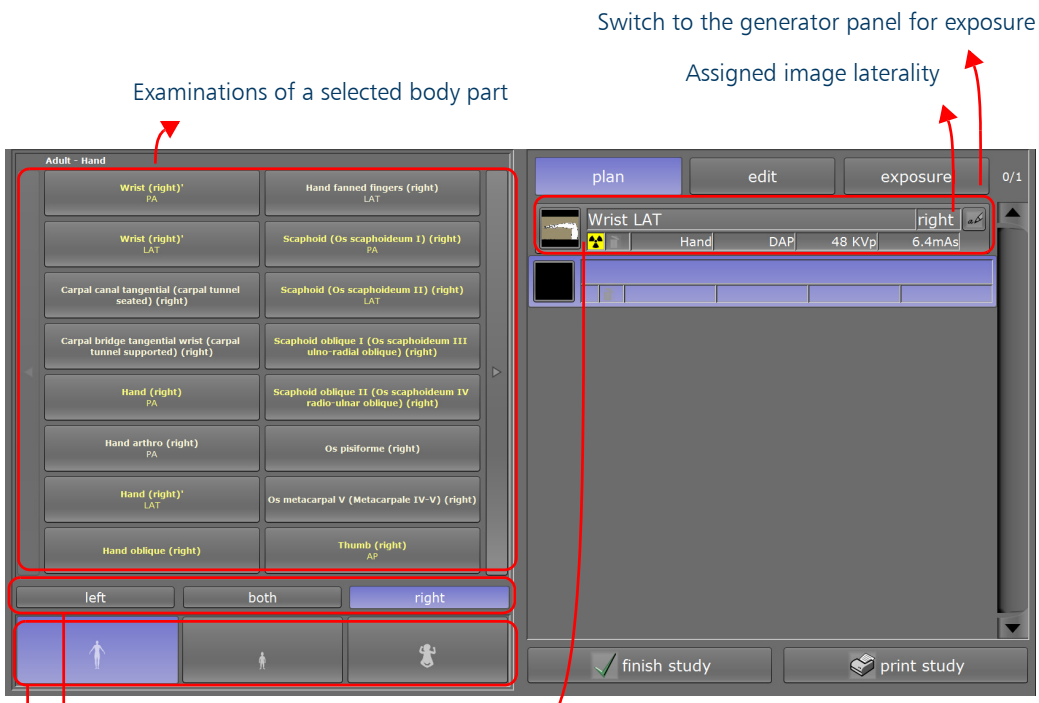


Figure 15. Planning mode of the X-ray view

NOTE

If the detector has been configured as a demo panel, an apostrophe (') behind the examination name indicates that the demo image will be loaded if the X-ray shot is simulated. For some of the examinations, no demo images are available. In this case, a selection box is displayed when the exposure is triggered, from which a raw data demo image can be selected.

PRACTICAL HINT

The whole list of examinations can be customised manually by using the configuration mode:

- creating new examinations / macros
- changing the order of examinations / macros
- hiding examinations / macros
- changing the colour of examinations
- changing / inserting procedure codes for examinations
- changing the image processing of examinations

NOTE

The yellow font on some of the buttons indicates frequently used basic settings. This colour is freely configurable, see chapter „Configuration of examinations and macros“ from page 27.

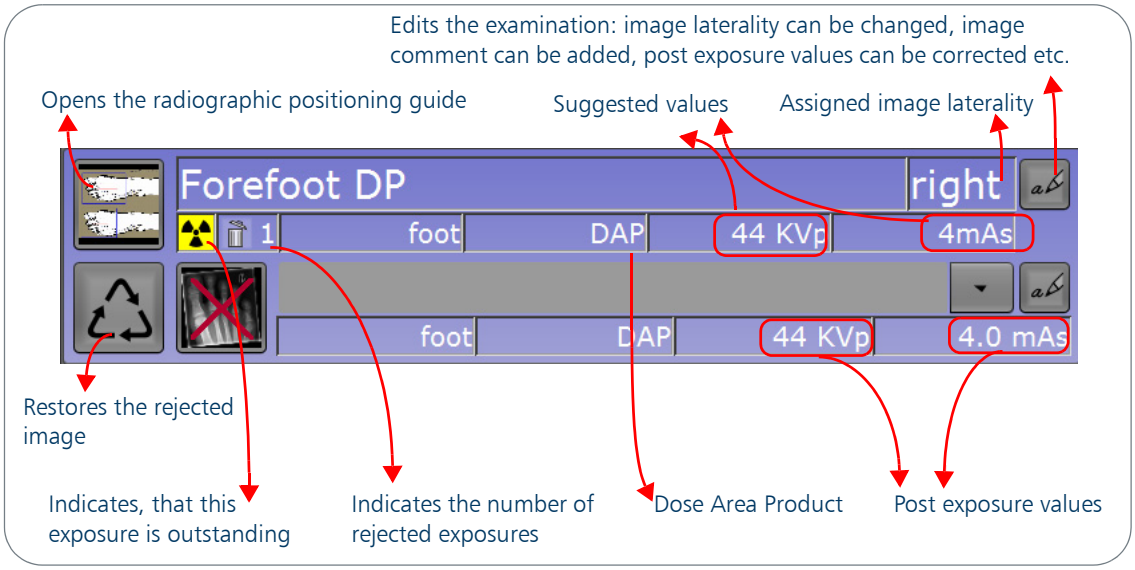


Figure 16. Planned examination

New plannings can be added in between already scheduled plannings. The desired position is simply to be selected and a new planning can be scheduled. The new examination is always inserted below the selected, existing planning.

NOTE

The insertation of new plannings is not possible before one or between two already exposures that have already been taken.

The planned examinations in the worklist include suggested generator values, which depend on whether an AEC is activated.

PRACTICAL HINT

All generator values for each examination can be customised manually either from a service engineer or a user with administration rights using the configuration mode. See section „Assignment of generator values to examinations“ in the support mode of the technical manual for further information on the configuration.

In addition, the name of the selected examination is inserted. The X-ray symbol indicates that the exposure is still outstanding.

The kVp and mAs values are the recommended values for the planned examination.

NOTE

When using the AEC measuring chamber, the mAs value is meant as a backup mAs value.

Radiographic positioning guide

If you click on the left image with the image of the examination during the planning, another window will be opened for the radiographic positioning guide, with more detailed information on taking the exposure. The radiographic positioning guide consists of example X-ray images, text, videos and images for the exact positioning of the patient.

The preview and the video of each examination may be customised individually for OEM (Official Equipment Manufacturer) partners. For the setup, please view page 72.

Figure 17. Radiographic positioning guide

NOTE

To add other projections from different body parts to the examination list, just click on the button with the respective organ structure. The overview will be displayed immediately and the new projection can be selected. The position of the new inserted examination can be edited by your technician.

2.3.2. Edit

If a wrong examination has been added to the worklist, it can be deleted. Therefore, switch to the edit tab and press the „bin button" next to the corresponding examination.

Furthermore, it is possible to exchange an examination by selecting a new examination on the left side or to review carried out exposures (click through the preview image) by using the „edit" button.

NOTE

For a system with generator control, it is only possible to edit the parameters „DAP", kVp" and „mAs" after the exposure, when the image is already taken, because the suggested values are overwritten by the exposure values.

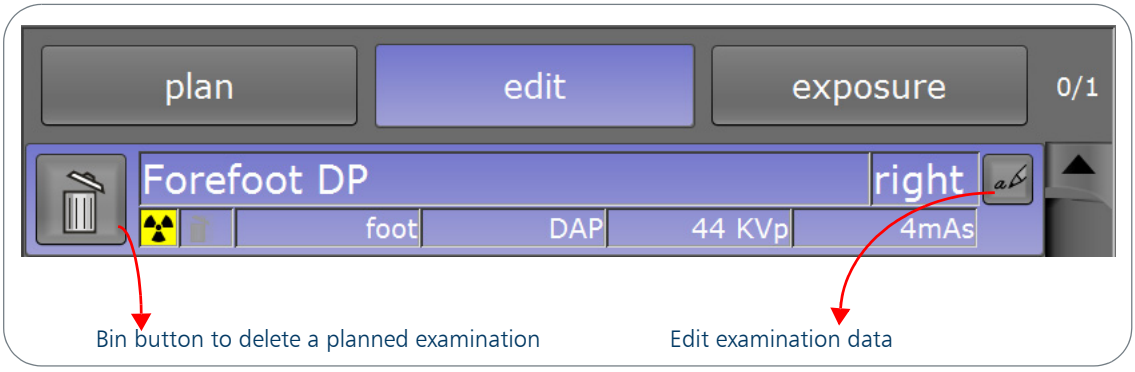


Figure 18. Edit a planned exposure

By pressing the „Edit examination data" button, an edit mask opens and it is possible to edit the entire examination information.

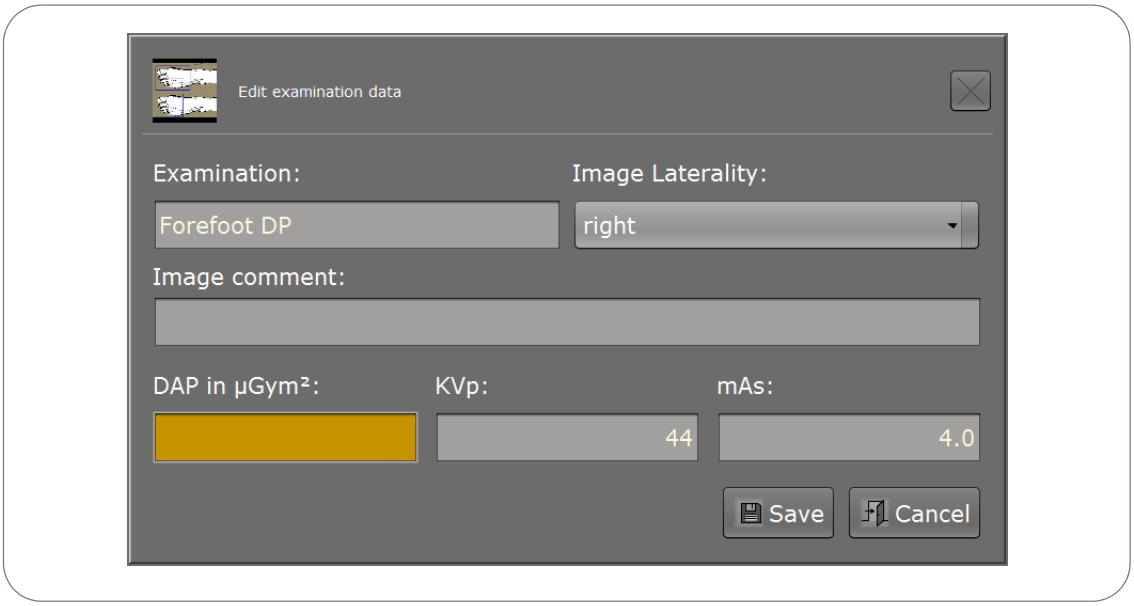


Figure 19. Edit examination data

By using the edit mask, additional image information can be inserted regarding the X-ray image. The image laterality value, which is assigned to a certain exam/exposure can be changed anytime in the edit exam dialogue. Also an image comment can be added such as:

- exposure with plaster or
- exposure with radiopaque material

After the exposure, the data provided by the Dose Area Product meter is entered automatically into the „DAP" field or can be entered manually in the designated text field. See also section „Exposure", page 37 for more information.

NOTE

The image comment is stored inside the DICOM image.

CAUTION

When kVp and mAs values are changed via the edit mask, they will not be synchronised with the generator. These values are only for documentation purposes.

NOTE

When an image has been taken, it is possible to switch back to the edit mode to change the type of examination. To change the image processing of this exposure, first choose the according body part on the left hand side of the screen and afterwards the required examination. The image will be reprocessed and the examination name will be replaced.

When the planning procedure has been finished, switch to the exposure tab to start the exposure.

2.3.3. Image acquisition process and generators

There are two types of image acquisition processes to arrive at an exposure, either to use CR systems or flat panel (DR) systems. An unlimited number of image acquisition devices can be connected to the image acquisition software.

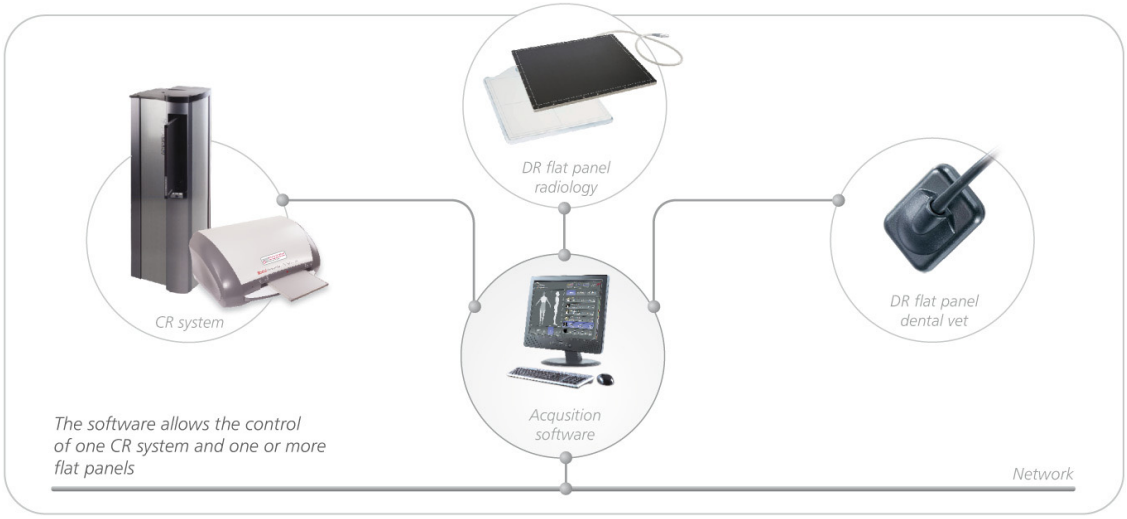


Figure 20. Image acquisition options

The actual X-ray exposure is prepared by clicking on the button „exposure". The generator panel is an optional GUI component. All values can also be adjusted and sent by an external X-ray generator console. In that case, the generator GUI component must be deactivated.

2.3.3.1. CR system

The following screen is displayed when starting the scanning process of a CR system.

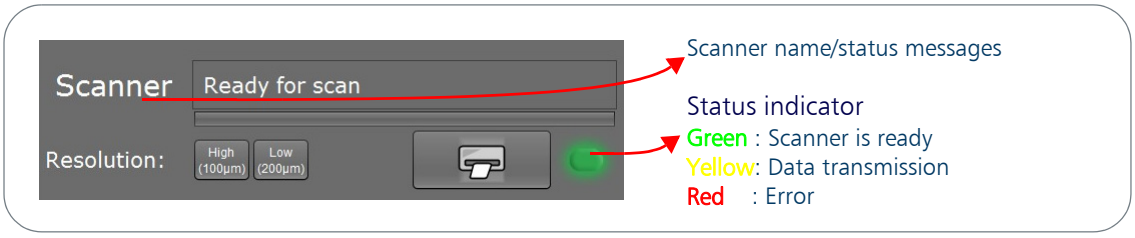


Figure 21. X-ray view with a CR system (no integrated generator panel installed)

When the status LED is green, the scanner is ready to read the image.

2.3.3.2. DR system

The following screen is displayed when starting the acquisition process of the DR system, whereby more than one detector can be connected.

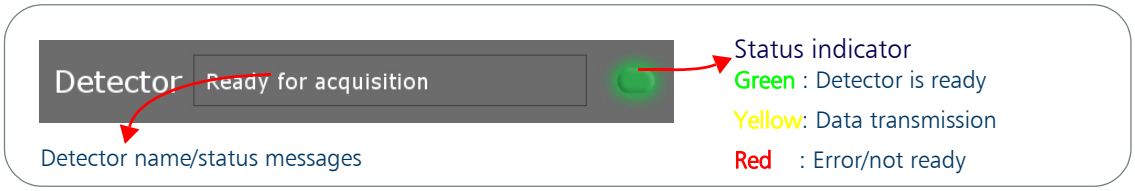


Figure 22. X-ray view without generator panel with a DR system

When the status LED is green, the detector is ready for exposure.

2.3.3.3. Common configurations

The following configurations are the most common combinations of the use of generators and image acquisition devices:

- 1x swivel bracket system, 1x generator, 1x panel
- 1x generator, 2 x panel
- 1x generator, 1 x CR device
- 1x generator, 1 x panel, 1 x CR device

2.3.4. Exposure

The generator panel is displayed at the start of the exposure acquiring processes by clicking on the button exposure.

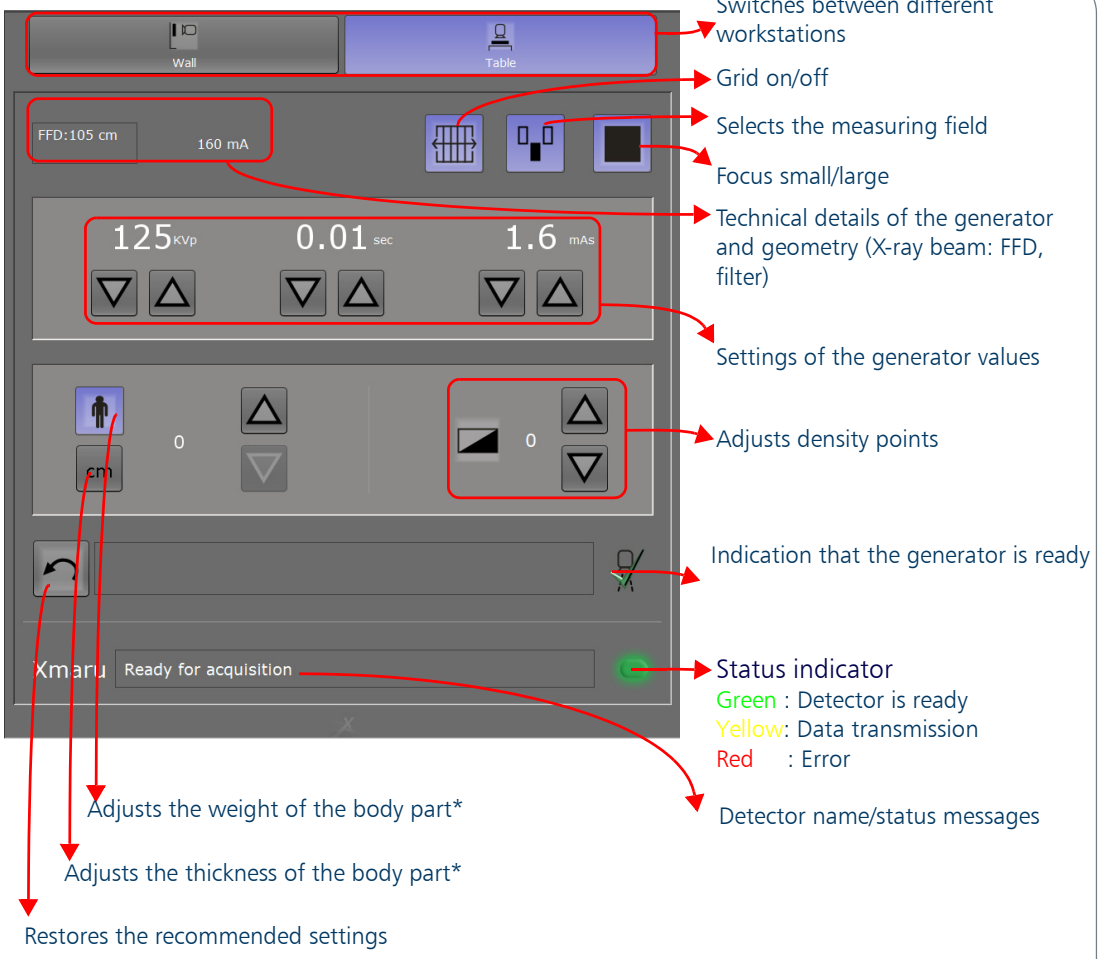


Figure 23. Generator panel in standby status

In case more than one work station has been set up in the support mode, they appear in the upper area of the generator panel.

NOTE

It is possible to change between the „mA" and „ms" value display for each „Generator" in the support mode" in the tab „Generator control".

NOTE

The software can monitor whether a grid is available or not. Please see the technical manual section „Workstation configuration - Grid“. If the grid is not set correctly, a flashing warning appears and the generator is blocked.

The examinations are programmed in two different modes: kVp/mAs mode and AEC mode.

Thickness/weight correction

Apart from the values for kVp and mAs, that are passed on to the generator, it is possible to adjust the recommended values for the weight of the patient or the thickness of the individual body part (via „cm“ button). The required values of kVp and mAs will be adjusted automatically.

This function is not available for a system with an EMD generator.

AEC or automatic mode

Apart from the value for kVp that is passed on to the generator in AEC mode, the density points can be adjusted in the range of -3 to +3% (23% increment per point).

NOTE

Avoid to change the s or mA buttons in this AEC mode. It will keep the backup mAs but influence the responding parameter, either mA or s.

Pregnancy status

The information about the pregnancy status has to be entered via the icon in the upper centre above the generator panel. Different statuses can be selected in the planning mode.

DANGER

The values shown in the generator panel (kVp, mAs, mA, etc.) are only recommendations (guidelines) and must always be verified before an X-ray is taken. These values can be adjusted in the value table for the particular generator. For questions please refer to your service engineer for generators.
If no generator values are sent to the generator automatically, it is urgently recommended to add the values set manually for each exposure at the generator console as well. This has the advantage that the values actually applied are stored together with the corresponding image (in the DICOM header) and can be recorded in the X-ray log. This is important for the correct documentation of each individual exposure.

CAUTION

Each connected detector must be calibrated by an authorised service engineer. The maintenance cycle is given by the manufacturer of the detector.

NOTE

Generator values must be correctly indicated for documentation purposes, even when the generator is not connected and the values are manually changed at the generator console, see also section „Edit“ page 33.

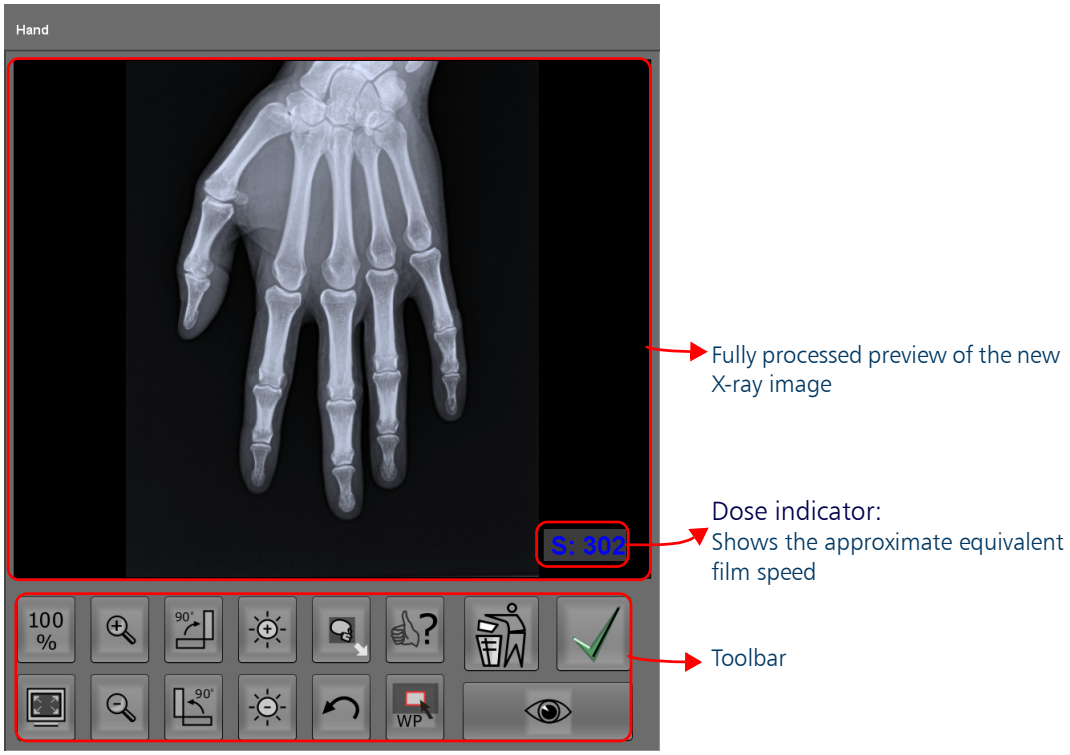


Figure 24. Preview image

As soon as the X-ray image has been taken, it is optimised in accordance with the image processing algorithm stored for the examination and is displayed immediately. A toolbar is then displayed beneath the preview.

This is where different options for displaying the image (e.g. fit image, rotate image, etc.) are available.

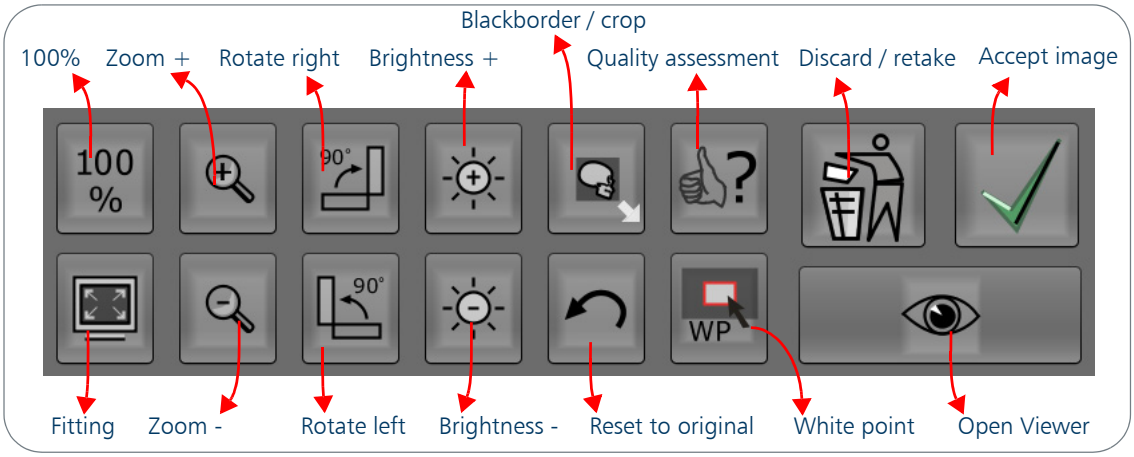


Figure 25. Toolbar

The following tools are included in the toolbar:

	Displays the image pixel per pixel (full resolution)
	Shows the complete image
	Enlarges the image
	Reduces the image
	Rotates the image to the right by 90°
	Rotates the image to the left by 90°
	Increases the perceived brightness (gamma curve)
	Reduces the perceived brightness (gamma curve)
	Draws or adapts the black border around the image
	Restores the original condition of the image
	Rejects a bad exposure
	Accepts / reopens an exposure

	Opens the study using the included viewing application (diagnostic mode)
	Allows the quality assessment of new images
	Re-determines the Region Of Interest (ROI)

Table 2. Tools for preview image

2.3.4.1. Sensitivity factor - S-value

Dose index, S-value, Dose indicator

In the following you will find an explanation on the image processing with regards to the dose index.

Basics

With digital radiography it is not possible to determine the actual image receptor dose exclusively by the brightness impression of the final image, unlike the creation of analogue images that represents this value.

Incorrect exposures can be compensated by the image processing in a wide range (automatic signal normalisation), so that there is always a constant brightness and contrast effect. There is no direct relationship between the image receptor dose (dose required), and the optical density of the image!

Following are examples of varying radiation doses that were taken with a Varian „PaxScan 4343R" (GadOx):

54 KVp and 1.80 mAs

54 KVp and 1.05 mAs

54 KVp and 0.60 mAs

54 KVp and 0.15 mAs

Figure 26. Image receptor dose comparison

With digital radiography underexposed images have enhanced noise and less detail. Overexposed images increase the radiation of the patient and partially the staff.

In most countries it is regulated that the manufacturer of digital radiography systems must define a dose indicator (dose index), which indicates the sensitivity of the image receiving system. The dose indicator gives the user of the system the ability to draw conclusions on the dose used for an image.

In Germany, this is regulated in DIN 6868-58. It says regarding the definition of the dose indicator:

It is „a manufacturer-specific value of the digital image receiving system specified for each image that correlates under the same recording conditions with the image receptor dose".

AccuVue uses a numerical value as a dose indicator that is oriented towards the S-value (Speed Class) of the sensitivity classes of film-sheet systems.

Speed Class (SC)	Dose required µGy	Description
100	10.0	High definition
200	5.0	Universal film
400	2.5	High gain
800	1.25	Highest gain

Table 3. Speed Classes

When X-raying analogue with film-screen combinations the respective dose (see table) generates an optical density (OD) of 1 above the X-ray fog. Thus, for example for a film with the sensitivity SC = 400, a dose of 2.5 µGy is required to generate an optical density of 1 (medium gray).

In practice

The dose index (S-value) is calculated at the bottom right corner of the image (blue font) after the image acquisition with AccuVue

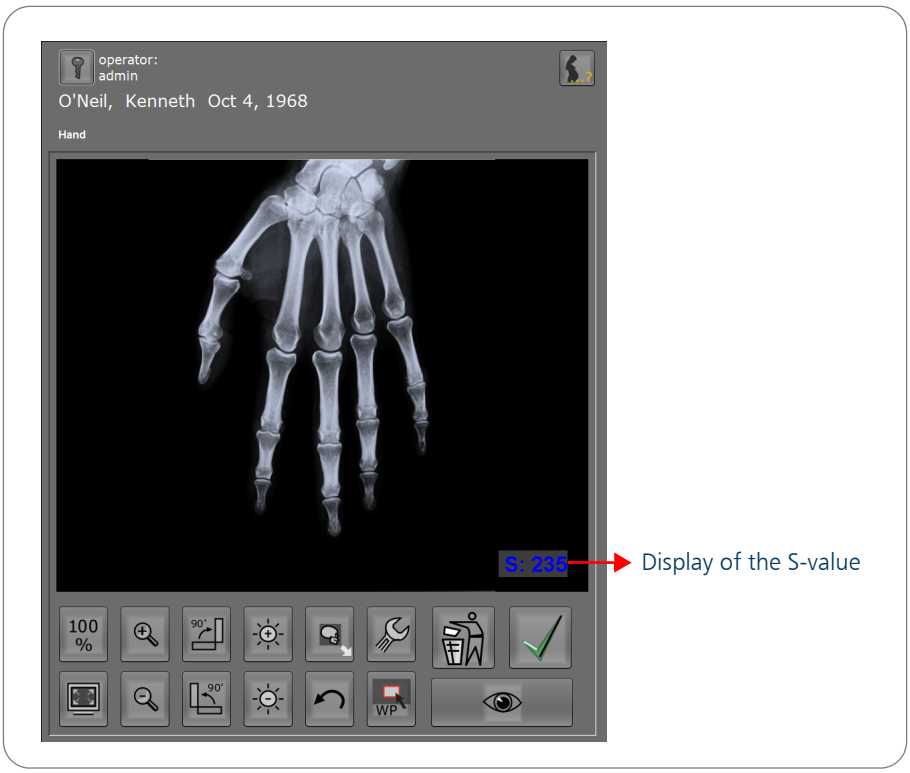


Figure 27. S-value

If the displayed image gives the desired brightness impression, you can draw conclusions via the displayed S-value on the average image receptor dose. If the image is displayed too dark or too light, the displayed S-value is incorrect too. If you set the white point again, it will change the impression of luminosity and thus the indicated dose indicator.

The relationship between S-value and radiation dose is inversely proportional.

High S-value -> small dose (underexposure)
Small S-value -> high dose (overexposure)

A high S-value means a small image receptor dose. S-values above 1000 indicate a strong underexposure. S-values below 50 indicate an overexposure.

Consider the following example:

For the X-ray of a knee, a dose of about 5 µGy is required. The expected S-value is approximately 200. After the exposure an S-value of 630 is indicated.
This means that the image was underexposed by the factor of 3.
In order to correct this, either the product of mA*s has to be increases by the factor 3, or the dose has to be increased by the factor 3 with the help of the buttons for the exposure points.

In the human field, there are guideline values at which the radiation exposure can be read according to the body regions.Typical sensitivity classes are S = 200 for extremities, S = 400 for the torso and S = 400-800 for children.

NOTE

The displayed S-value is only an indicative guideline and may show deviations of the recommended image receptor dose.

2.3.4.2. White point

This function allows the user to re-determine the Region Of Interest (ROI) for the image processing filters if the X-ray image does not meet the expectations after it was taken. Click on this function and then simply place the special rectangular cursor on the lightest area of the bone structure. The currently used image region is then highlighted with a red frame and the X-ray image is automatically re-configured.

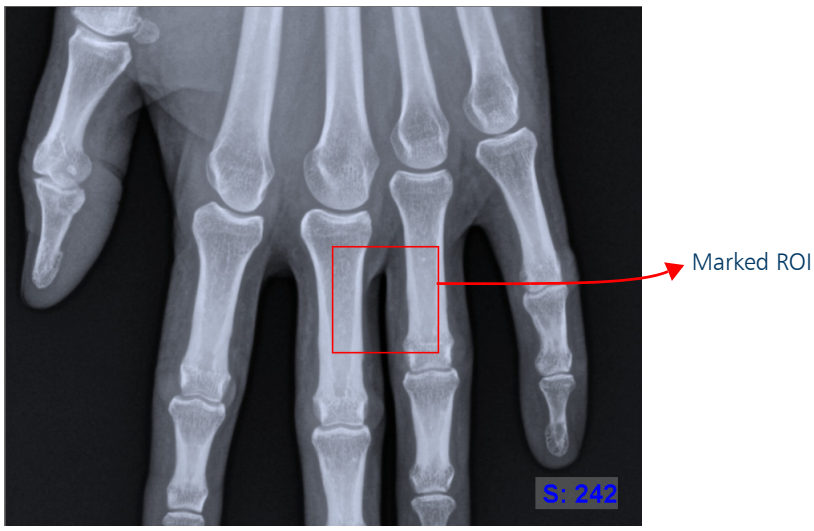


Figure 28. White point

2.3.4.3. Quality assessment of images

The visual impression of the images can be evaluated as „good", „moderate", „poor" and „not ratable". The quality assessment results are analysed by a ***dicom**PACS*®***DX-R*** dealer. If necessary, the processing for certain exposures can also be adapted by the dealer.

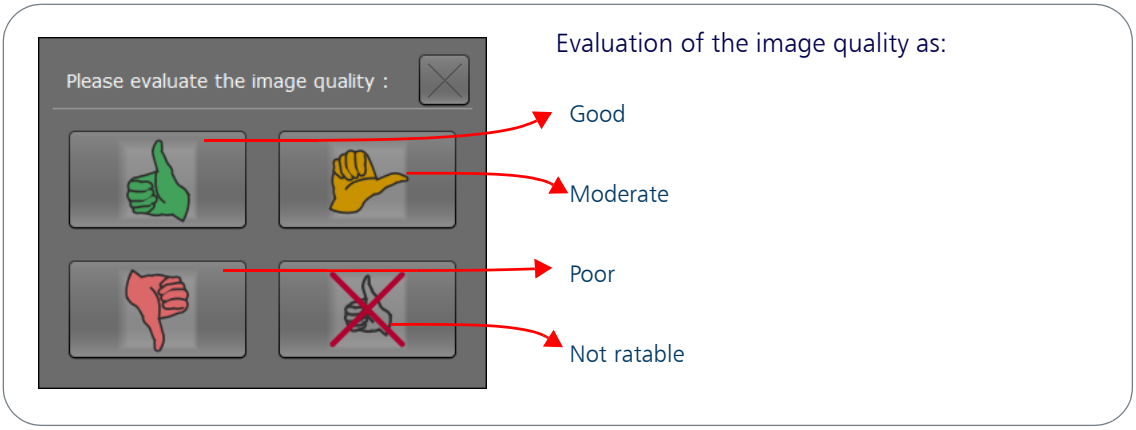


Figure 29. Quality assessment for images

2.3.4.4. Black border / cropping

The cropping function is used in conjunction with the function black border and offers the possibility to crop collimated areas around an image automatically when finishing a study. A drawn black border is a precondition for this function.

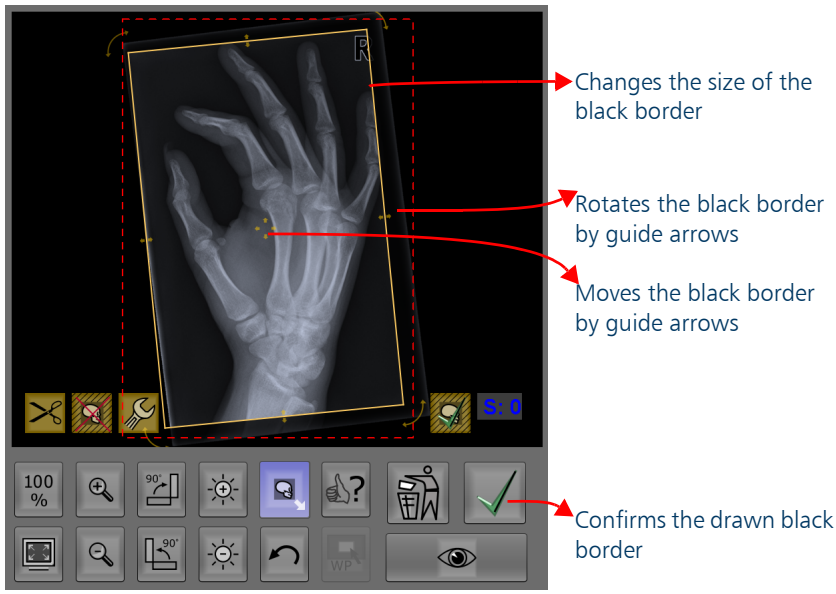


Figure 30. Black border with normal edit helper annotations in the preview image

The tool „Create / Edit Blackborder“ in the image preview is optimized for touch operation.

 The drawn black mask is inserted by the button and it can be further edited in its size.

 The drawn black mask is cleared by clicking on this button.

 When clicking on the screw wrench button a dialog opens, in which the shadowing can be adjusted from 70-100% (100% represents black) and in which you can add another blackborder by clicking on the button „Add another ROI“.

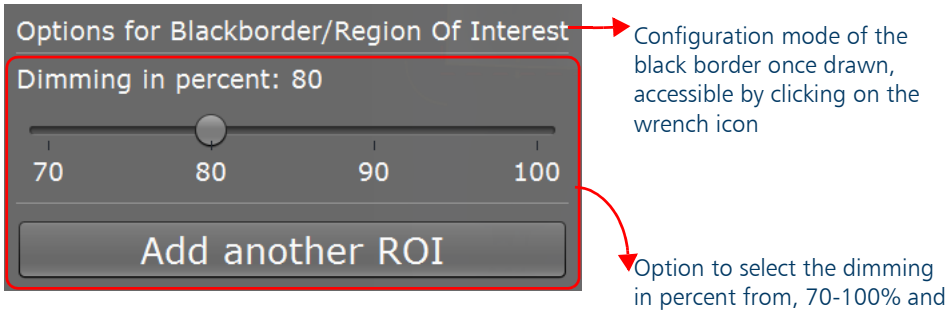


Figure 31. Black border with small edit helper annotations in the preview image

Result of black border

Result of cropping

Figure 32. Results of the black border and cropping

CAUTION

Before the cropping function can be used, it is necessary to activate the tool in the support mode.

The black border can be positioned with the red directional arrows.

When pressing the button with the crossed out black border, the drawn black border will be deleted and it can be re-drawn.
Once the lines of the black border function are coloured blue, the black mask cannot be adjusted.
If the button with the scissors is chosen, the image will be cropped along the dashed rectangle.
If a study with a drawn black border is finished, the cropping functionality can also be applied automatically in case it is set up in the support mode.

2.3.5. Retake / discard images

If an image does not meet the quality criteria because, for instance, the patient moved or because the collimation of the X-ray device was incorrect, this exposure can be rejected.

NOTE

The system automatically reverts to the exposure mode and indicates in the examination list that this image has been rejected. It also shows how many images of this examination have been rejected.

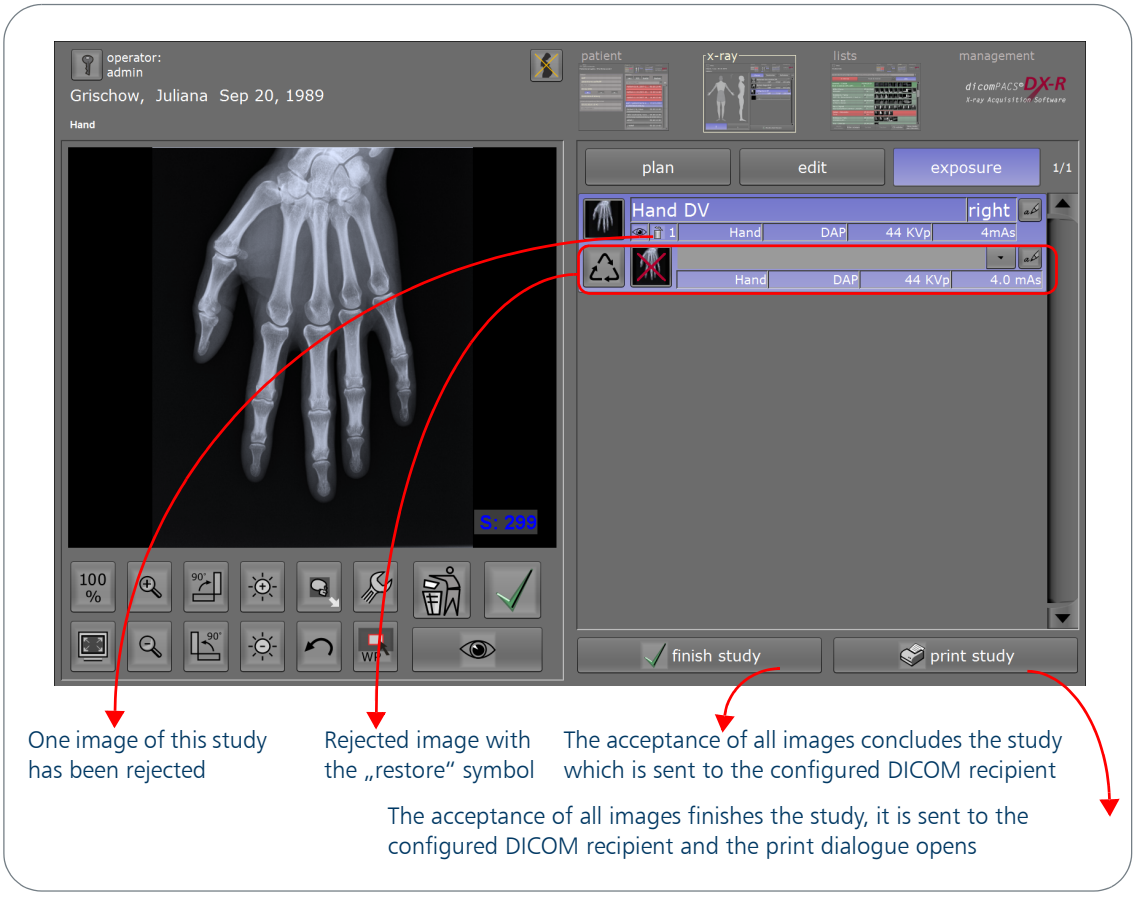


Figure 33. Discarded image

For legal reasons it is not possible to delete rejected images. Thus, a previously rejected image can be reactivated and used as the current image of that examination as long as this image has not been accepted. To reactivate the image simply click on the symbol „restore".

NOTE

All exposures are stored on the hard drive, independent of whether they have been rejected or not.

2.3.6. Accept an image

By clicking on the checkmark, the currently visible image is accepted. It is sent to the configured DICOM recipient (e.g. PACS) and is thus used as the „original image" created by the system.

NOTE

The original image cannot be altered. It can, of course, be loaded into the viewer and subjected to additional image processing. The changes made in the viewer, however, do not apply to the original image. They are stored in addition to the original image. If the image is loaded again from the database at a later stage, the stored changes are simply applied to it.

2.3.7. Finish a study

By clicking on the button with the green checkmark and the label „finish study", all images of the current patient are accepted and will be sent to the recipient. There are a number of special cases to be considered:

- study with taken but not accepted exposures
- study with both planned and taken exposures
- studies without DAP values (if configured)

When trying to finish such a study, a pop-up window opens.

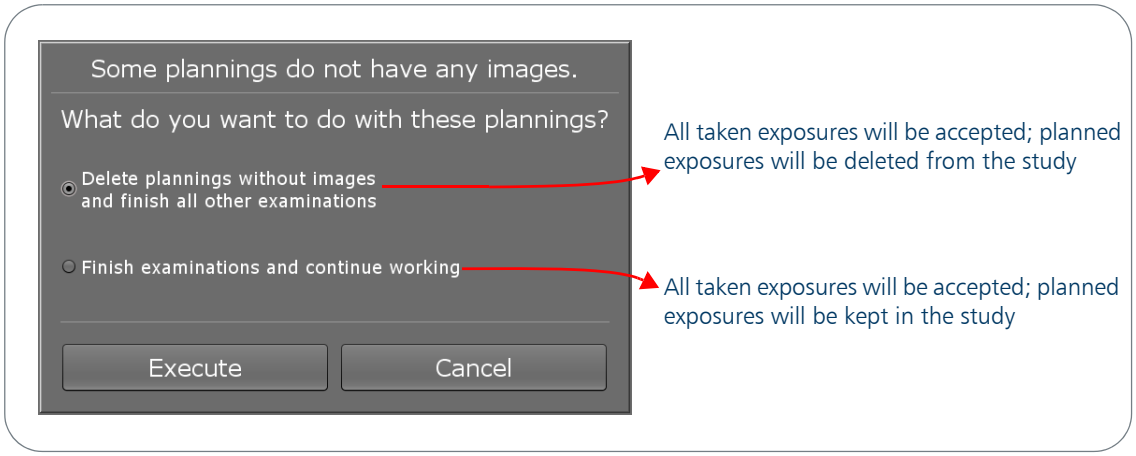


Figure 34. Dialogue for exposures not yet taken

Usually it is necessary that each exposure contains a DAP (Dose Area Product) value, which can be configured by the ***AccuVue*** software. Usually, a pop-up window opens, when trying to finish an exposure or a study without DAP values.

Figure 35. Dialogue for DAP values

If a DAP value is not known, it is possible to finish the study by choosing the option „Accept without dose value". However, this option is not advisable.

CAUTION

The option for accepting exposures with or without dose values has to be configured, therefore refer to your software dealer.

2.3.8. Display images in the viewer

AccuVue has an integrated professional viewer. This viewer provides extensive image processing options, such as inserting annotations, measurements, printing, exporting of images and many more. The following chapter includes a detailed description of the viewer.

2.3.9. Exposure status

An icon next to each exposure shows its status, e.g. planned, taken or finished.

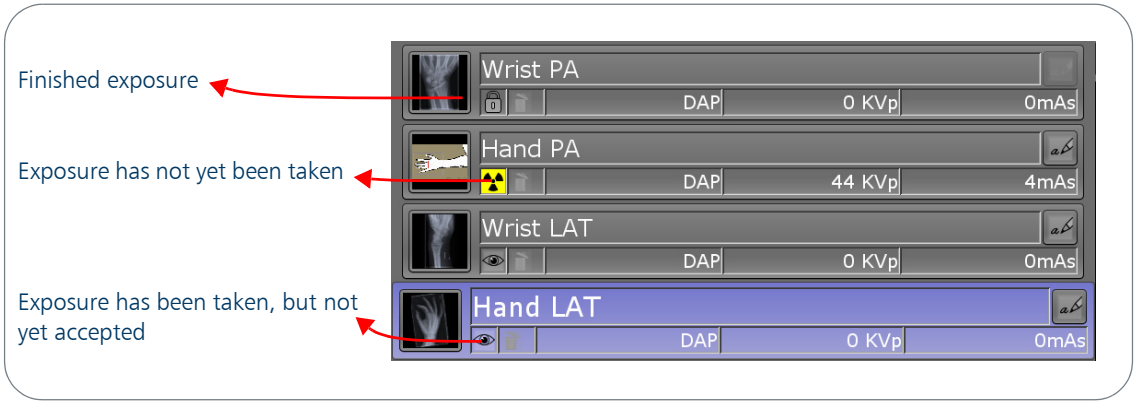


Figure 36. Exposure icons

Left blank intentionally

2.4. Lists view

The lists view displays all studies of all patients. Finished studies are shown as well as unfinished studies.
A detailed study status, including storage commitment - a query whether data has been stored safely - give precise information about the status of the individual studies.

NOTE

Storage Commitment must first be activated by a technician in the „support mode" (management) to specify the appropriate archive.
When Storage Commitment is subsequently disabled, then all images in which Storage Commitment was enabled, remain visible, including the detailed status.

In the lists view there are the options to search for studies using different criteria in the search bar, to load them into the PACS Viewer, to sent or print them or to create a patient CD. In addition, incomplete studies can be finished or a completed study can be re-opened (via the option to extend the study itself or to create a new study for the patient). By clicking the „More" button, currently selected studies can be deleted. The rejected images as well as the recycle bin can yet be displayed separately.

PRACTICAL HINT

When an examination is highlighted, the screen can be switched straight to the patient or X-ray view. This is where patient data can be changed or added, additional exposures can be planned and new, not yet accepted images, can be altered.

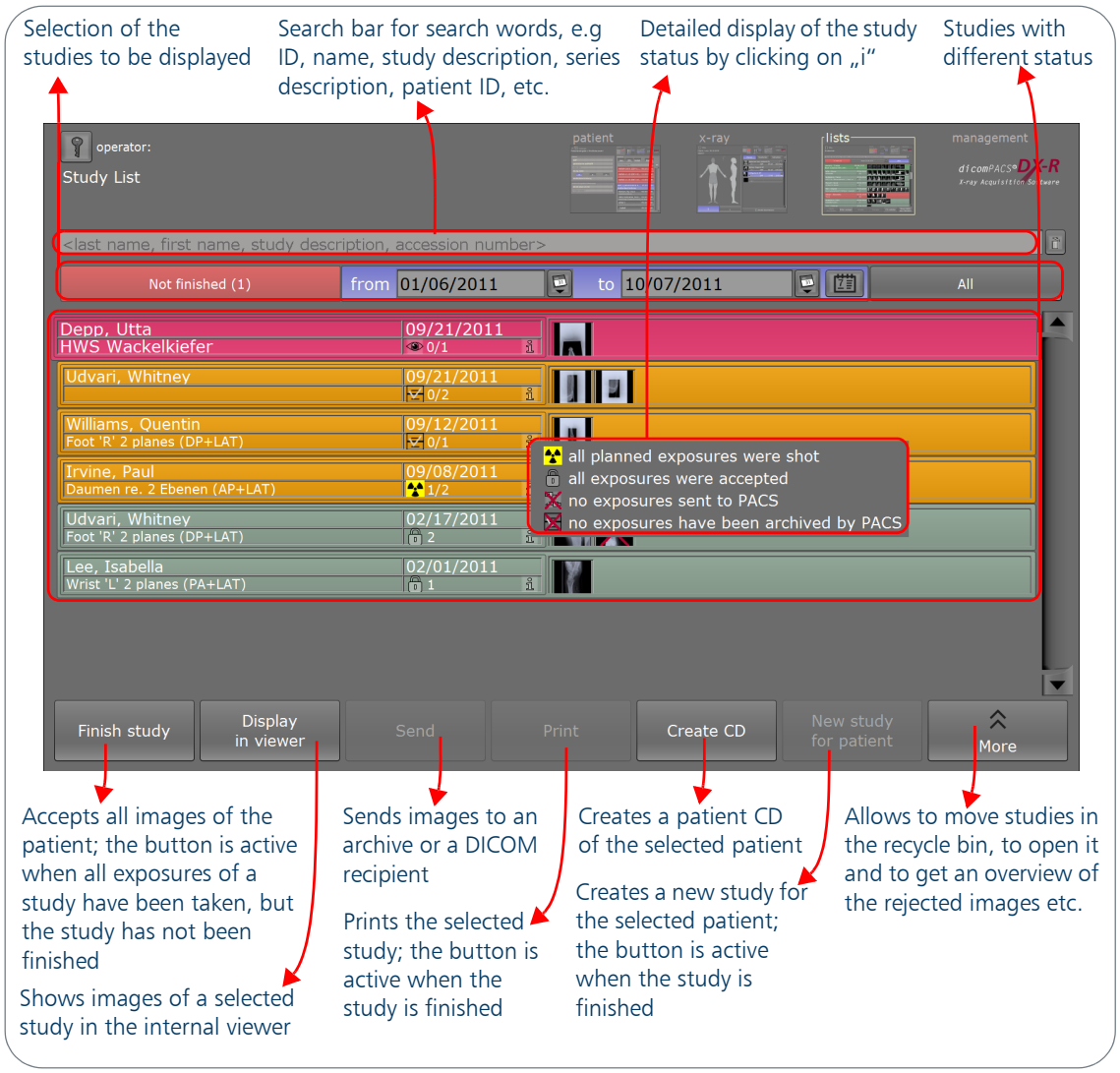


Figure 37. Lists view - with active storage commitment

The lists view has three different display options:

- „Not finished“: displays all incomplete studies (number in brackets)
- Today‘s date or date-range when the image was taken; displays all studies of a specific date or within a specified period of time when the image was taken; furthermore, when clicking on the calendar button, further search functions drop down
- „All“: displays any studies ever planned or completed

Where the „Today“s date is displayed, a general calendar button is located on the right. It includes additionaly to search for „Yesterday“, „from...to“ and „from“.

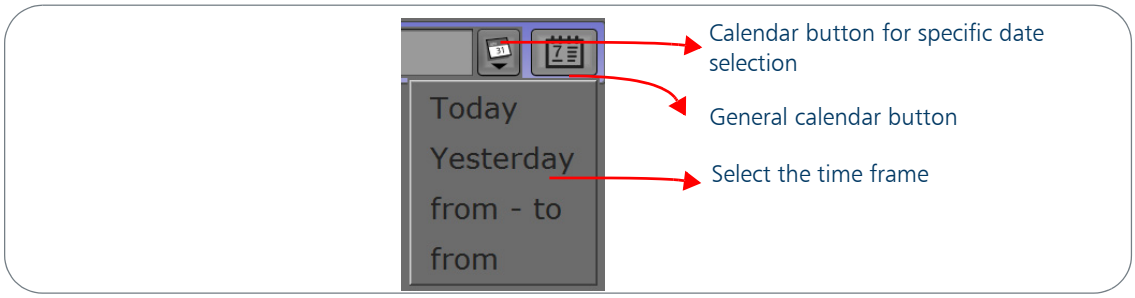


Figure 38. Time frame selection via general calendar button

The options „from...to"/„from" have specific calendar views for the convenient determination of the date; this function is called up via the adjacent calendar button.

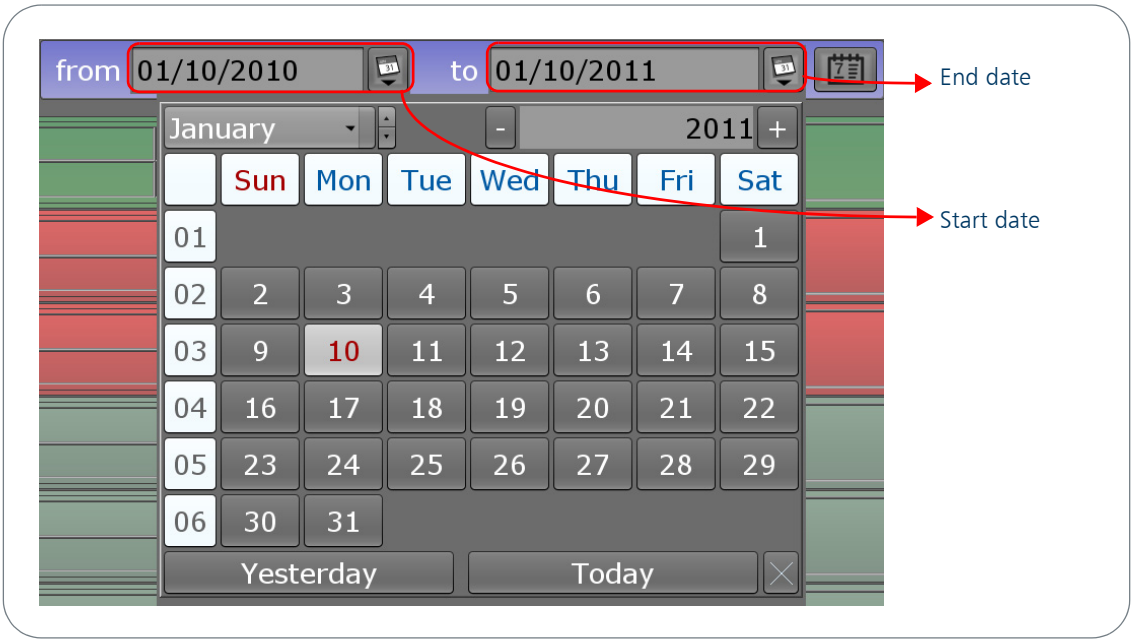


Figure 39. Date range

If both elements of the date range search contain a date, all instances which lie between those dates, will be displayed. If only the first element contains a date, only studies with an image made on that specific day will be displayed. If the first element or both are empty, all images will be displayed. To select a date just enter a date in your respective date format and confirm by pressing *Enter* or clicking on the button right to the text to open a calendar field.

NOTE

In the lists view the date is displayed when the last exposure was taken for a study (if it is on the same day, the time is displayed) and not when the study was created.

Detailed status information on the exposures and their acceptance, sending and archiving can be displayed by clicking on the „i"nformation button within the study list.

The information corresponds to the following status including an indication of the number of associated images, for which the status applies.

If no Storage Commitment is activated in the „support mode“ (via „management“), there are two different colour displays in the study list, each displaying the status of the study:

- Red - the study is still in progress
- Green - The study is completed

Various symbols of the study list entries without storage commitment represent different status of the studies:

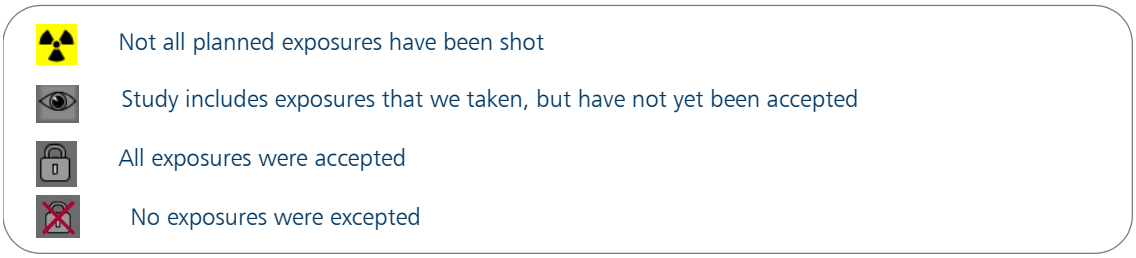


Figure 40. Status symbols without storage commitment

If Storage Commitment is activated for at least one archive, the study may take three different states, which are also shown by different colouring in the study list entries:

- Red - the study is still in progress; it is not yet sent to the archive
- Orange - the storage of the study in the archive is requested, but not yet saved (request storage) or the storage of the study in the archive is executed but not yet confirmed (not yet committed)
- Green - the storage of the study in the archive is confirmed (committed)

Various symbols of the study list entries with Storage Commitment represent different status of the studies:

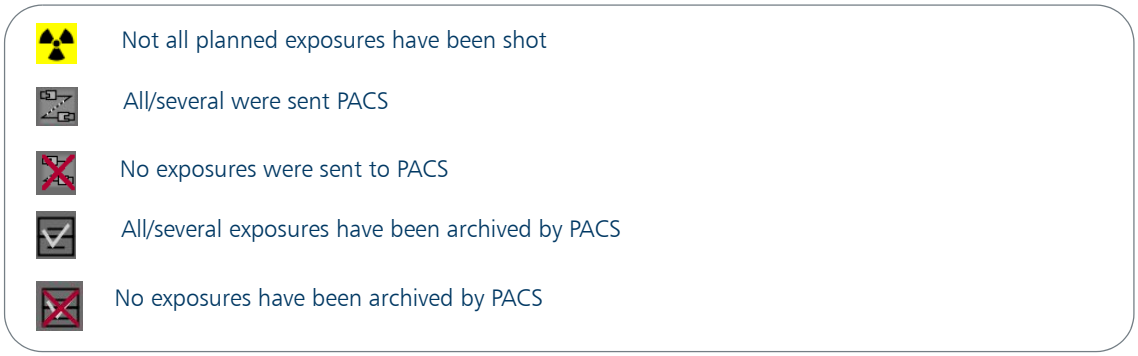


Figure 41. Status symbols with storage commitment

2.4.1. Extend a study

To extend a finished study, select the study from the lists view and go to the X-ray view via the header. A dialogue box opens with the option to extend a study or to create a new study for the same patient in case the study is older than eight hours.

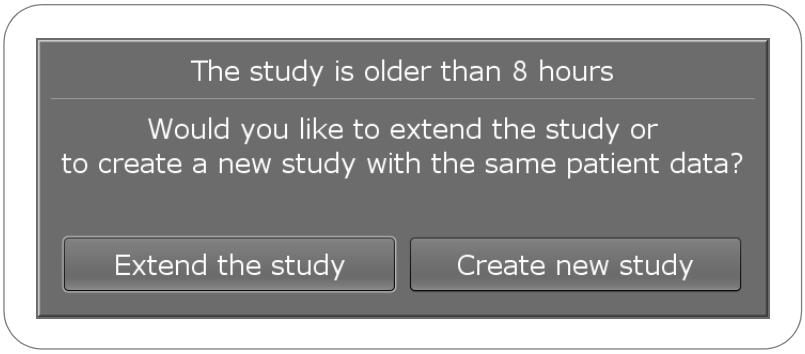


Figure 42. Dialogue box to extend a study

When the option „Extend the study" is chosen, the screen switches immediately to the X-ray view and all taken exposures are visible. Already accepted images can be re-opened and re-sent to the archive by selecting the re-open image button (in the toolbar: button with a padlock). This can be used e.g. when no position marker has been included when taking the exposure and the user wishes to insert it afterwards.

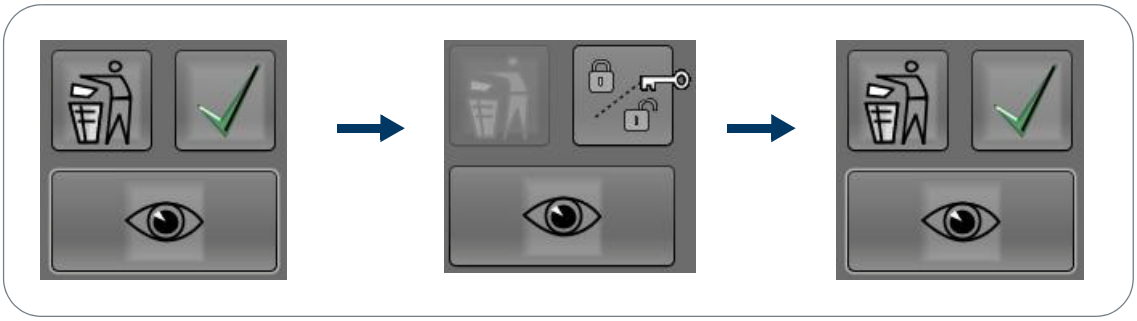
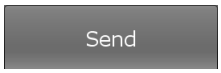


Figure 43. Reopening of images

If the option „Create new study" is selected, automatically a new study is created for the patient, see page 60.

2.4.2. Send



After a click on the „Send" button, the teleradiology dialogue appears. The recipient can be selected and the selected study will be sent to the archive and other DICOM recipients by confirming the selection. Additionally, the image quality can be selected and thus the size of the data transfer.

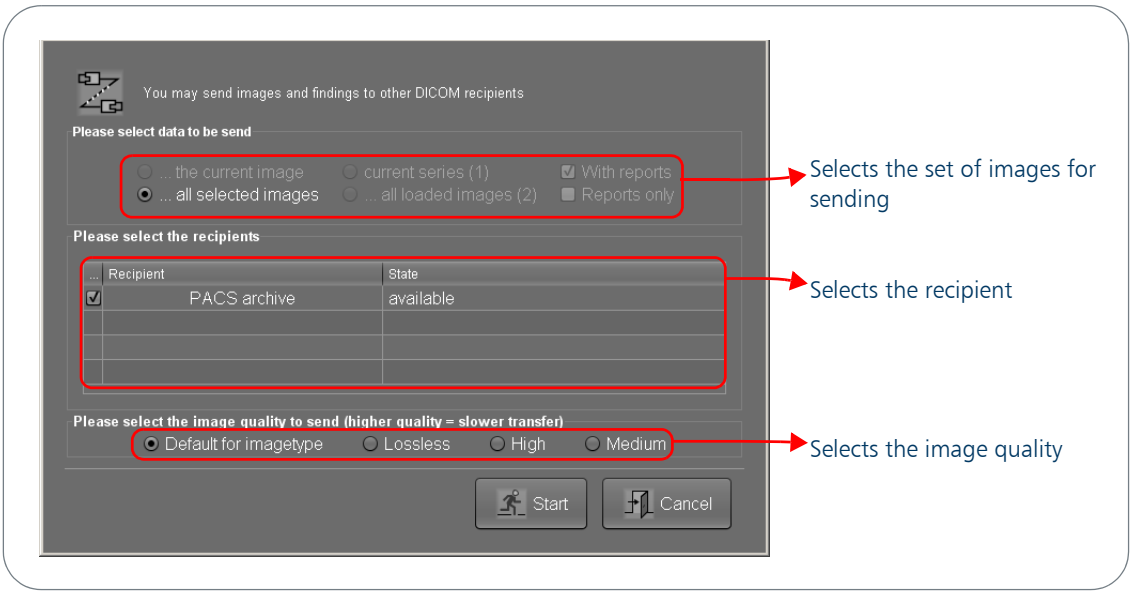


Figure 44. Send dialogue

2.4.3. Print

Print

After a click on the „Print" button, the printing dialogue appears for the selected finished study.

In the print dialogue you can select the printer. The button with the screw wrench opens the configuration dialogue for the printer, see page 166, section „Print", for further information on the configuration options.

A preview bar with the option to select images for printing is available for a better overview. You can select individual images with one click. On the selected image the pick-up icon with the number of the print order is displayed. You can furthermore select the paper and page layout and other options for printing. In the print preview, you can see the selected images in the desired output format, including all selection options.

In the lower right corner of the print dialogue are two buttons for printing. The button „Print & Close" closes the print dialogue after printing and the „Print" button keeps the dialogue open for other printing jobs.

With the „Cancel" button, the print dialogue will be closed and the current selection for the printing is cancelled. Upon completion or cancellation of the printing process the user gets back to the „patient" view.

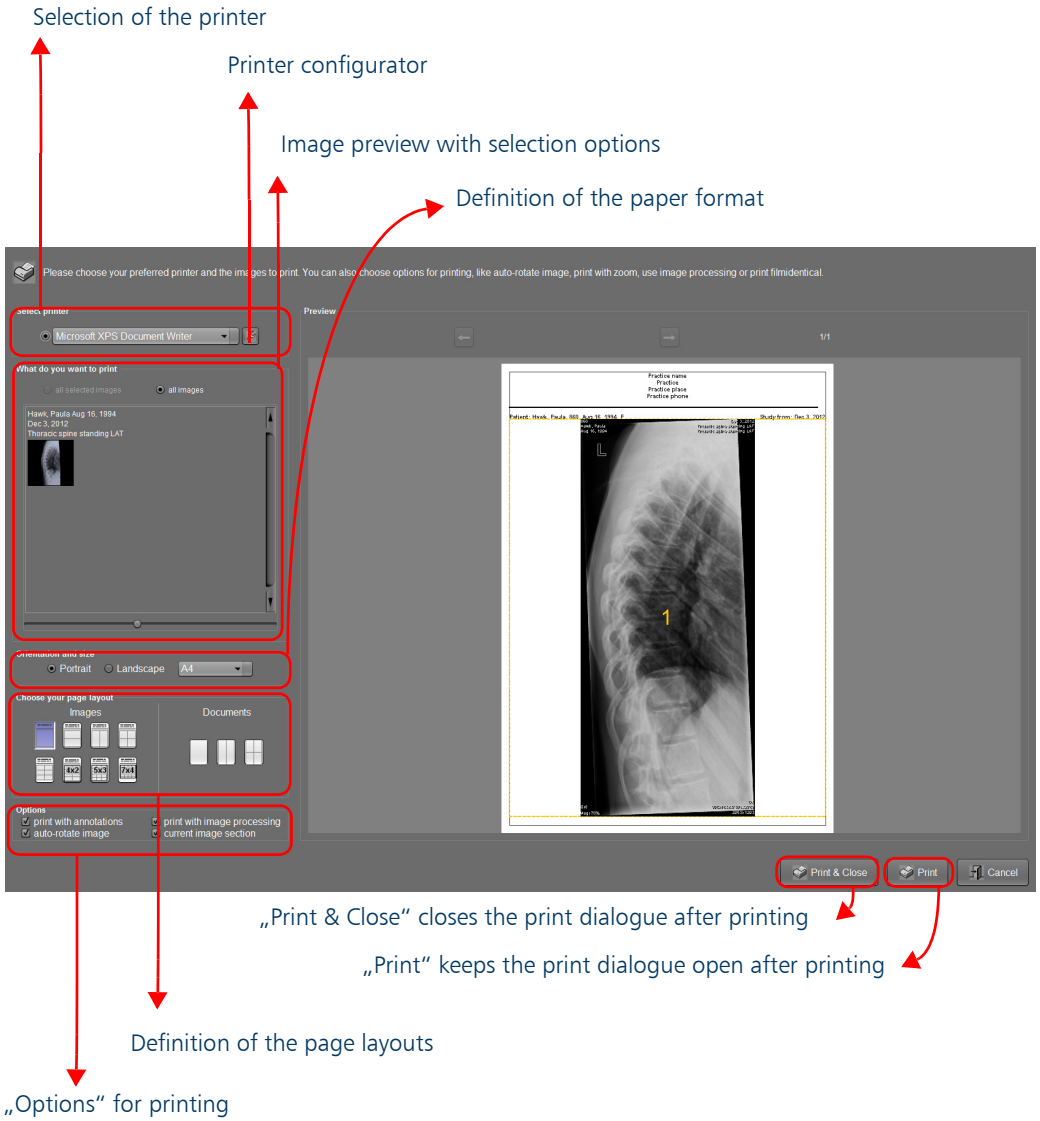
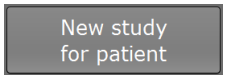


Figure 45. Print dialogue

NOTE

This feature is only available for initially finished (green marked) studies.

2.4.4. New study

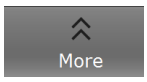


To create a new study of an existing patient, use the option „New study for patient". Please note that at first the patient has to be selected for whom a new study should be created. The screen then switches automatically to the „X-ray" view and the new examinations can be planned. The application creates a new patient with the same patient information only without any old planned or taken exposures and study descriptions.

NOTE

This feature is only available for initially finished (green marked) studies.

2.4.5. More



More functions can be accessed by clicking on the button „More".

There you have the option to choose between the following three functions:

Move Into Recycle Bin - deletes the currently selected study from the lists view, i.e. the study will not be completely deleted from the database, but it and all associated data will be assigned a special status in the database, with which it is no longer available in the lists view.

Show Rejected Images - opens a list in which all rejected exposures are listed that have been rejected during an examination. It is possible that exposures from a certain time frame are displayed. The display of the total number of rejected images (lower left corner) dynamically adapts to the selected display period. Furthermore, the overview can be exported in a HTML or CSV format.

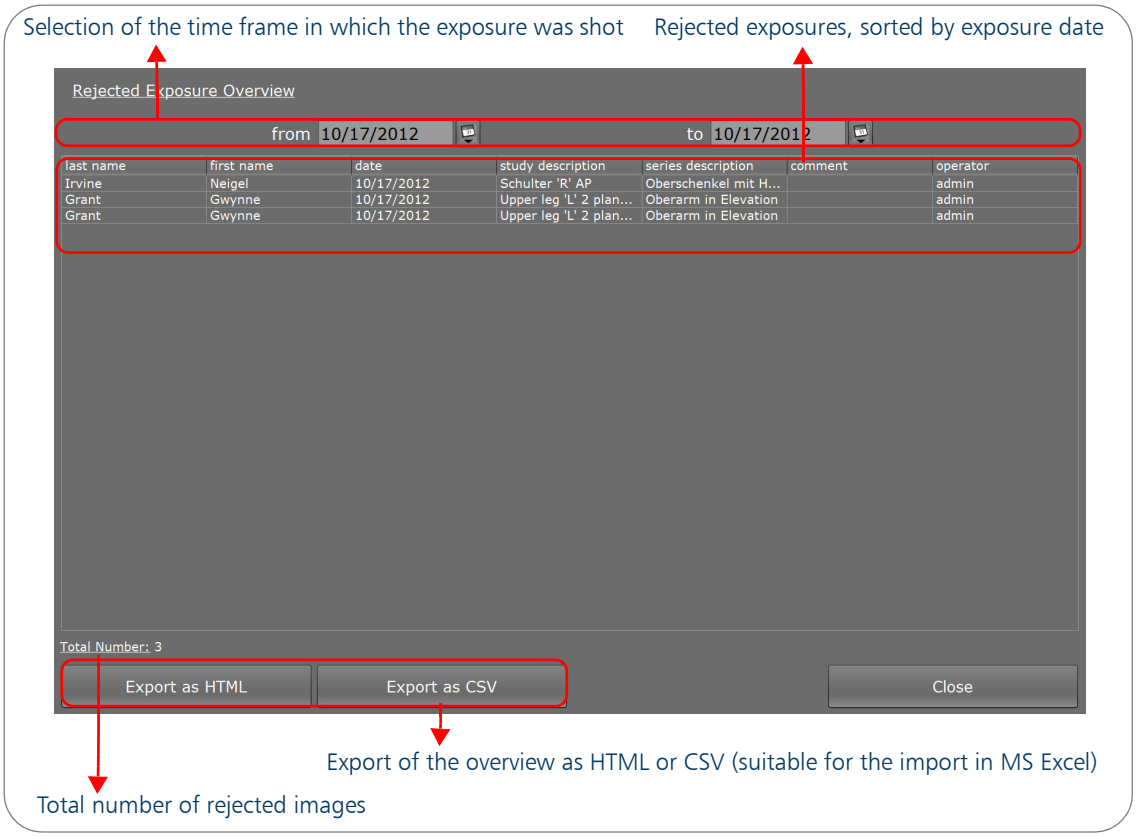


Figure 46. Rejected Exposure Overview

„Open Recycle Bin" - displays all studies that were only deleted from the lists view. Single studies within the recycle bin can be searched for by using the search bar. Furthermore, it is possible to restore studies by clicking on the restore symbol (triangle with arrows), which is located in front of each study listing, to send them again to the lists view.

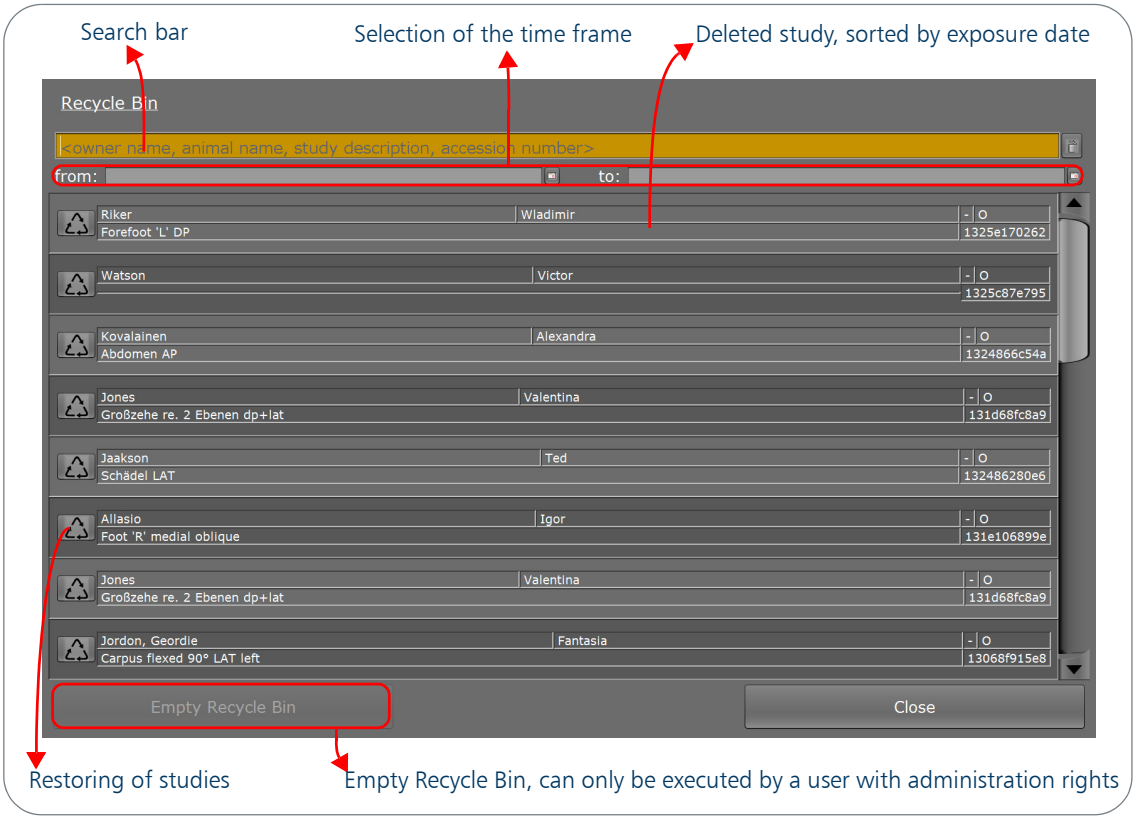


Figure 47. Recycle Bin

NOTE

Emptying the recycle bin may only be executed by the administrator or support technician with administrator rights. This results in a physical deletion from the local hard disk. All definitively deleted items are logged in a separate file along with the information of the user who has emptied the bin. The studies that have been sent to the created archive will however remain.

To avoid the accidental empty of the recycle bin, the daily password is requested. Only after the successful entry of the password the recycle bin can be emptied.

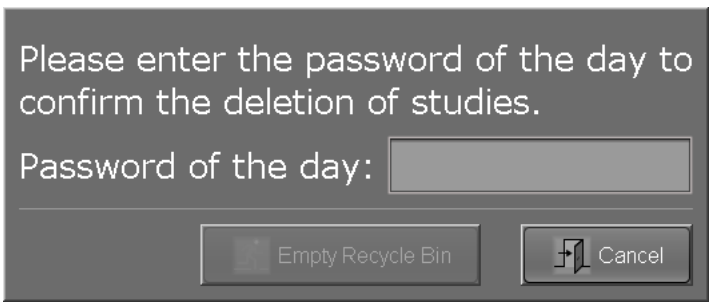


Figure 48. Password of the day

The statistical overview provides the option to display the absolute frequencies of the taken images for any period of time.

The illustrated table listing can be sorted in ascending or descending order, according to both study name and number, by clicking on the table header on either „Examination" or „Number". The small arrow on the right side symbolises the ascending or descending order. Below the table, the „Total Number" of taken images in the selected period is displayed. The result that is shown adapts automatically to the selected display period.

The sorted result can be exported as a HTML or CSV file.

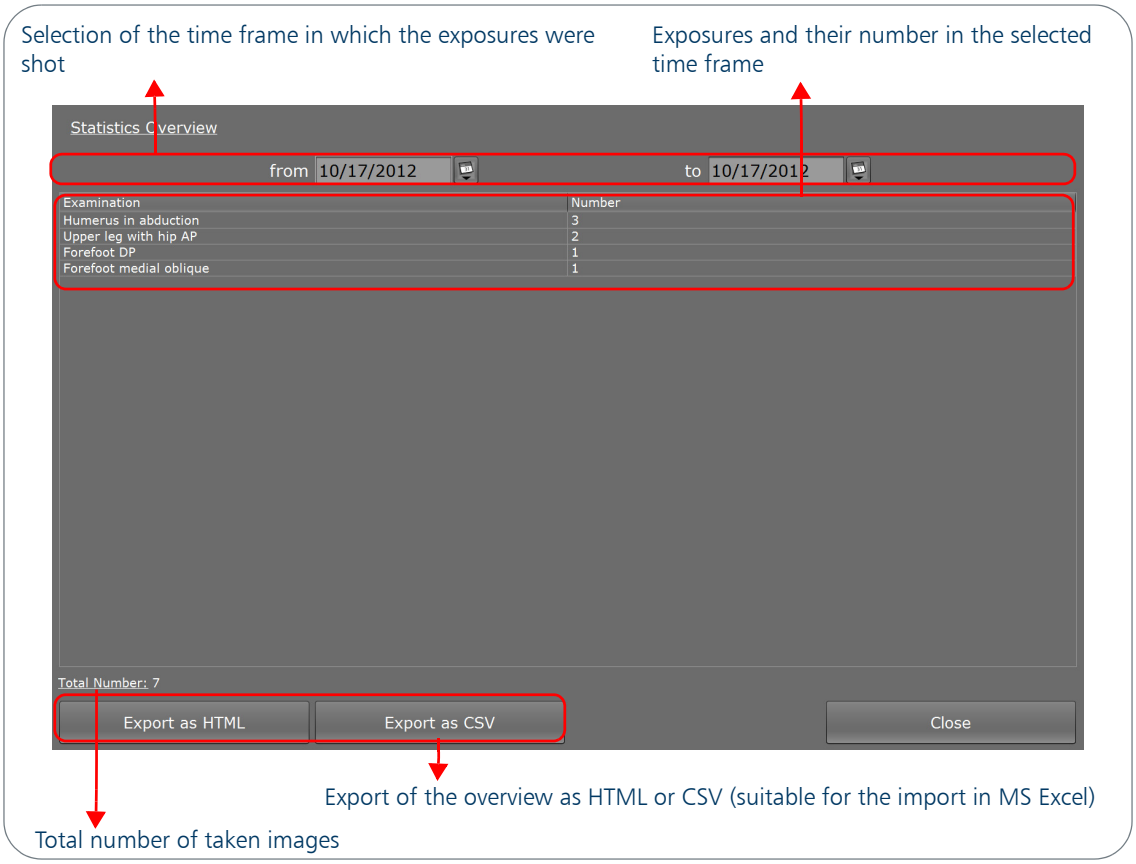


Figure 49. Statistics overview

Left blank intentionally

2.5. Configuration of examinations and macros

To configure examinations and macros, switch to the configuration mode by clicking on the „management" view and then on the button „configuration".

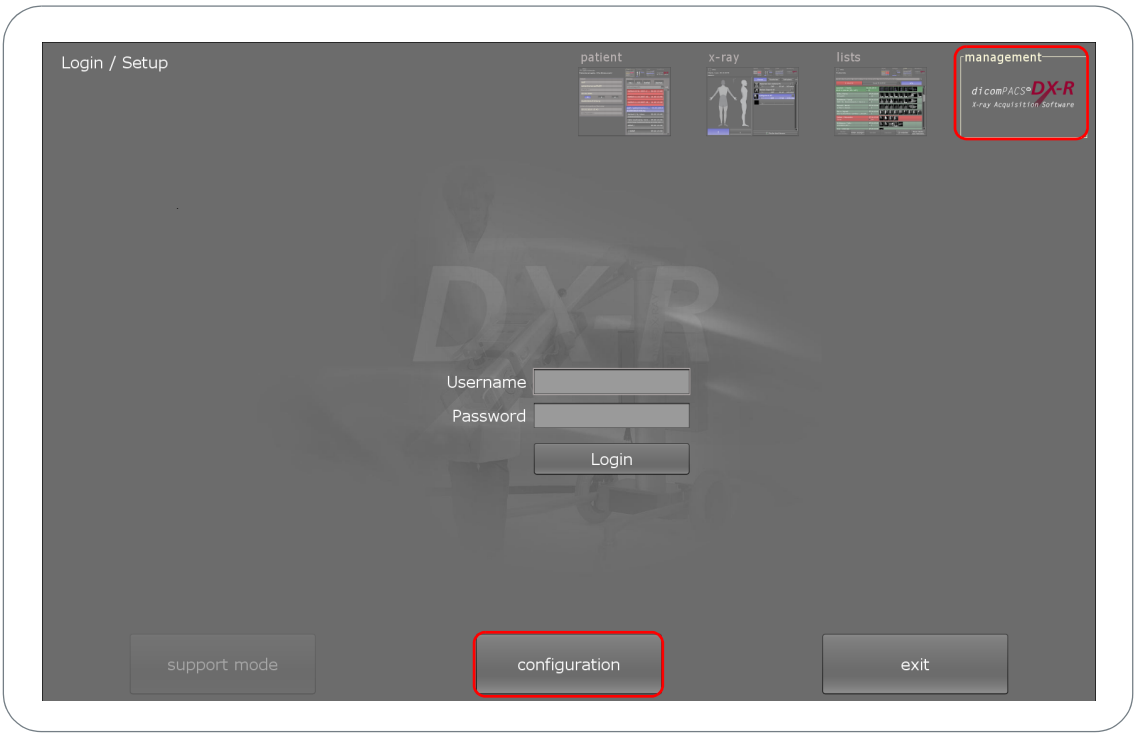


Figure 50. Start screen

The configuration mode is displayed immediately and offers the possibility to customise and extend the supplied examinations in the organ trees for adults and children. It also facilitates the creation of macros, which include several individual X-ray shots for recurring examination sequences, e.g. for full leg and scoliosis X-rays.

2.5.1. Display of examinations/macros

To display the organ-specific studies / macros, click the respective organ tree button for (adult/child/ infant) and then click on the relevant body part.

On the left the organ specific examinations/macros are displayed (the newly created examinations/ macros are displayed at the end of the list until they are repositioned, see section Moving examinations/macros, page 67).

If a new macro should apply to all body parts of the selected organ structure, click on the appropriate icon.

After selecting the required body part, all available examinations are displayed. The right-hand side of the screen shows the existing macros which may be altered on the left-hand side of the screen. It is also possible to add new macros/examinations for the selected body part next to the already existing macros/examinations on the right-hand side of the screen.

On the right side of the screen, you can now execute the desired changes for the examination or the macro. The superior examinations/macros can be called directly via the macro button. If the superior macros should be created for the selected organ tree, the appropriate icon must be clicked.

Examinations and macros differ in their colour representation from each other:

- a selected study appears blue (inactive: gray);
- a selected macro yellow (inactive: red).

PRACTICAL HINT

Newly created examinations/macros can be identified from pre-installed examinations/macros e.g. by the delete button (bin).

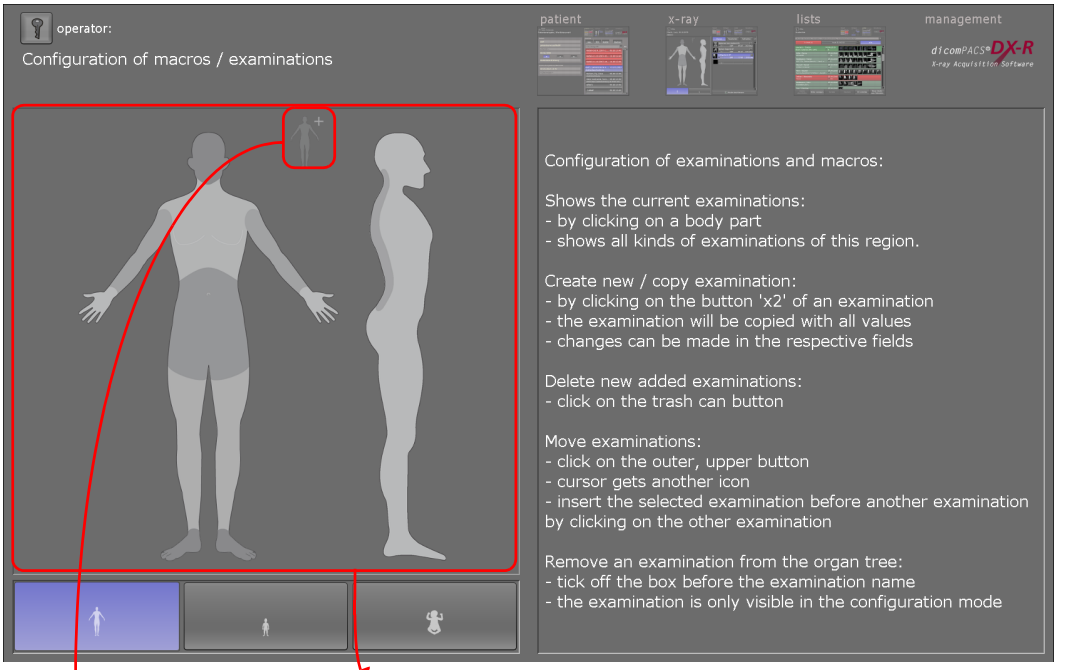


Figure 51. Configuration of macros / examinations

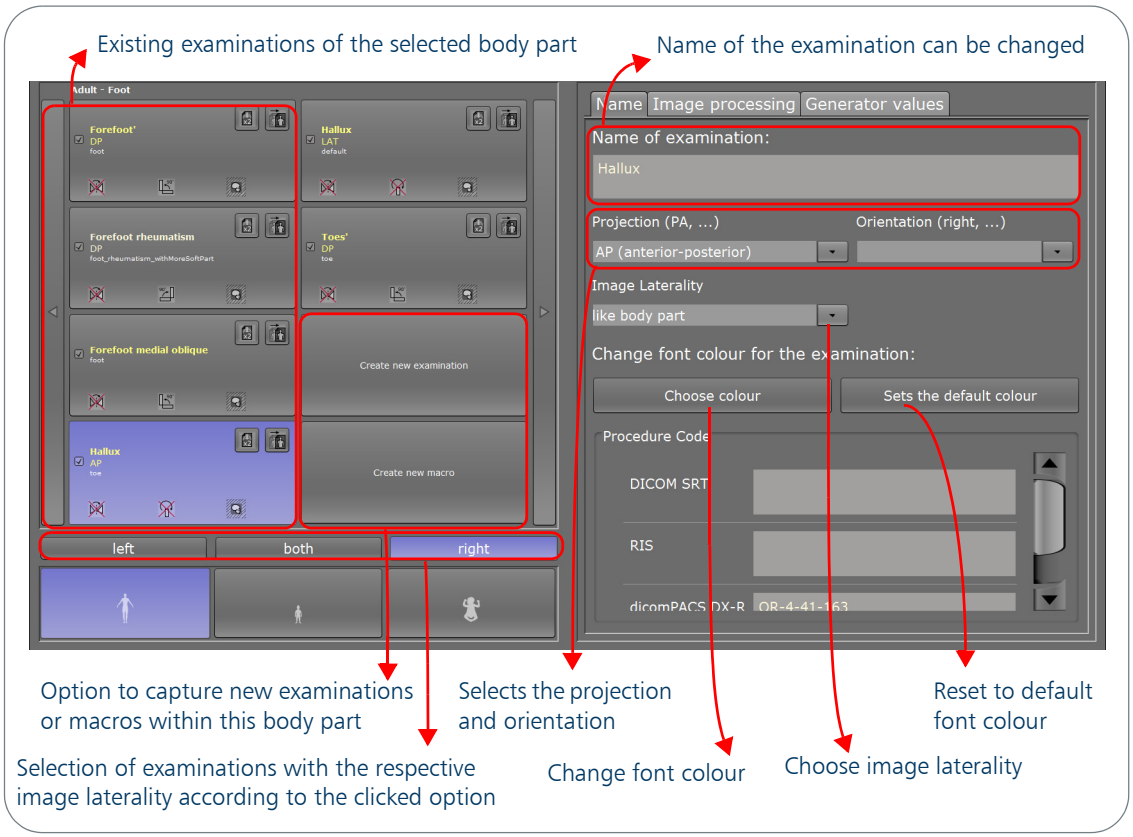


Figure 52. Configuration of macro / examinations

2.5.2. Creating examinations/macros

There are two options to create new examinations/macros: superior (button: „macro“) and organ specific (as per the organ on the organ graphic in the organ tree).

At the end of the examinations-/macro list (scroll to the right) you find the button „Create new examination“/„Create new macro“. Click on the desired button and then take the appropriate configurations in the right half of the screen.

2.5.2.1. Tab „Name“

Name of the examination

For the naming of a newly created examination, click in the text field „Name of examination:“ (if applicable, first click on the tab „Name“ located above) and change the name „New examination“ into the desired name.

It is not necessary to confirm or save the name change separately.

NOTE

By typing a semicolon (;), a line break (on the left screen) is inserted in the name of the examination. The text after the semicolon starts in a new line with a smaller font, which gives you the option to visually structure the text. It is also possible to enter several semicolons.

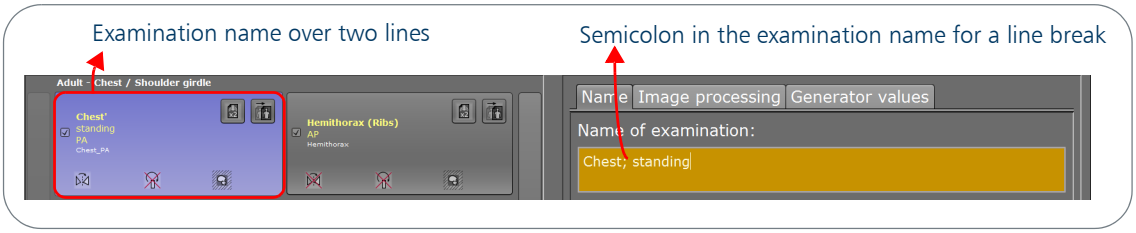


Figure 53. Change the name of an examination

Projection and orientation

For each examination the „orientation“ (left, right) and the beam paths („projection“) may be defined:

- „AP (anterior-posterior)“
- „PA (posterior-anterior)“
- „DV (dorso-volar)“
- „VD“ (volo-dorso)“
- „DP (dorso-plantar)“
- „LAT (lateral)“

Image Laterality

When changing or creating an examination in the configuration view of the application, the image laterality can be edited. Image laterality is only available when activated in the support mode. The value for the specific examinations can be set to one of the following values, which is always defined for the examination:

- „always both“
- „always left“
- „always right“
- „unpaired“ (e.g. thorax)
- „like body part“ (the image laterality is equivalent to the selection made from the organ tree in the planning mode of the X-ray view).

The selected value is saved in DICOM tag 0020,0062.

Change font colour for the examination

For the visual accentuation, it is possible setting the font colour for each study by clicking on the button „Choose colour“: In the window that opens (tab „swatches“), click on any colour tile and you can immediately see the changes (in the „Preview“) on the basis of sample graphic /text. On the right in the field „Recent“ all colour appear that have been tried. The button „Reset“ sets back the font

colour to the originally pre-configured state - confirm your colour choice before leaving the window with „OK". If the 31x9 (279) colours seem not to be sufficient, you can use a variety of intermediate colours in the tabs „HSV"/„HSL"/„RGB"/„CMYK" (= colour models) and you can easily configure them as follows: Click one of these tabs and move the mouse pointer directly into the colour field, click and hold the left mouse button, and follow now the colour gradients in the sample text/ graphics field or adjust the colours by the individual controllers - confirm the selection with „OK".

Procedure codes

Procedure codes are medical numbers or alphanumeric codes used to identify specific X-ray examinations. ***AccuVue*** offers the possibility to work with those different procedure codes.

[The procedure codes of ***AccuVue*** are a proprietary Radmedix solution.]

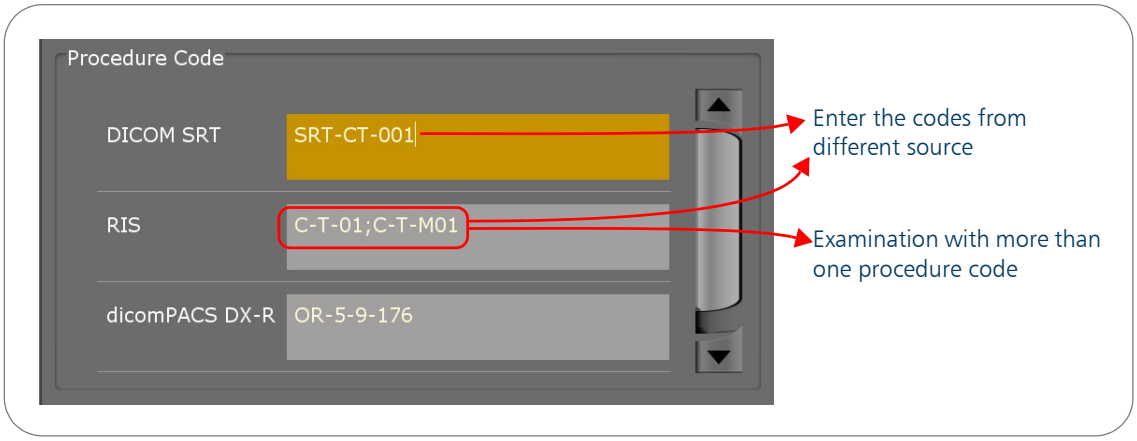


Figure 54. Procedure codes

If ***AccuVue*** receives a worklist entry that includes a configured procedure code, the appropriate examination will automatically be planned for the patient.

NOTE

It is possible that one examination can be called up by more than one procedure code. In addition, it is also possible that one procedure code includes more than one examination. If a study is completed, the according procedure codes are sent along with the study.

When a study is finished, the corresponding procedure code will be sent back to the patient management system.

2.5.2.2. Tab „Image processing"

When an examination is configured, it is necessary to configure the correct image processing. To configure the appropriate image processing, select the tab „Image processing". The type of image processing parameters can be selected and configured according to the user requirements. It offers e.g. the option to configure an automatic flip or rotation of the X-ray images of an examination.

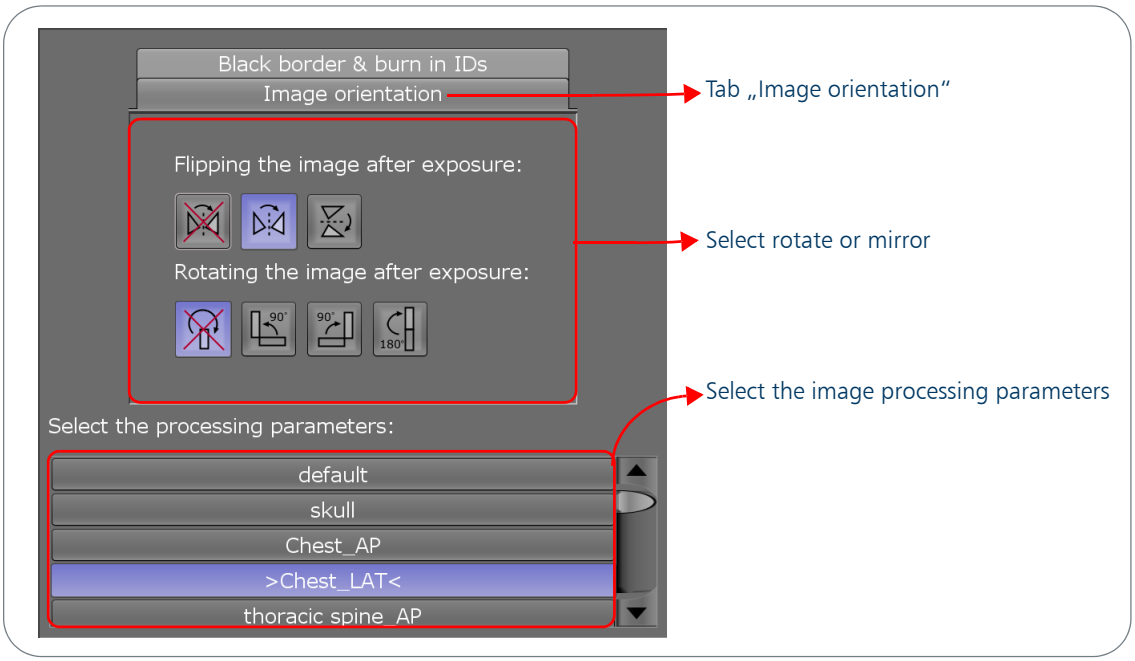


Figure 55. Image orientation

For security purposes, the information that an image has been flipped is burned into the image on the lower right end of the image when it is accepted. In addition, an icon that indicates that the image is flipped is also shown at the upper centre of the image.

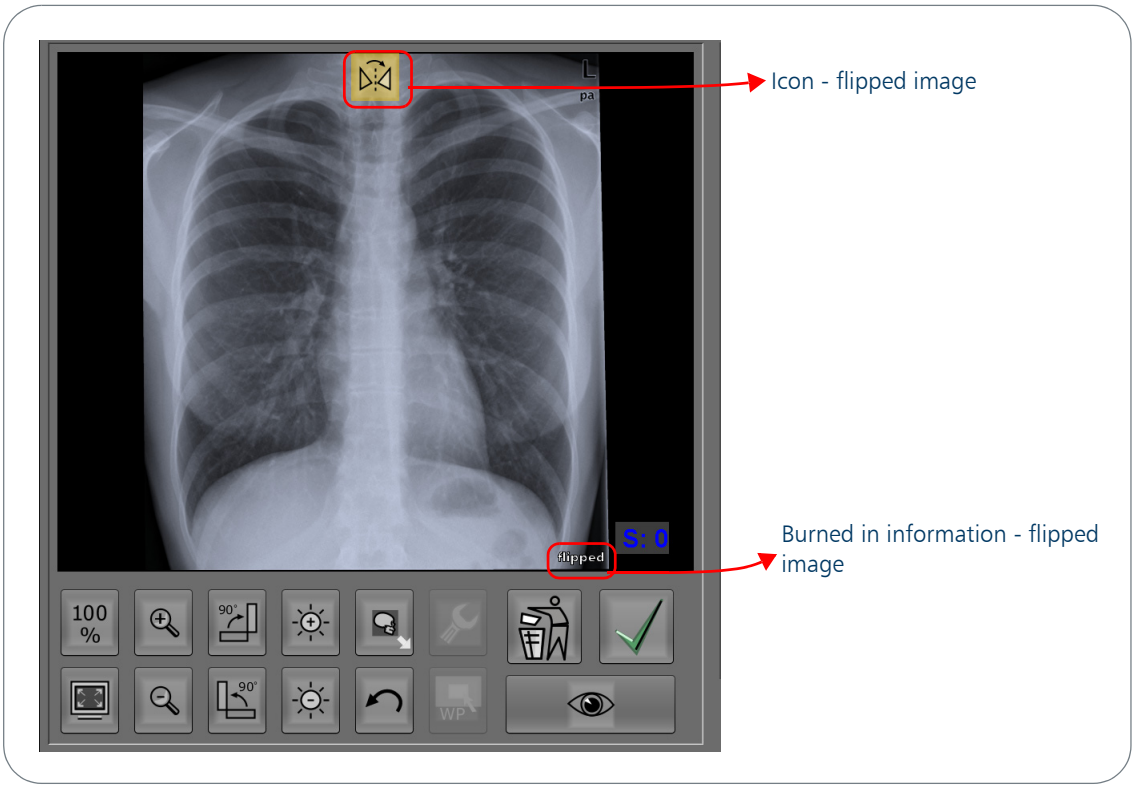


Figure 56. Flipped image with icon and burned in information

Apart from the image orientation, the user may also configure the black border and burn in examination data.

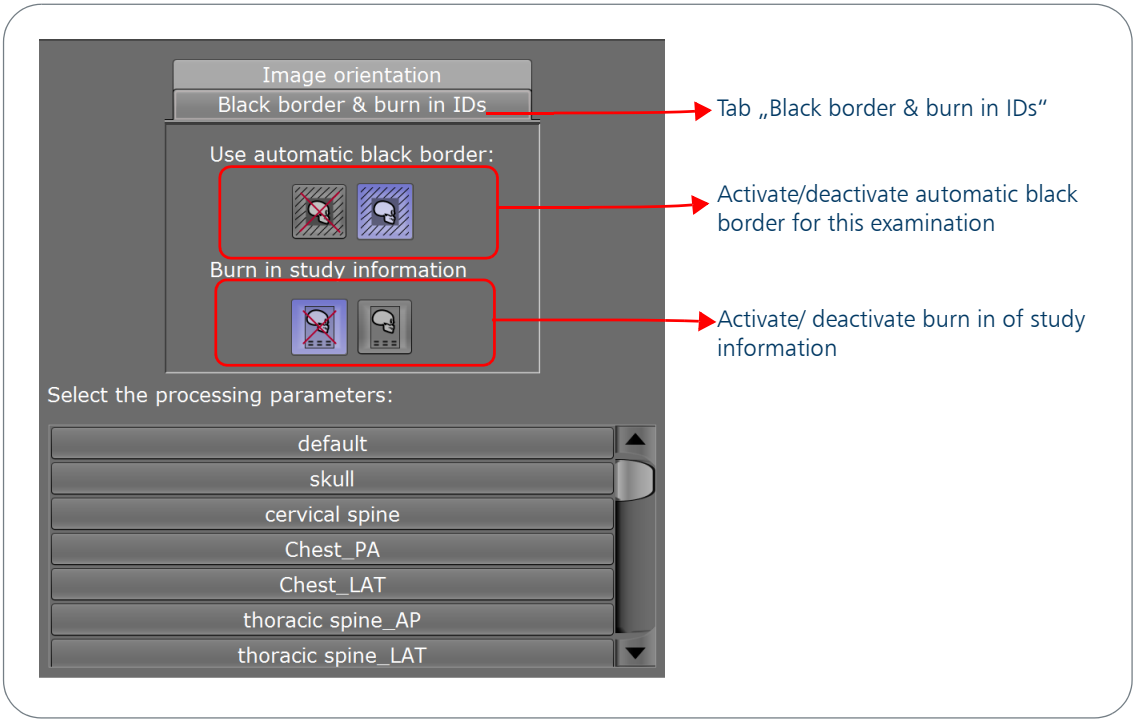


Figure 57. Black border and burn in of IDs

It is possible to burn in ID data of

- the physician
- the patient (name, ID, DOB)
- the date and time and
- the study description.

In the configuration mode you have the option of either burning in the ID data for all images or you can select the burn-in for individual images in the toolbox annotations in the viewer, see page 139.

2.5.2.3. Tab „Generator values“

The tab „Generator values“ allows the adjustment of the suggested generator values. The suggested X-ray values of an exposure depend on whether AEC is activated.

On the one hand it is possible to adopt the generator values from existing examinations: therefore, the relevant examination must simply be chosen from the list („Examination belongs to the following group“), which expands when clicking on the arrow on the right. On the other hand it is possible to adjust the values manually with a click in the respective value field.

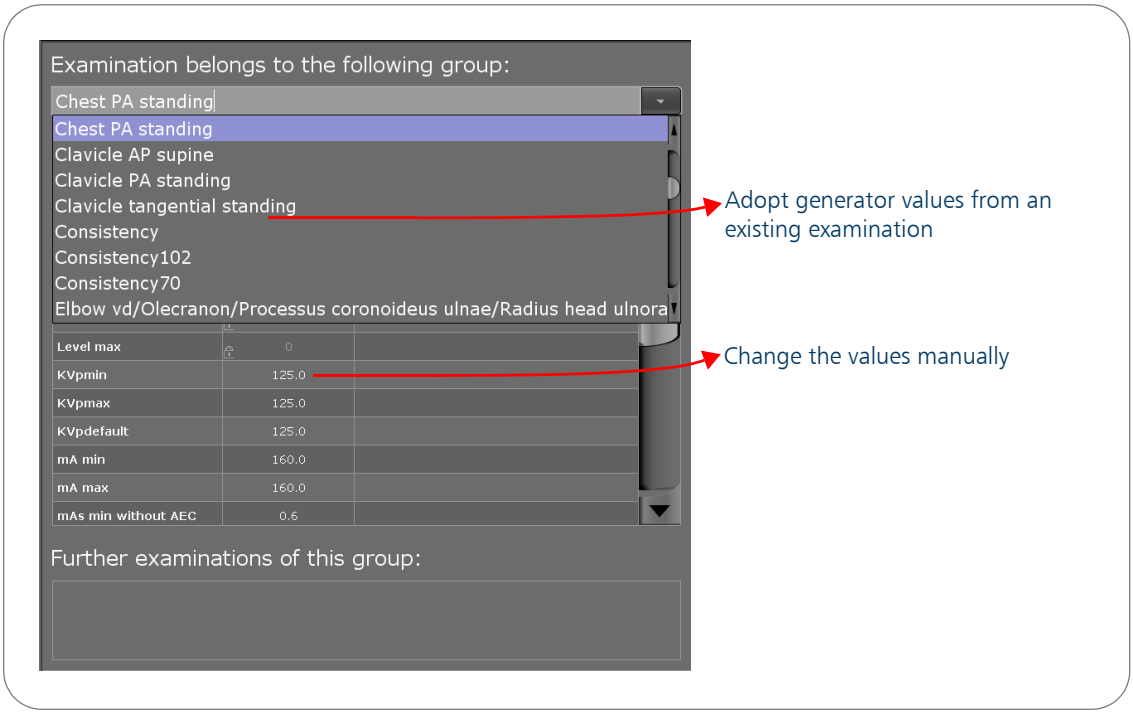


Figure 58. Generator values

All generator values are stored in examination groups and all examinations are assigned to these groups.

NOTE

Please note, that if the values of an examination are changed, it applies to all examinations of the group.

Example:

Knee LAT, knee AP and knee PA are in the same examination group. If the user wants to have different values for these examinations, first of all the examinations have to be listed into different groups.

To list a new examination group with new generator values, it is necessary to click on the arrow on the right next to the current examination group and then on the empty entry at the beginning of the list entries. Now you can assign a new group name and select the desired values from the table or enter them manually.

2.5.2.4. Creating a macro

Macros are very useful for simplifying the planning of recurring examination processes, e.g. scoliosis and long leg examinations, screenings, organs in more than one plane etc.

The intention is to combine all the necessary exposures for an examination within one macro. When the macro is used at a later stage to plan an examination, the system will automatically enter the saved exposures into the worklist of scheduled X-ray images for this study.

This saves a lot of time, since the user does not have to plan each individual exposure every time.

To capture a new macro, proceed as follows:

- Select the type of macro: superior (button „macro“) - organ specific (click in the organ tree)
- Click on the button „Create new macro“ at the end of the list
- Enter the „Name of macro“ in the text field; the name will appear on the newly created button - no further confirmation is necessary
- Click on the button „Add examinations“
- Select successively all examinations, which should be included in the macro
- Change the sequence of the planned examinations (if required) by clicking on the triangular arrow buttons
- Click on the button „Finished“ to confirm

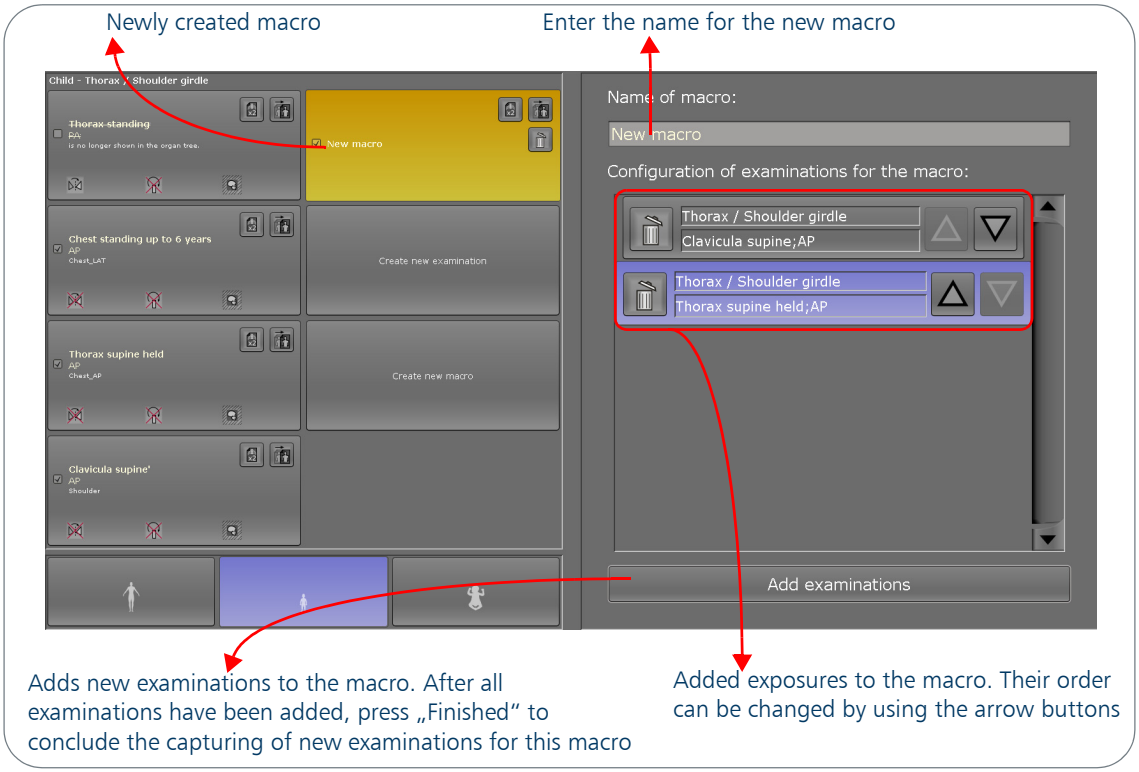


Figure 59. Create a macro

2.5.3. Editing examinations/macros

Editing existing examinations (except for the creation) is described in section „Creating examinations/macros, see page 67.

After calling up an examination/macro, the right side of the screen shows the following change options:

- for examinations the tabs „Name“/ „Image processing“/ „Generator values“
- for macros „Name of the macros:“, „Configuration of examinations for the macro:“

2.5.4. Copying examinations/macros

For the duplication of examinations and macros (including all values and settings), click on the relevant „x2“ button (tooltip: „Copy examination“) - directly below the original appears the reproduction (indicated by the delete button: bin icon) called „Copy of ...“.

The editing of a copy is the same as for the creation on the right side of the screen (see section 2.5.2, page 67).

It is possible to make multiple copies.

When copying examinations/macros in the „configuration“ mode, the following values are copied as well: RotateExam, UseBlackBorder, ScanDevice, ScanModeID, FlipExam, ImageSize, Projection, Orientation, seriesClassName, burnInIdAnnos, DicomBodyPart, ExamGroup, ImageLaterality, StitchingType.

Chapter 3. The ***AccuVue*** Viewer

The built-in viewing application opens at a click on the button depicting an eye.

The viewing application is divided into four different sections:

- The navigation bar is located on the left side
- The toolbar is located on the right side
- The working area is the main screen in the middle of the application
- The information bar is located at the bottom

To return to the console, press the „back" button inside the viewer.

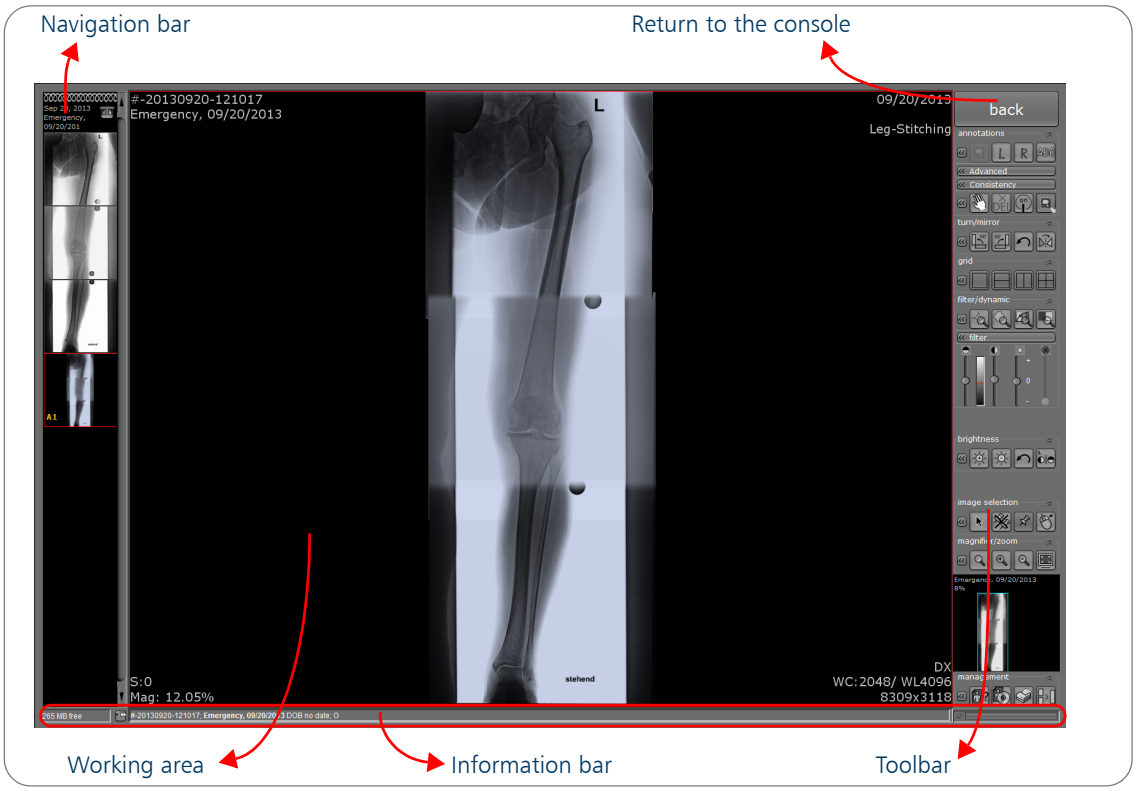


Figure 60. Viewing application

Toolbar

Most important tools can be activated by clicking on the toolbar buttons. The function of a button is displayed as a short tool tip when the mouse moves over the button.

Working area

All loaded images are displayed in the working area and are available for editing.

Navigation bar

All opened images are visible on the navigation bar, even when not displayed in the working area.

Information bar

All important information such as patient data etc. is displayed on the information bar.

3.1. The toolbar - general handling

The toolbar is divided into separate tool areas. Each tool area contains a number of tools belonging to a thematic group. The tool area „annotations" for instance, contains all tools for the measurement of images.

All settings can be adjusted by clicking on the symbol with the two arrows in the respective area. Tools whose buttons are not directly visible on the toolbar can still be used by clicking on the button in the configurator or by using a keyboard shortcut.

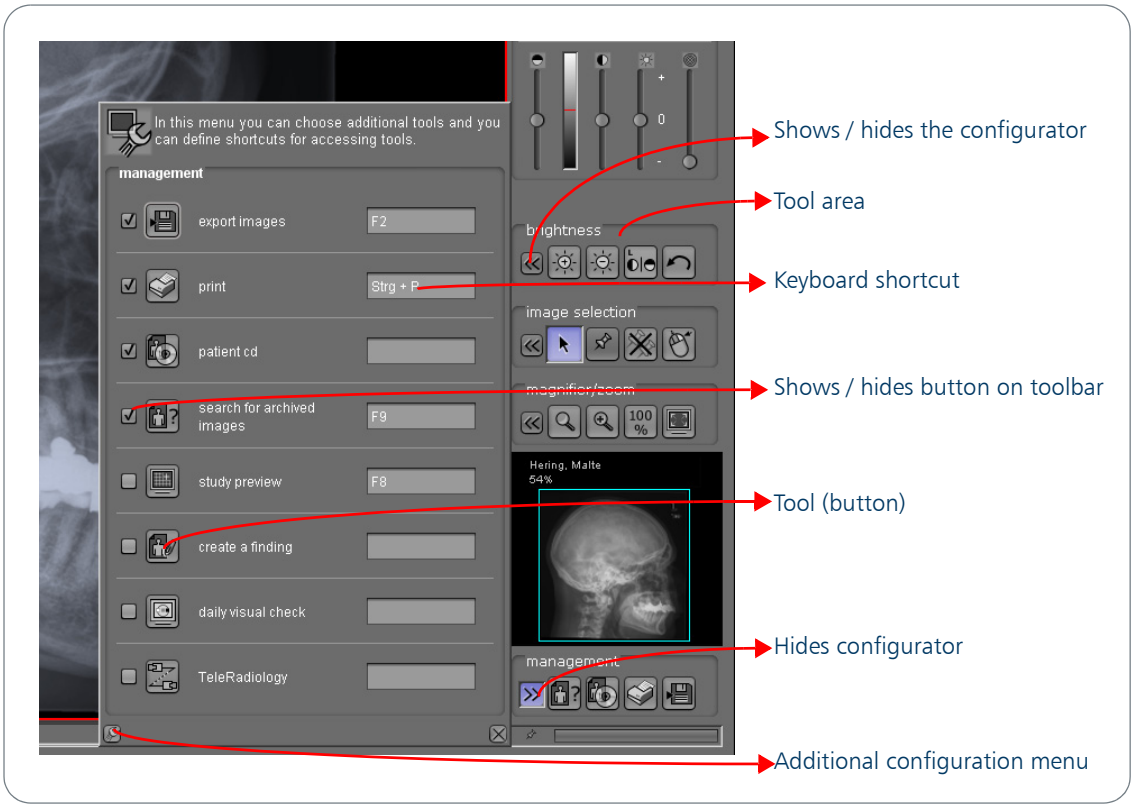


Figure 61. Configurator

Depending on requirements and usage, the buttons visible in the toolbar areas can be hidden or shown (by ticking the checkbox next to the button). They can also be allocated to a keyboard shortcut. In order to enter the desired shortcut, position the cursor in the field next to the button and enter the shortcut via the keyboard (e.g. C or Alt+C).

PRACTICAL HINT

This is an uncomplicated way of customising the user interface and the availability of tools for individual needs.

If there are too many tools selected for the toolbar area, then this is marked with red rectangles around the already selected tools as well as the preferred tool chosen to be added to the toolbar. In this case a tool from the selected or other toolboxes have to be deselected to get space for a new button.

When selecting too many tools for the toolbar, they are marked with red rectangles

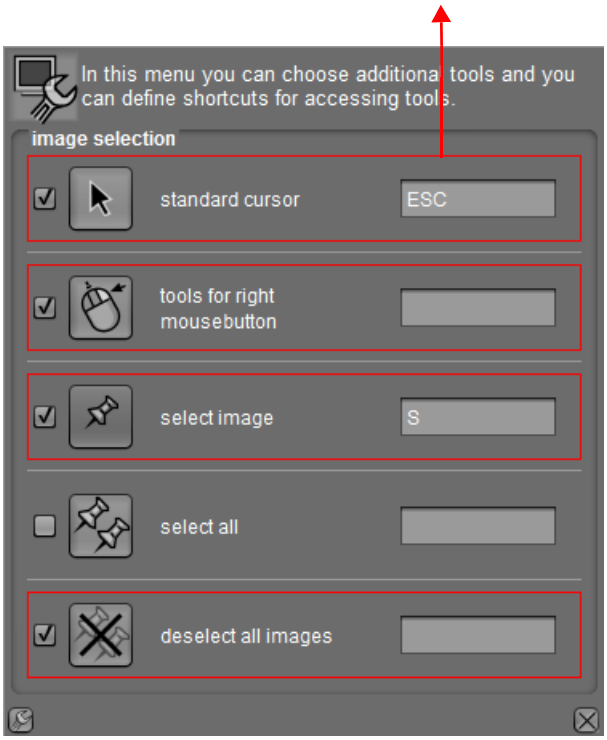


Figure 62. Customising toolbar - too many selected tools

A further important element of the toolbar is the overview area. It shows the displayed image in the working area as an overview.

A green frame in the overview area marks the part of the image currently visible in the working area. The visible area can be moved in two ways:

1. with the left mouse button held down in the working area
2. with a single mouse click in the overview area.

When the cursor is positioned in the overview area, the zoom factor can be adjusted using the mouse wheel.

The percentage figure in the image (here 54%) shows the current zoom factor of the active image compared to its original resolution in pixel. At 100%, a pixel on the screen corresponds to a pixel in the original image.

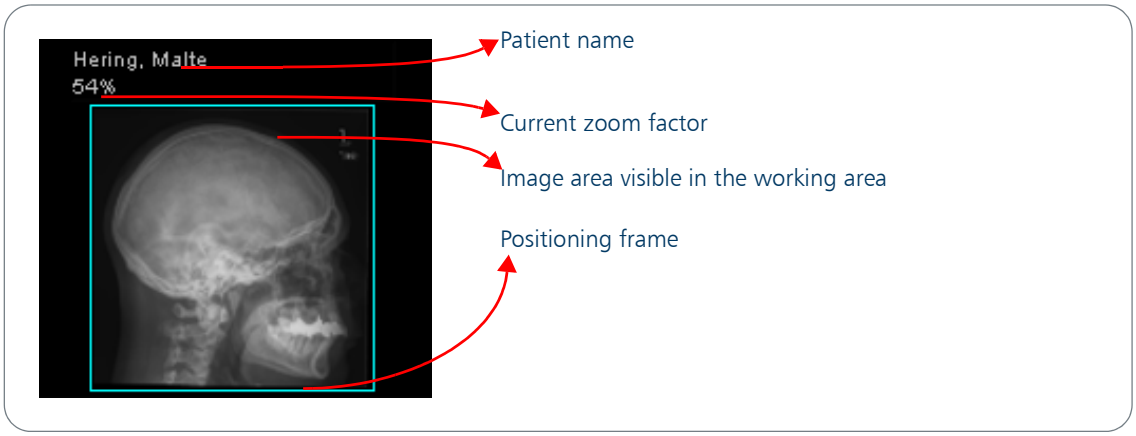


Figure 63. Overview of the current image

PRACTICAL HINT

The tools described on the following pages are divided into two types requiring different handling:

- Mouse tools (such as measurements and the magnifying glass which have to be activated and can then be used with the mouse in the working area)

- Tools operated by a simple click (such as rotations or the display of a specific grid in the working area)

Please activate the image to which the tool should be applied. Afterwards apply the tool with a left mouse click or by pressing the allocated keyboard shortcut.

3.1.1. Configuration of the toolbar

In the toolbar the annotations were grouped in sub menus. The sub menus can be configured by each user in a way that all or only selected tools are displayed or hidden in the sub menu. Thus, each user can e.g. customize the layout of the toolbar according to the own field of specialization and application and save the settings to call them up whenever needed.

To do this, you have to click on the screw wrench button in the toolbar section „management". The tab „GUI / Toolbar" offers amongst others the possibility to show or hide individual sub-menus and functions, or to set the size of the tool buttons.

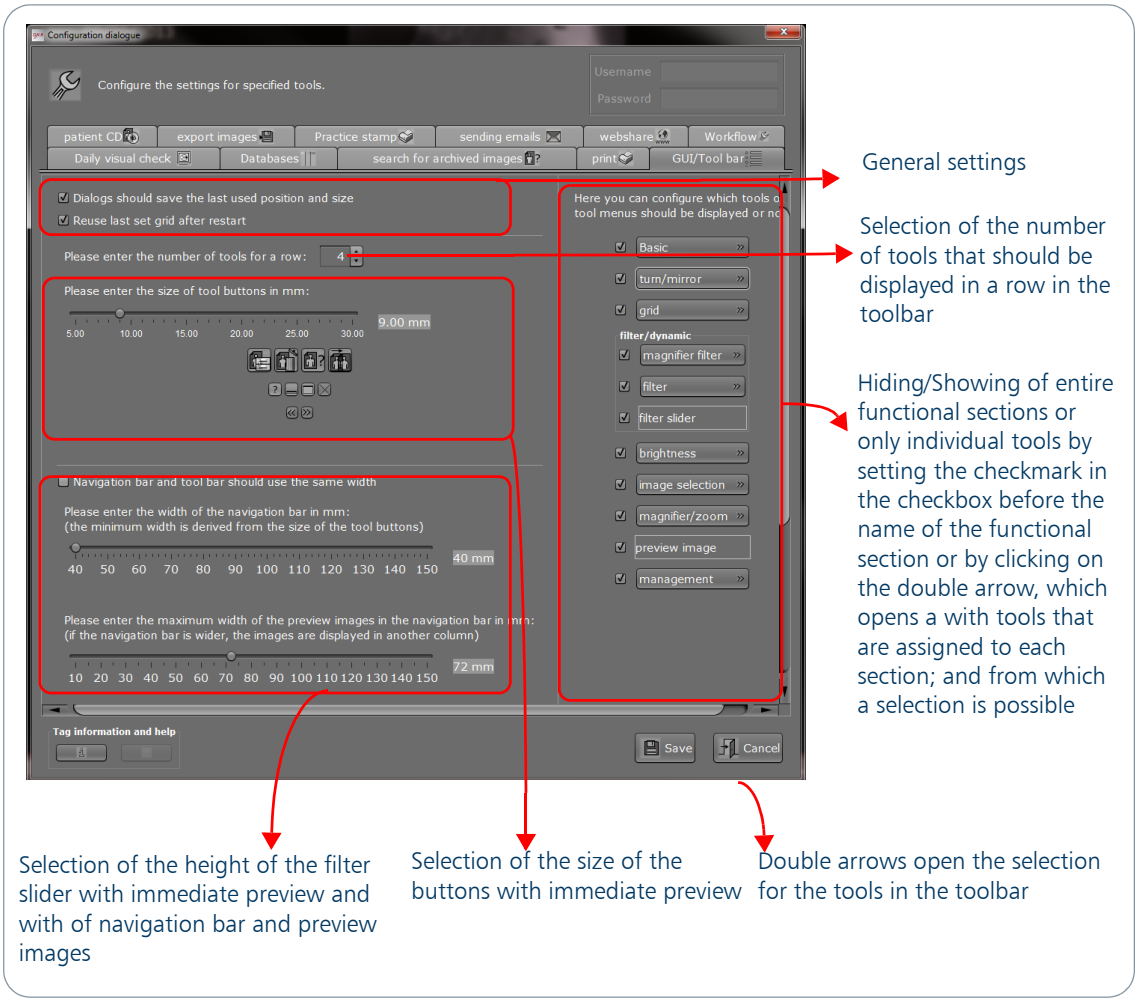


Figure 64. Configuration dialog tab „GUI/Toolbar“

For customizing the toolbar, proceed as follows: Set or remove the checkmark in front of the checkboxes of the respective functional sections and your preferred tools on the right side of the configuration dialog to determine the layout for your customized toolbar.

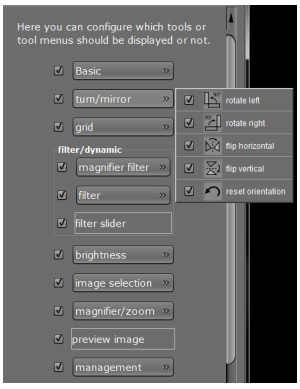


Figure 65. Selection of tools for the toolbar

3.1.2. Dynamic of the toolbar

AccuVue® minimizes the functional sections automatically by frequency of use, for example if more tools were selected than there is space available in the toolbar. Once the selection of the tools has been completed, the tool group can be shown or hidden by the double arrows on the right.

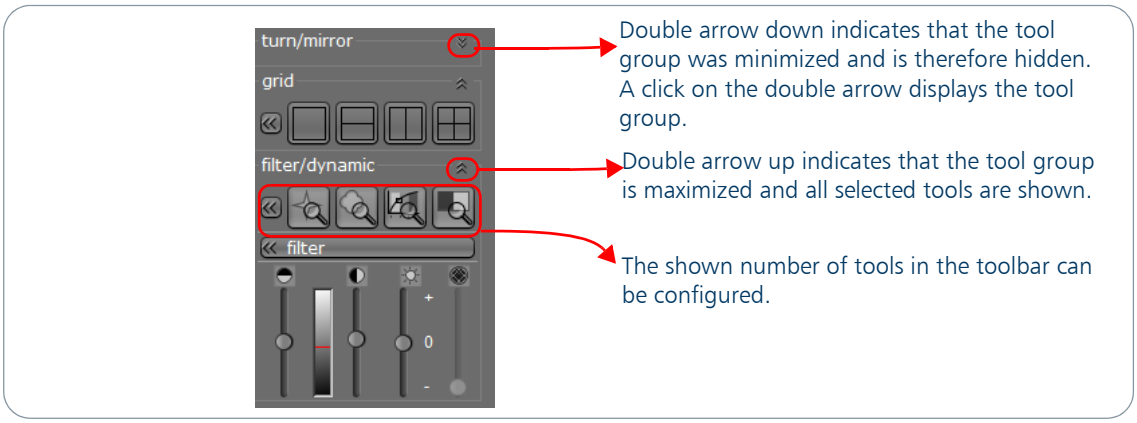


Figure 66. Minimizing and maximizing of tool groups by clicking on the double arrows

The shown number and size of the tool buttons can be configured in the configuration dialog „GUI/ Toolbar". This is advantageous for monitors with higher resolution (5MP).

Also the height of the filter sliders can be adjusted. An immediate automatic preview displays the changes in height accordingly.

3.2. General notes on the use of annotations

3.2.1. Shortcuts

or easier editing of annotations shortcuts have been introduced to make the work more effective:

- „Esc": for the termination of actions, also of measurements, which consist of several annotations

The shortcut „ESC" for cancelling annotations can be configured in the configuration dialog in the tab „Annotation Common Options".

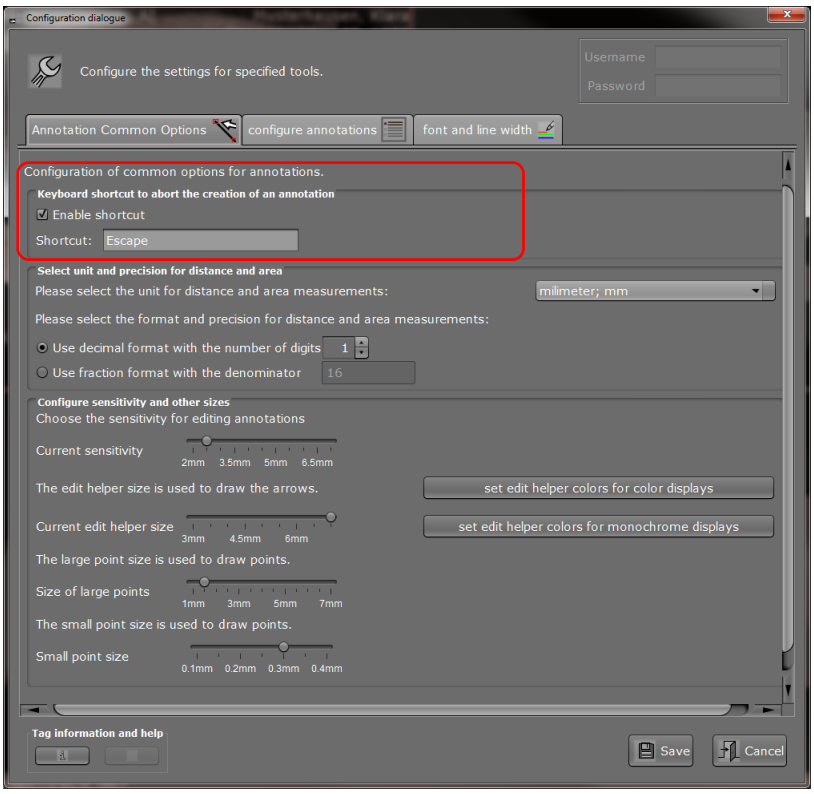


Figure 67. Configuration dialog „Annotation Common Options“

- „Alt“: to activate the edit mode *temporarily,* press the Alt key. To activate the edit mode permanently, please use the tool „edit annotations“ (hand) within the section „edit“

- „Shift“: to connect measurements with each other, respectively to add measurements (distances, angles) to already existing lines, hold down the Shift key while drawing or click on the existing lines, while activating the desired tool (distance, angle) and hold down the Shift key

- „Ctrl“: for turning annotations, hold down the Ctrl key

- Additionally, an overview of possible shortcuts can be found in the help dialog of the tool „edit annotations“ (see section „Annotation hints“)

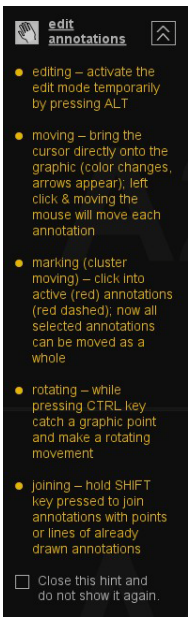


Figure 68. „Annotation hints“

3.2.2. Edit helper for annotations

The sensitivity and sizes of edit helpers for drawing annotations can be configured in the configuration dialog (wrench) in the section annotation. The tab „Annotation Common Options“ offers many configuration options that can be selected for the size, sensitivity and color of the edit helpers.

The color of the edit helper can be defined while the configuration dialog is still open and you can immediately see the changes on the image when the edit annotation tool is active.

Edit helpers have the following characteristics:

- All elements of an annotation will be active when the mouse moves nearby or over them.
- All elements have auxiliary arrows (edit helpers) when they are active.
- When editing (mouse button pressed) no auxiliary arrows are displayed only directly affected elements are active, such as:
  - active lines whose end points are edited
  - points are always drawn; points are only drawn if they are active, are now hidden
  - geometric objects.
- There is a black/white scheme for auxiliary arrows, which is advantageous for black/white monitors, and a color scheme for color monitors. The color scheme for auxiliary arrows is enabled by default. The colors can not be defined, it can only be selected between the two schemes.
- All elements, including context menus have auxiliary arrows when they are moved.

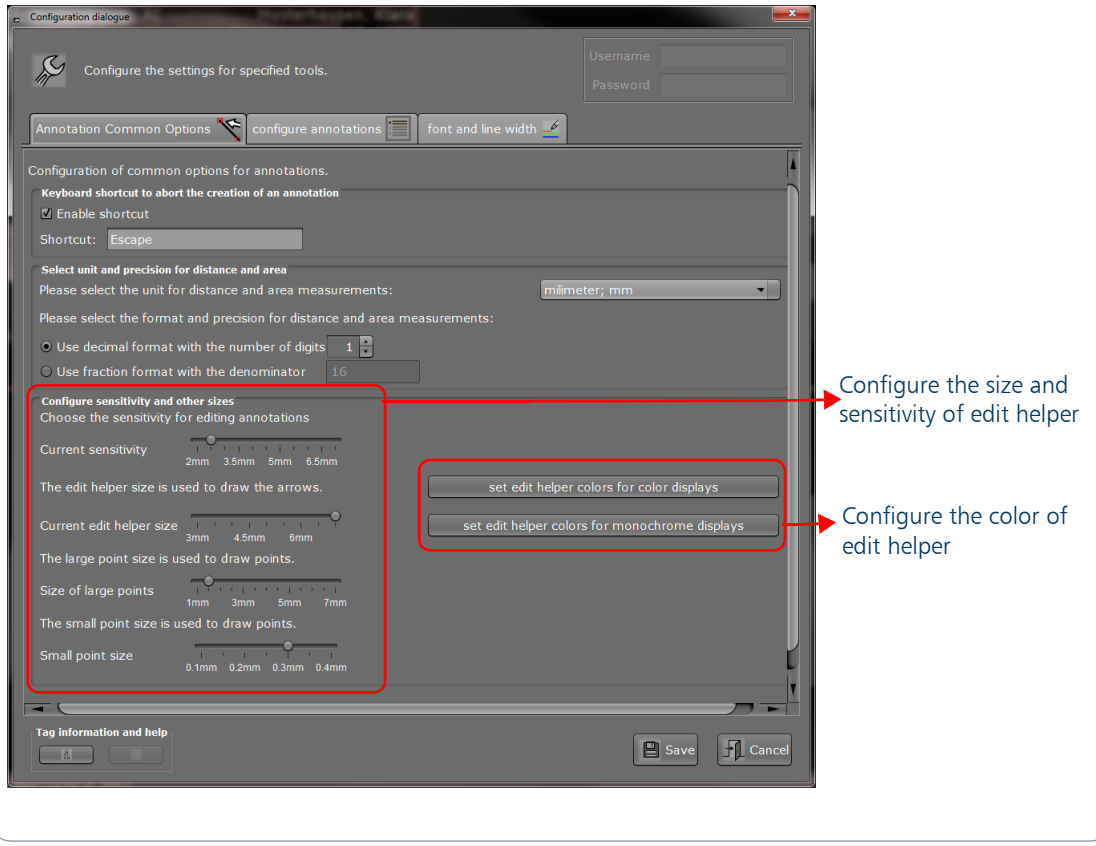


Figure 69. Configuration dialog Annotation Common Options

3.2.3. Annotation hints

So called „Annotation hints" were designed for a variety of annotations to guide the user through the use of tools. The window with the annotation hint is slightly transparent, and can be moved. It contains a short guide on how to use the annotation. The latest step is always highlighted in orange. For an easy orientation, the head of the window contains the name of the annotation and the corresponding icon.

Figure 70. Help text for annotations

The window with the annotation hints can be un-/folded via the icon with the double arrow. When it is folded, only the name of the annotation and the icon are displayed.

By checking the check box before „Close this hint and do not show it again." the annotation hint for the selected annotation will be disabled.

The window with the annotation hints is positioned relative to the currently selected grid by default. In a 1x1 grid, it is displayed in the left upper corner. In another grid distribution it is always positioned on the left or on the right of the current grid, depending on where there is more space.

When moving the cursor over the annotation hint window, the cursor changes to a move symbol (cross), except the on field with the double arrows and on the help text. If you hold the moue button down, you an move the window, also to other screens.

Once the annotation hint window was moved manually, the automatic positioning is disabled. Only after a restart the automatic positioning is active again.

The annotation hints window is active as long as the annotation is active.

In the configuration dialog „Annotation hints" can be selected which hints should be shown during the creation of annotations.

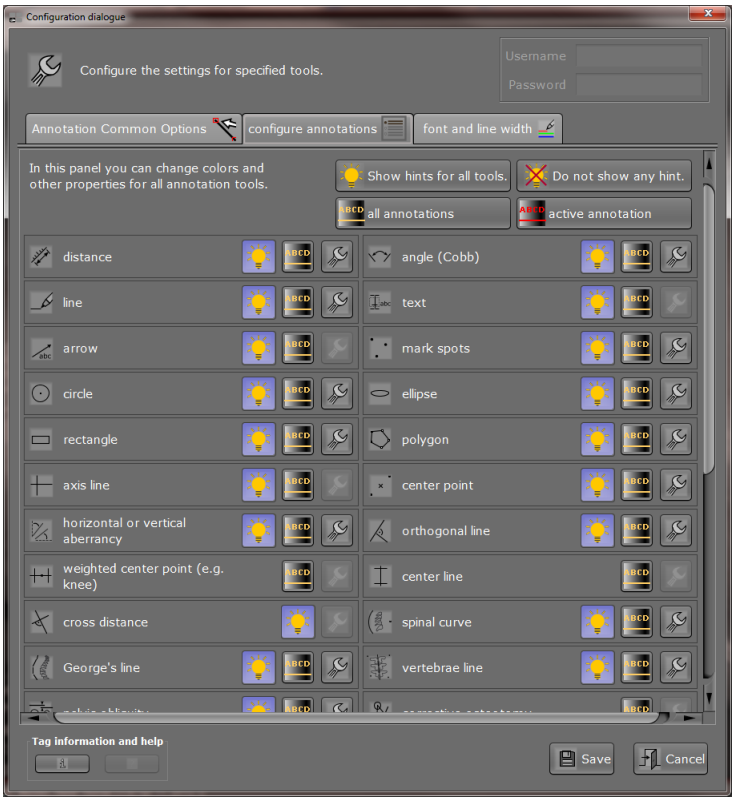


Figure 71. Configuration dialog „Annotation hints"

Using the buttons „Show hints for all tools" or „Do not show any hint" you can select either all annotation hints to be displayed or none of them to be displayed when using the annotations.

Furthermore, it is possible to select single annotation hints by setting the checkmark in the checkbox before the name of the chosen annotation.

3.2.4. Drawing annotations

Annotations can be drawn in two different ways:

- by clicking and selecting (Click-and-Click) or
- by clicking, holding down the mouse button, positioning the cursor on the required position and releasing the mouse button (Click-Hold-Drag-Release)

3.2.5. Properties of annotations

The properties of annotations can be changed in the edit mode. To edit annotations it is possible to use the „Alt" key or the tool „edit annotations" (hand) in the section „edit". This activates a context menu next to all annotations  . The context menu can be moved. By moving the cursor over it, the frame tuns in red color and by holding the left mouse button down, it can be moved to the desired position.

The screw wrench icon opens a dialog which displays different configuration options of annotations, divided into different tabs.

Figure 72. Context menu for editing the properties of annotations

The changes are automatically saved after setting the checkmarks in the relevant checkboxes and are displayed instantly. Only when a „Save" button is displayed in the tab, it must be pressed to save the changes (e.g. in „Colors").

3.2.5.1. Combination of annotations

Annotations can be combined and connected with different annotations to one measurement. By holding down the „Shift" key e.g. lines and angles can be connected with each other. Also existing annotations can simply be selected in the edit mode, to e.g. select the endpoints to move them.

The tools „angle" and „line" can be added to already existing annotations by clicking with the cursor on the already existing lines with the active „line" or „angle" tool.

NOTE

Annotations, that were once connected, can not be separated again. It is only possible to delete all connected points, because the program detects the connected points as one annotation.

3.2.6. Annotation colors

Colors can be specified for all annotations. To choose a color, you have to click on the screw wrench button of the tool in the edit mode  . You can not only change the color of one annotation, you can also change the color of annotations of one type (e.g. the same annotations) by setting a checkmark in front of „apply to all annotations of the same type“.

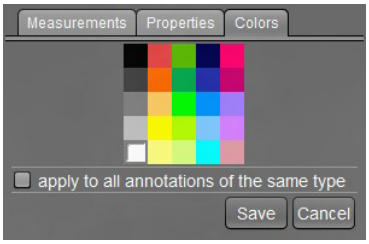


Figure 73. Adjust colors

An overview of all annotations and the possibility to configure their properties, such as the color, can be executed in the configuration dialog of the respective annotation section. The dialog can be opened by clicking on the screw wrench button  .

3.2.7. Multi-line text

The context menu  also allows you to additionally add multi-line text to applied annotations. When clicking on the „abc“ icon, a transparent gray shaded field opens, in which text can be entered. The position of the text is exactly where it was entered. If the position of the text should be changed, hold the Alt key down and simultaneously move the text box by holding the left mouse button down or change to the edit mode.

An automatic line break is adapted to the size of the text box. The size can be changed by dragging the shaded lower right corner by holding the left mouse button down.

Simultaneously pressing the keys „Shift“ and „Enter“ generates a manual line break, which is also retained when the text field is made smaller or larger. This note is also displayed in the empty text box.

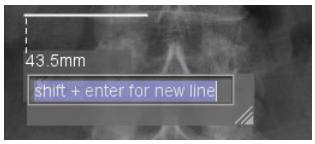


Figure 74. Add text to annotations

The text field is closed by using the „Enter" key or by clicking outside of the text field.

3.2.8. Connecting annotations

While drawing annotations it is possible to combine then with existing annotations.

Click on the points which you want to connect to the desired tool/annotation, while holding down the Shift key on your keyboard. The points are then connected together and the individual annotations are treated as one coherent annotation from that time onwards.

NOTE

Connected annotations can only be deleted as one annotation in the edit mode („Alt" key).

3.2.9. Deleting annotations

The context menu  offers to delete selected annotations by clicking on the „DEL" icon . This action an not be undone.

3.3. Section Annotations

The section „Annotations" provides a wealth of tools for the measurement of images as well as a large number of drawing functions. For rapid work, the user can also define keyboard shortcuts for quick access to the annotations.

In the human version the section annotations is divided into four specified sub-groups:

- basic - all general annotations for findings are located here
- advanced - special measuring tools and tools for the chiropractic use are located here
- consistency - special tools for consistency checks are located here
- edit - tools to edit annotations are located here

3.4. Annotations - basic

In this section you find all information for the basic annotations.

3.4.1. Distance

 By clicking on this button, it is possible to measure the distance between two points in the active image. Left click on the starting point, hold the mouse button down and move the mouse pointer to the ending point of the distance to be measured, then release the mouse button.

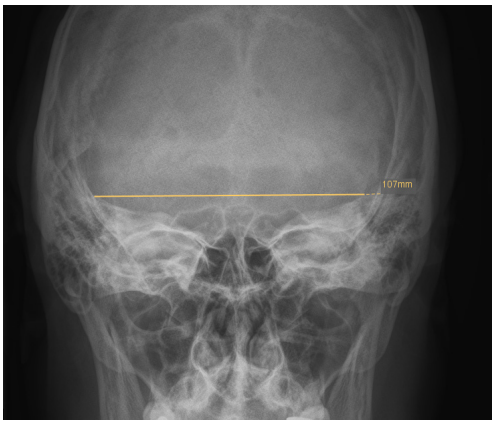


Figure 75. Measure a distance

CAUTION

During the process, the current distance is displayed in millimetres (mm). If no reference scale has been saved in the image (in the DICOM header), the length will not be specified and is displayed as pixel.
Just the measuring line will be drawn. An unlimited number of measurements may be taken before a different tool is selected.

The edit options allow to enable or disable the following values in the tab „Measurements“:

- Line Length
- Density
- Standard Deviation
- Signal-to-Noise-Ratio

The values are displayed or hidden directly after they were dis- or enabled.

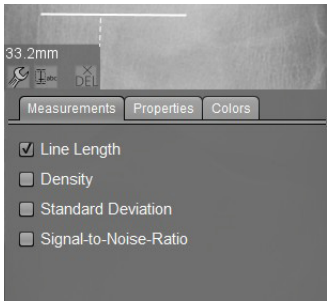


Figure 76. Edit mode of the distance in the tab „Measurements“

In the tab „Properties“ it can be selected that the line of the distance is extended to the image borders.

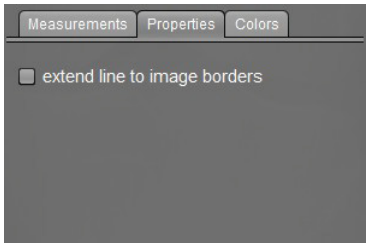


Figure 77. Edit mode of the distance in the tab „Properties“

3.4.2. Angle (Cobb) - measurement of angles

Left click with the mouse on the starting point of the first leg of the angle (first line), hold the mouse button down and drag the pointer to the end of the first leg.
After you created the first line of the leg, the line is marked in red and can be edited directly without having to switch to the edit mode.

Repeat the process for the second leg of the angle. The angles measured will be displayed immediately (acute and obtuse angle). The legs do not have to touch.

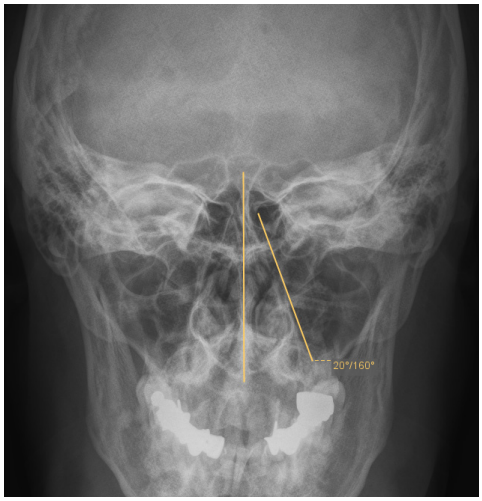


Figure 78. Measure an angle

In the tab „Measurements“ in the context menu, it is possible to select that the minimal distance between lines is displayed.

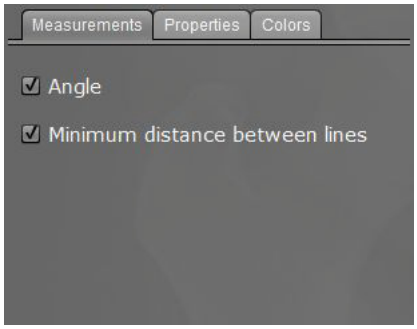


Figure 79. Configuration options in the tab „Measurements“ in the context menu of the angle annotation

Via the tab „Properties“ you can set the angles to a specific value. The standard setting is that the angle is freely adjustable.

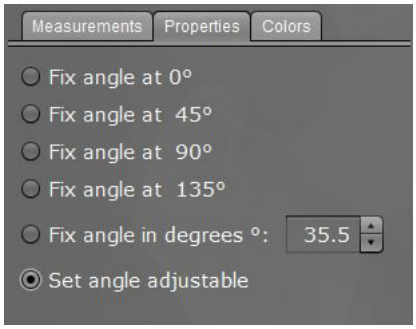


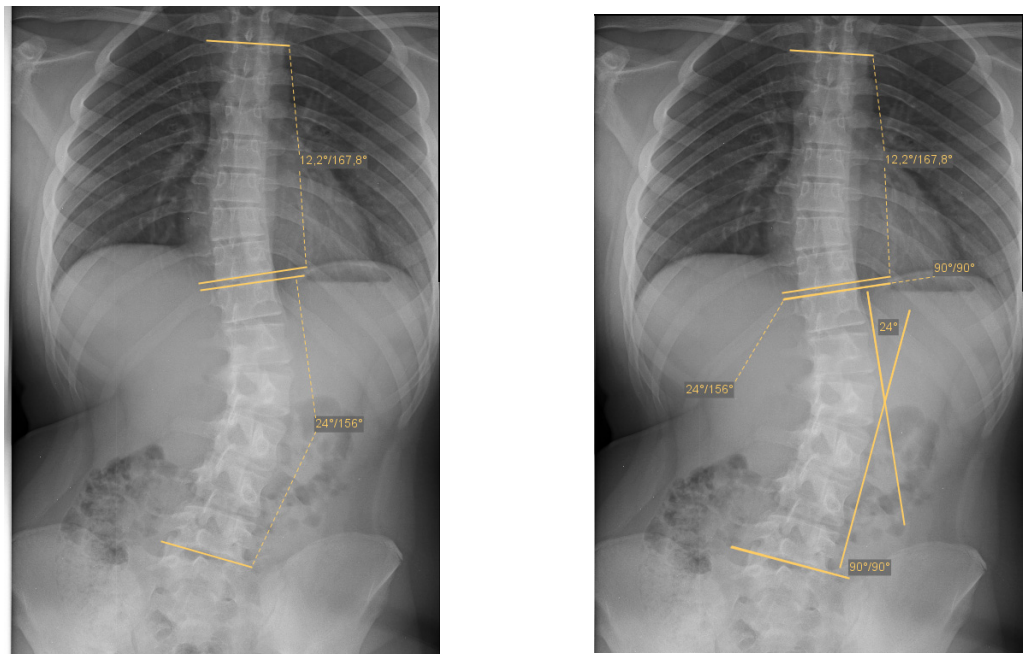
Figure 80. Configuration options in the tab „Properties“ in the context menu of the angle annotation

You have two possibilities to calculate the Cobb angle for assessing the curvature of the spine (scoliosis):

1. Draw two freely chosen lines. Two angles are displayed, because the intersection is outside of the image.
2. Draw the first line and connect, through holding down the Shift key, the second line with the first. Only one angle is displayed, because the intersection is within the image.

The Cobb angle is already calculated when you locate the legs on the respective neutral vertebra.

After you used one of the options, you can move or change the angle by clicking on the edit tool (hand tool).



Cobb angle with ***dicom***PACS®

Cobb angle with conventional method

Figure 81. Measurement of the Cobb angle

NOTE

The legs do not have to touch for measuring the Cobb angle.

The conventional method requires more measuring steps to achieve the same result as with this tool.

3.4.2.1. Add measurements to existing lines/distances

It is now possible to calculate the angles between existing lines or distances or to include existing angles to a measurement.

First activate the tool „angle". Then the existing lines that should be included in the measurement must be clicked on, while holding the Shift key on the keyboard down (the selected line is displayed in red). You can also draw a line and then select the first or second with by holding the Shift key down and a mouse click.

NOTE

In the same way it is also possible to add existing lines to a distance measurement.

NOTE

To insert angles is a function that is not limited to the use with chiropractic tools.

3.4.3. Line

This tool is used to draw lines in an image or document without any measurements. This lines can be used as markers and hints. The length and the direction of the line can be determined with the mouse button held down. The line is defined when releasing the mouse button.

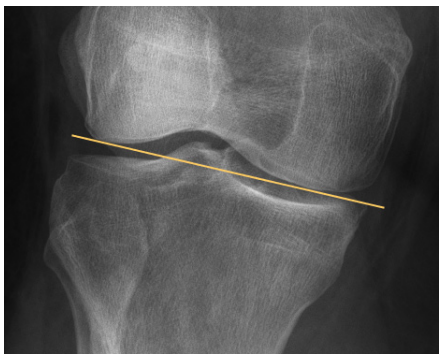


Figure 82. Draw a line to give a hint

The edit options allow to enable or disable the following values in the tab „measurements“:

- Line Length
- Density
- Standard Deviation
- Signal-to-Noise-Ratio

The values are displayed or hidden directly after they were dis- or enabled.

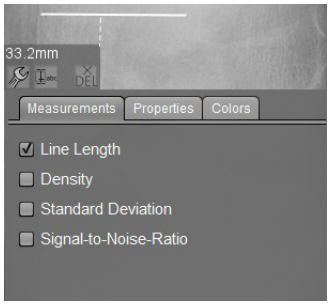


Figure 83. Edit mode of the line in the tab „Measurements“

In the tab „Properties“ it can be selected that the line is extended to the image borders.

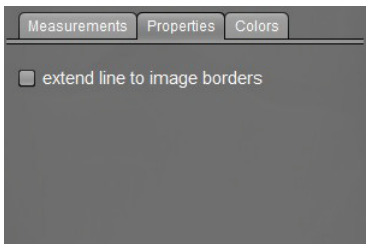


Figure 84. Edit mode of the line in the tab „Properties“

3.4.4. Text

This tool is used to enter text into an image or document. After selecting this tool, place the pointer in the position in the image or document where the comment should be added. A left click will produce a small white field in which text can be written. By pressing Enter the field is closed and the text appears semi transparent. The text may only be viewed with ***dicom***PACS® and ***dicom***PACS®***DX-R***.

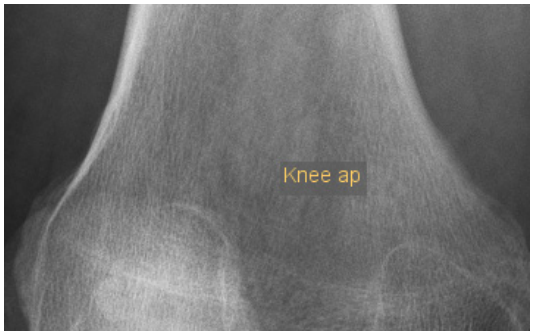


Figure 85. Enter a text

3.4.5. Arrow

This tool is used to draw arrows in an image or document. After selecting this tool, place the pointer in the position in the image or document where the tip of the arrow should appear. The length and the direction of the arrow can be determined with the mouse button held down. The arrow is defined when releasing the mouse button. A small white field for entering text appears at the end of the arrow. By pressing the input key (Enter or Return), the text appears semi transparent. For an arrow without text, press the input key without entering text.

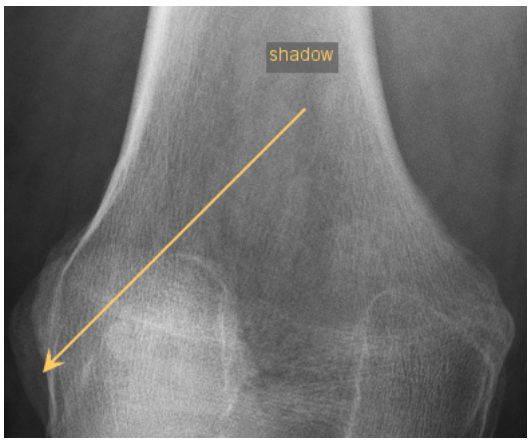


Figure 86. Draw an arrow to give a hint

3.4.6. Mark spots

This tool marks spots by holding down the left mouse button, by default this is a dot. Any number of spots can be marked in an X-ray image.

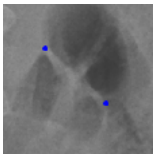


Figure 87. Mark spots

In the edit mode, which is amongst others accessible by clicking on the „Alt" key, the point density and the location coordinates can be de-/activated in the tab „measurements".

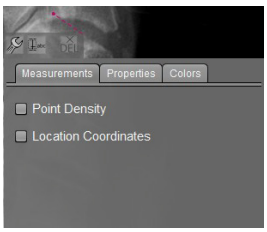


Figure 88. Edit mode tab „measurements"

In the tab „properties" a selection can be made how the marking should be displayed, e.g. cross dot, etc.

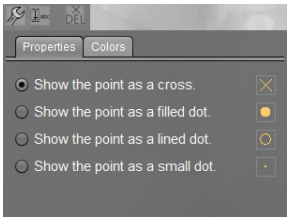


Figure 89. Selection of the graphical display of the marking

3.4.7. Polygon

 Activate the tool by left clicking on the button. The tool is used to measure the length of an irregular shape.

Measure an open shape

Left click in the working area on the starting point of the shape to be measured. Then click on the second corner point and continue until you have reached the preferred shape. Double click on the last point to be included in the shape. The current accumulated length is always displayed during the process, and the total length is displayed after double clicking on the last point. To display the length, the tool measure distance may be applied.

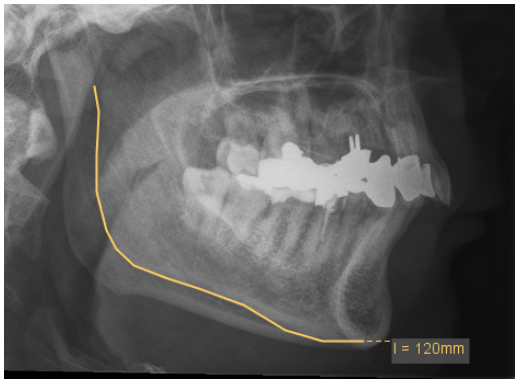


Figure 90. An open shape

The tab „Measurements" gives out the length of an open polygon shape.

Figure 91. Tab Measurements of an open polygon

Measure a closed shape

Activate the tool by a left click on the button. Afterwards click in the working area on the starting point of the shape to be measured. Then click on the second corner point of the shape, and continue until you have reached the preferred shape. The current accumulated length is always displayed during the process.

To close the shape, bring the mouse pointer near the starting point. When all points are marked with small squares, left click once to close the polygon.

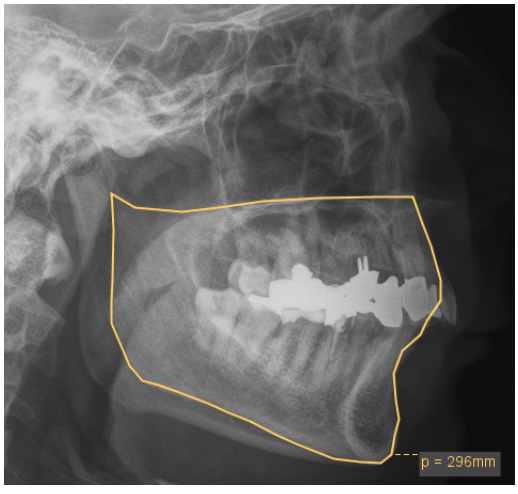


Figure 92. A closed shape

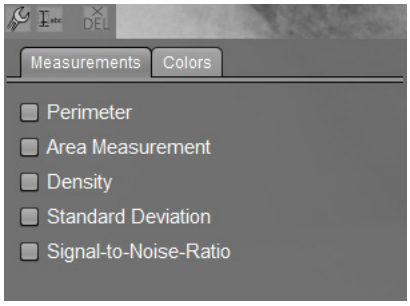


Figure 93. Tab „Measurements“ of a closed polygon

PRACTICAL HINT

If a keyboard shortcut for the zoom tool (e.g. the key “+”) is defined, it can easily be used to zoom into the image to facilitate accurate drawing.

3.4.8. Ellipse

After selecting this tool, left click on the starting point (one corner of a hypothetical rectangle surrounding the circle or ellipse) hold the mouse button down and drag it to the opposite diagonal corner of the rectangle. The ellipse is defined on release of the mouse button. At the end of the ellipse a small white field appears where text can be entered. By pressing the input key (Enter or Return), the text is shown semi-transparent. For an ellipse without text, press the input key without entering text.

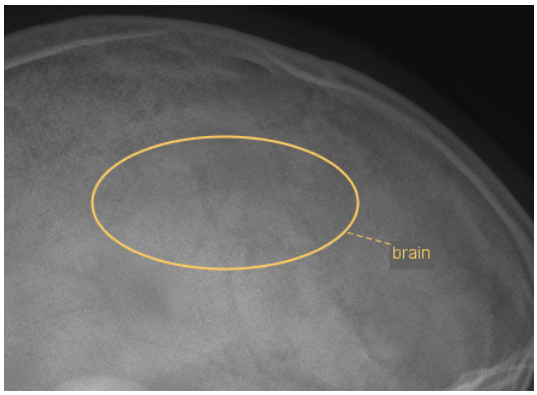


Figure 94. Draw a ellipse to mark a region

The edit options allow to enable or disable the following values in the tab „Measurements“:

- Perimeter
- Area Measurement
- Density
- Standard Deviation
- Signal-to-Noise-Ratio

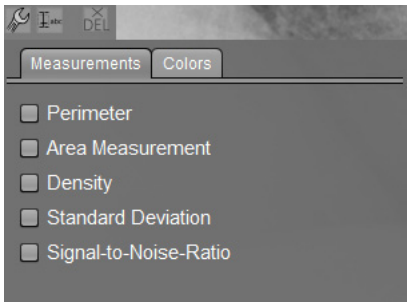


Figure 95. Tab „Measurements“ of ellipse

The size and the position of the of the object can be changed in the edit mode by following the directional arrows and moving the object in the required position.

3.4.9. Circle

The annotation can be used to determine the centre of any object, e.g a femur head. The tool is activated and inserted by clicking on the icon for the circle in the annotation toolbox in the viewer. Position the mouse pointer near circle line of the circle. Once it is displayed in the „active“ colour (e.g. red) and a small square marks its corner, click on the square to change the size of the circle by holding the left mouse button down and moving up or down.

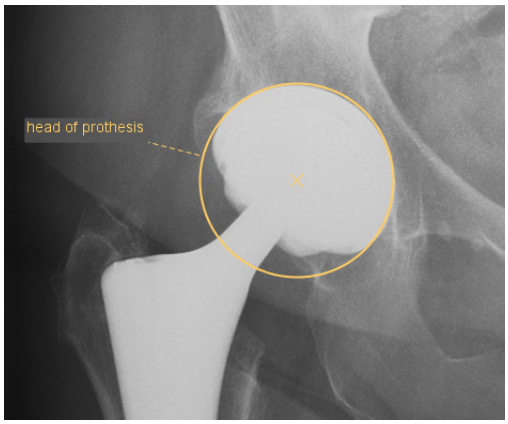


Figure 96. Draw a centercircle

To move a circle, position the mouse pointer in its middle. Once it is displayed in the „active“ colour (e.g. red) and a small cross marks its centre, it can be moved as a shape without changing its size. Hold the left mouse button down and drag the circle to the required, new position. Release the mouse button to display the circle.

By a double click on the attached configuration menu opens a dialog box, where changes to the settings of this annotation can be done.

The tab „Measurements“ offers various measurement options.

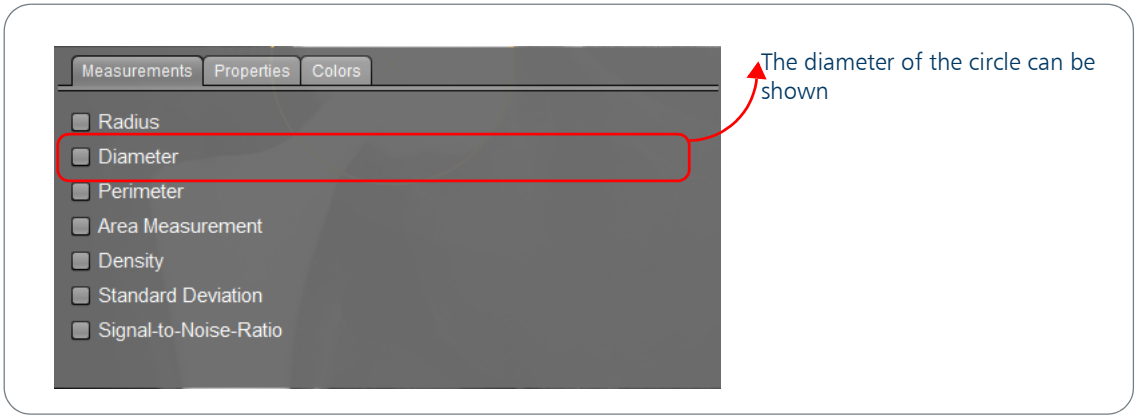


Figure 97. Properties of the circle

The tab „Properties“ determines the display of the center point.

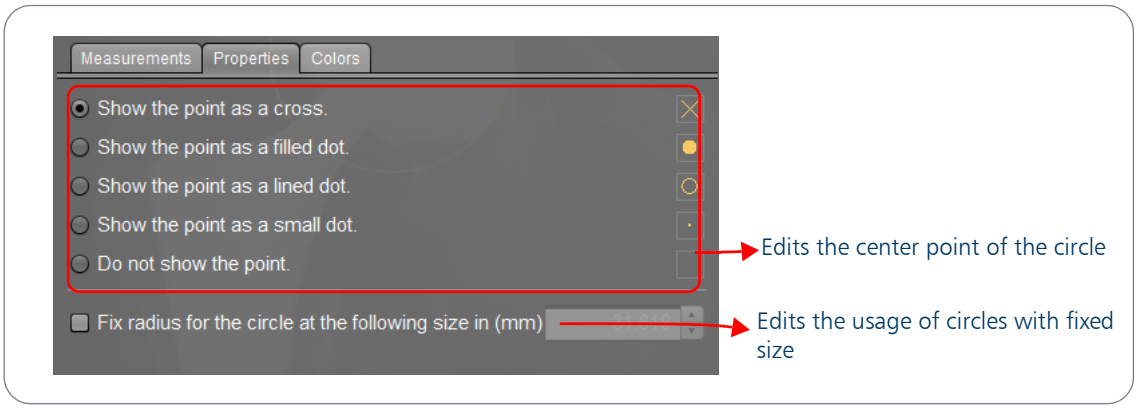


Figure 98. Settings of the circle

3.4.10. Rectangle

This tool draws a rectangle by holding down the left mouse button and dragging the mouse in the required direction. Releasing the left mouse button finished the drawing of the annotation.

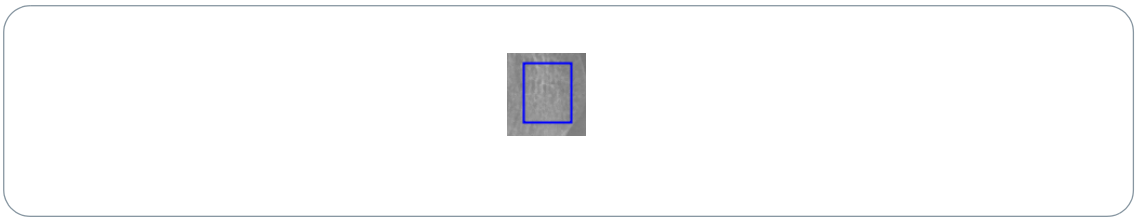


Figure 99. Rectangle

In the edit mode, which is amongst others accessible by clicking on the „Alt“ key, the following values can be enabled or disabled in the tab „Measurements“:

- Perimeter
- Area Measurement
- Density
- Standard Deviation
- Signal-to-Noise-Ratio

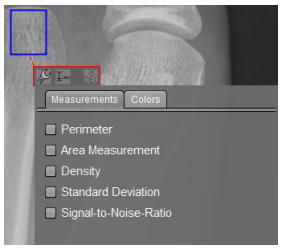


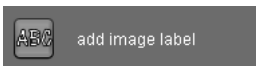
Figure 100. Edit mode tab „Measurements“

The size and the position of the of the object can be changed in the edit mode by following the directional arrows and moving the object in the required position.

3.4.11. Add image label

CAUTION

The user is responsible for the correct application of the left and right marker.



By selecting the add image label function, it is possible to enter a text directly into an image. All other annotations are saved as overlays and can be faded out. To activate this annotation, click into the image, whereby a dialogue box opens. Inside the dialogue window the font, font colour and the font-size can be adjusted. Furthermore, it is possible to choose a predefined label and the text background.

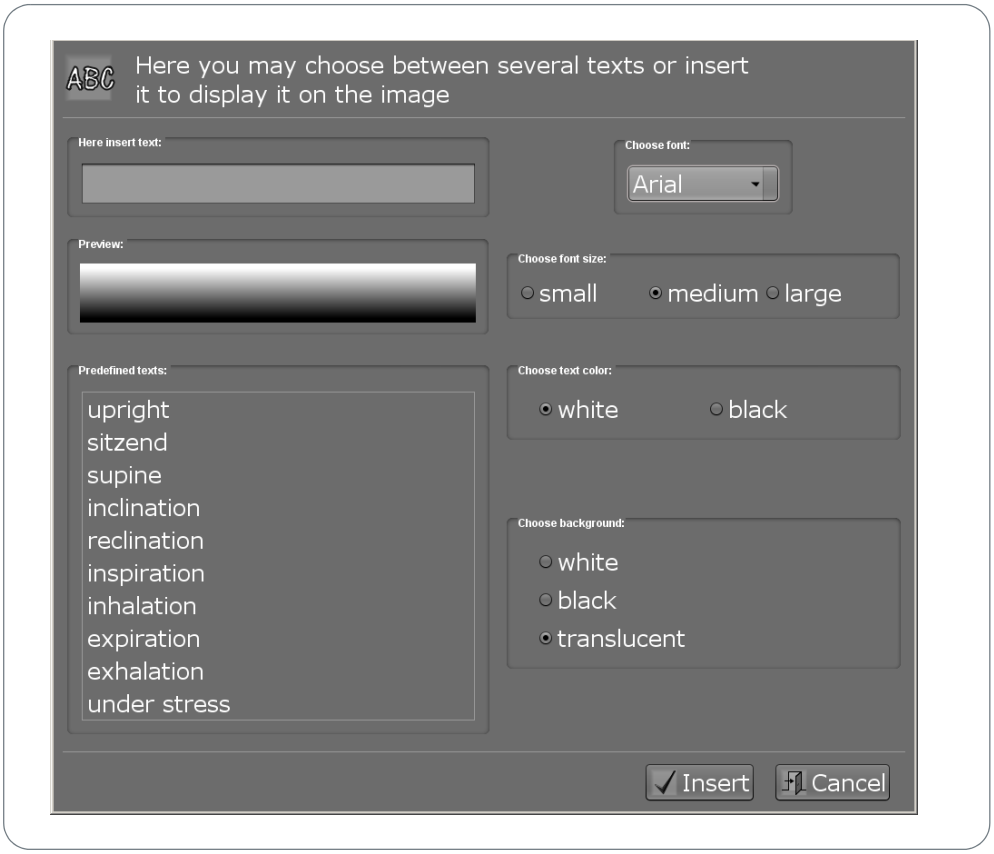


Figure 101. Add image label

Position marker - insert left / right position marker

CAUTION

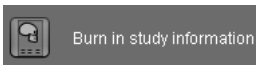
The user is responsible for the correct application of the left and right marker.

By clicking on one of these buttons, an „L" or „R", for „left" and „right", can be inserted in the respective position in the image, e.g. in case it has been forgotten when the image was taken.

Blackborder on / off - de- /activate blackborder

The digital X-ray process usually creates troublesome white borders around an image. By clicking on the blackborder on/off button, a black border frame can be activated and deactivated. If the black border is activated, the white borders around the image are coloured black. When the black border is deactivated, the white borders around the image will be displayed again.

Burn in study information - add study information to the image



It is possible to burn in ID data in a study. The physician, the patient, the study description, the date and the time of the image acquisition can all in once be burned in the current image. The user may also select the burn-in for all images of the selected study in the configuration mode in the tab „Image processing“ when configuring examinations, see page 69.

Each entry can be moved with the left mouse button held down.

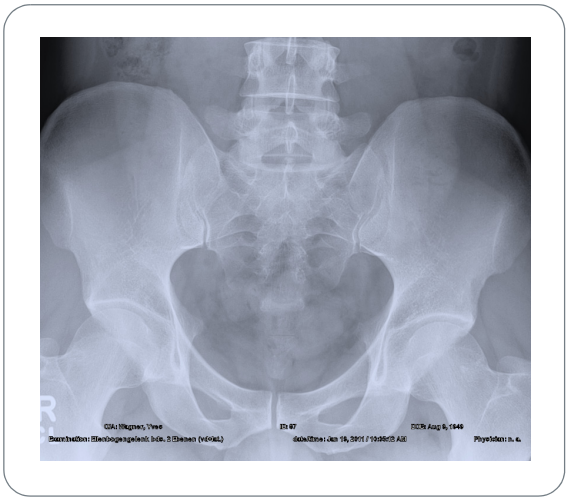


Figure 102. Burn in study information

All burned in information in the image made with the tool „burn in study information“ are always displayed at the bottom of the image, regardless of whether the X-ray is rotated.

Branded information of the following tools can be positioned freely as before:

- marker left
- marker right
- add image label

Using the editing tool (hand), you can move the position of the information manually (except for the information from the tool burn in study information).

3.5. Annotations - advanced

3.5.1. Inserting prosthesis templates

 Planning prostheses for operations and documentation is facilitated by using prosthesis templates that have been inserted as templates. When images containing a scale are loaded into the viewer, the dialog for inserting prosthesis templates can be called up by clicking on this icon.

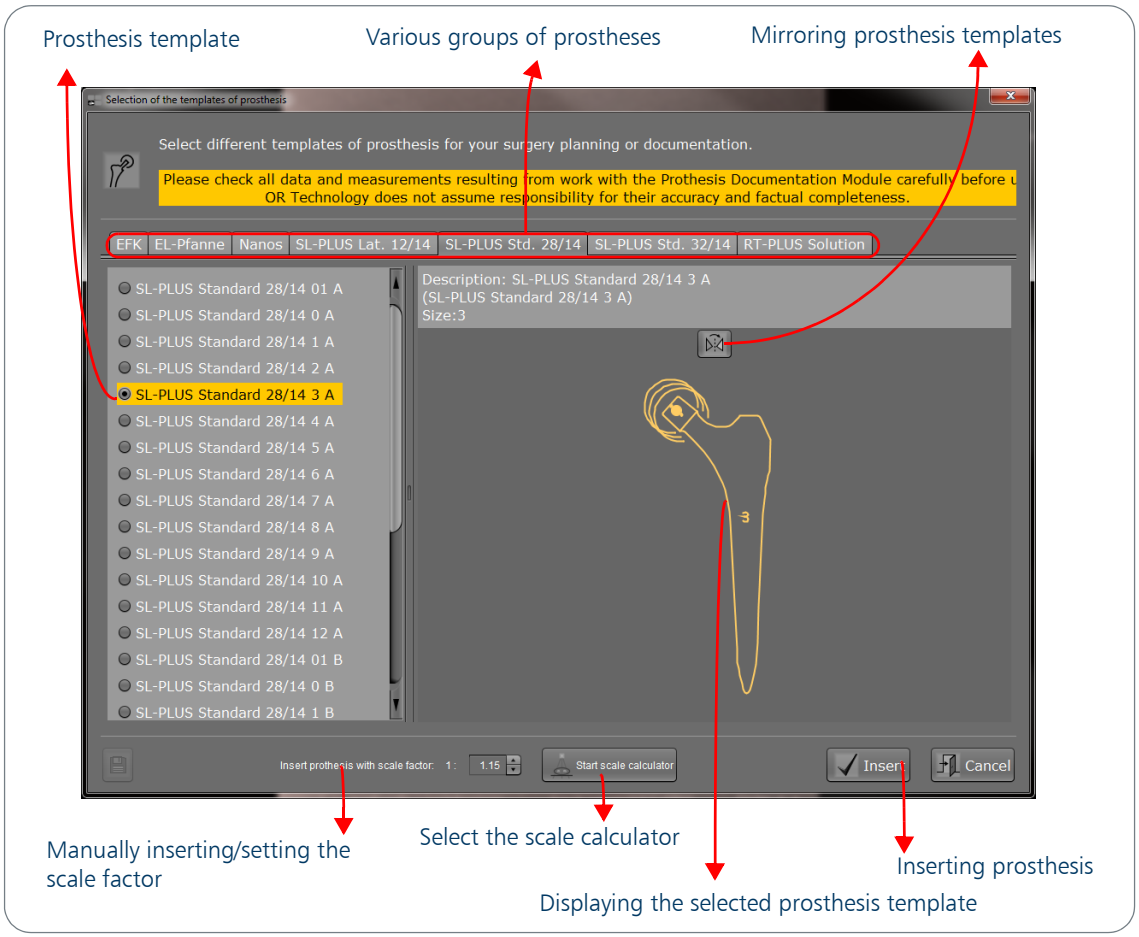


Figure 103. Select a prosthesis template

Various groups of prostheses

Here it can be determined from which prosthesis group the prosthesis template is to be selected. Clicking on the relevant tab switches between the various groups.

Prosthesis templates

All prosthesis templates in a selected group are indicated. The prosthesis template displayed against an orange background is the template currently displayed in on the right hand side.

Mirroring prosthesis templates

Clicking on this icon mirrors the displayed prosthesis template. Where a position description is available for the selected templates, (“left” or “right”), this is changed: in the place of “left” on the left side, “right” is then displayed on the right side. By clicking on the icon again the prosthesis template is mirrored back again, while a corresponding reversal of the position descriptions takes place.

Displaying the selected prosthesis template

Here the selected prosthesis template is displayed as preview image. A description of the prosthesis template is displayed above the icon  .

Start scale calculator

You have the possibility to manually enter the scale factor or to calculate it via the scale calculator. The standard scale factor is 1:1.15cm.

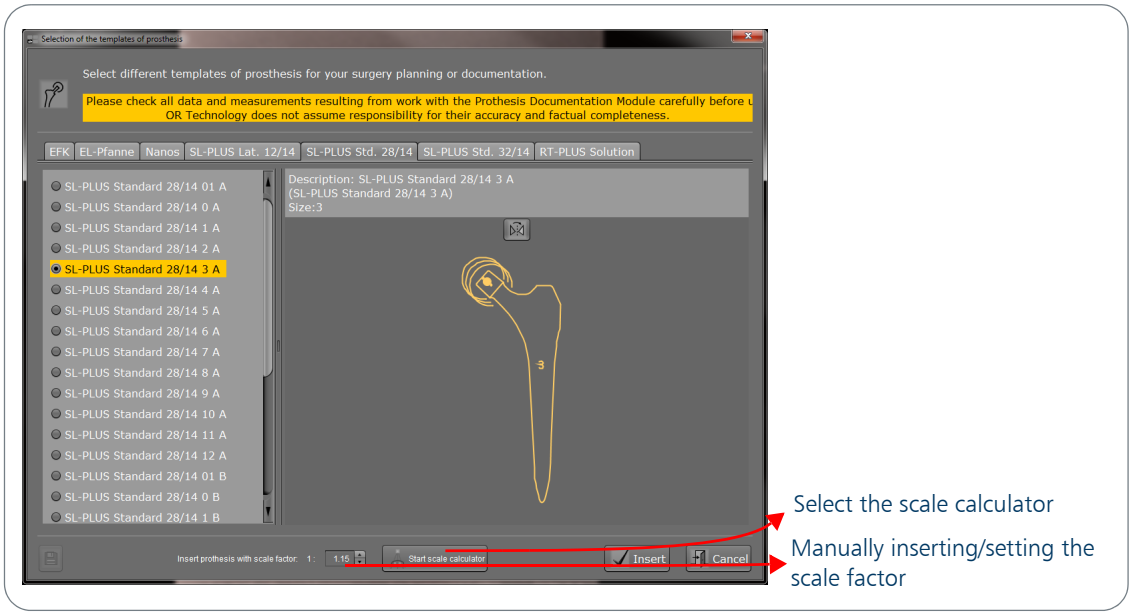


Figure 104. Insert prosthesis dialog

When you click on the „Start scale calculator" button, a dialog opens where you can define the geometry of the X-ray equipment, to calculate the scaling factor to be used.

NOTE

If the X-ray image was calibrated manually, then the magnification factor has been calculated already and the scale calculator will not be displayed.

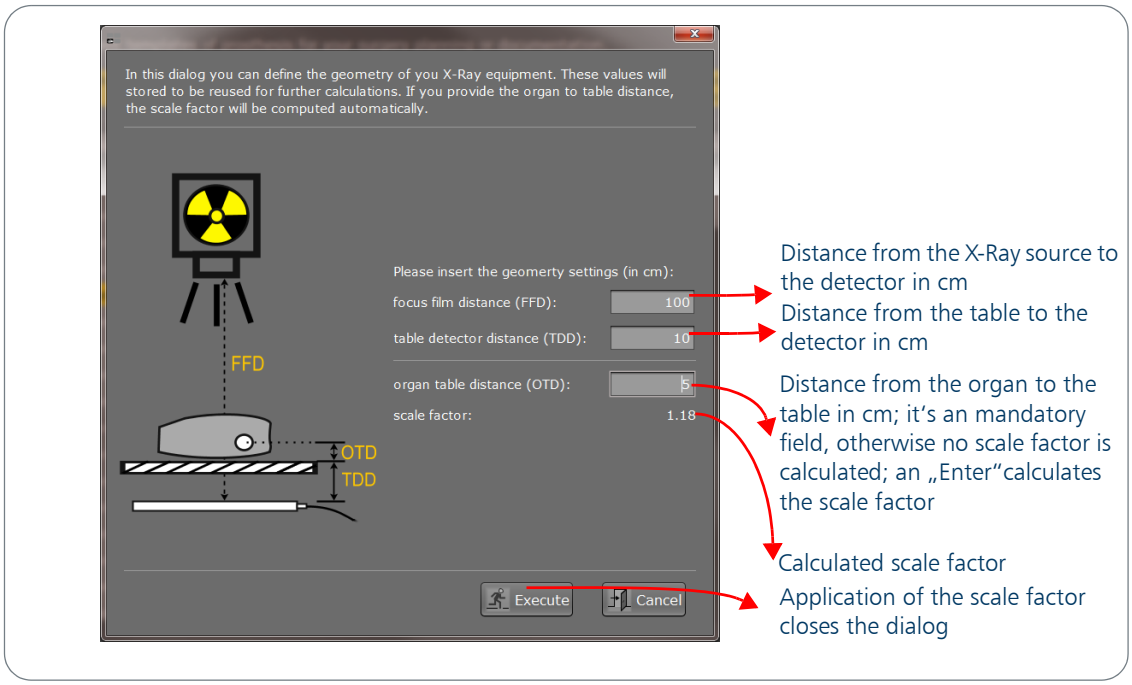


Figure 105. Scale calculator

The values FFD and TDD are saved by the program, the distance between the organ and the table must always be re-stated again. Pressing the „Enter" key button calculates the respective scaling factor.

The click on „Execute" applies the scale factor on the selected prosthesis. The edit mode is automatically activated. A click on the wrench allows to select a new prosthesis in the tab „Properties" and the new scaling factor can be adjusted manually.

Inserting prosthesis

By clicking on the button „Insert", the selected prosthesis template is inserted into the image in the viewer. The selected prosthesis template can also be inserted into the image by double clicking or actuating the Enter key on the prosthesis template on the orange background or by double clicking on the display.

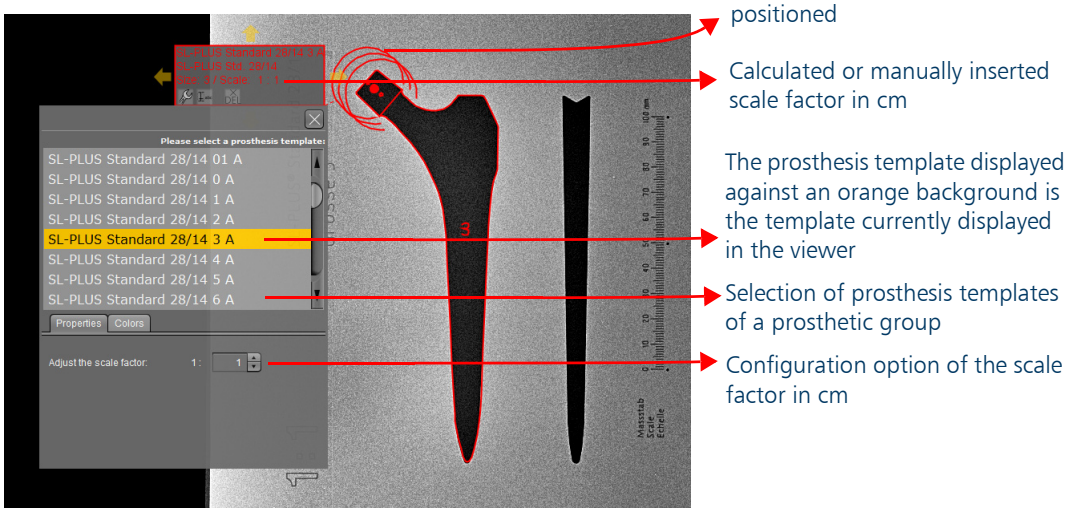


Figure 106. An inserted prosthesis image from the prosthesis dialog

Editing the prosthesis templates is done in the same way as with the annotations (e.g. lines, arrows, text, ...). The prosthesis templates may inter alia be marked, rotated and displaced.

The colour of the prosthesis templates can be changed under "multi line/ polygon" in the configuration dialogue for the annotations colour.

If the selected prosthesis template does not fit properly, another template can simply be inserted from the same prosthesis group.

Inscription of the prosthesis template

If a prosthesis template is inserted, the button („Edit annotations") is selected. To insert another prosthesis template from the same prosthesis group immediately double click on the inscription of the prosthesis template to open a pop-up menu.

If you have used other tools in between, the button („Edit annotations") must first be activated, after which you can insert another prosthesis template of the same prosthesis group from the pop-up menu.

Pop up menu

The pop-up menu indicates all prosthesis templates of the prosthesis groups to which the inserted prosthesis template belongs. With the help of the arrow key and Enter (Return) or by a mouse click, another prosthesis template, for example of another size, may be selected. The change of choice in the pop-up menu is immediately visible in the viewer.

Insert prostheses in manually calibrated images

It is possible to insert prostheses in manually calibrated images  . For further information on the calibration of images see page 136.

The prostheses automatically adjust to the given, respectively corrected reference length of the calibration. The following dialog is displayed to indicate changes:

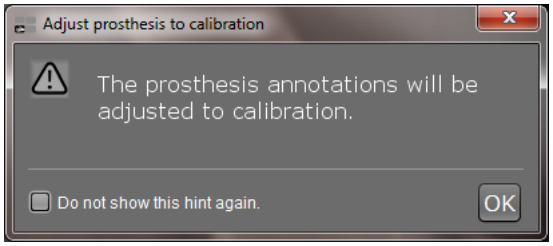


Figure 107. Dialog to adapt the prosthesis template to the newly selected resolution

3.5.2. Center line

 By activating this function, a centre line for the determination of a diaphyseal axis is inserted. Position the mouse pointer near the end of the centre line. It is displayed automatically in the edit mode in the „active" colour (e.g. red). Small squares mark its corners; click on the corner point to move the lines. The point can be picked up and moved to a new position with the left mouse button held down.

To move a centre line, position the mouse pointer in its middle. Once it is displayed in the „active" colour (e.g. red) and no small squares mark its corners, it can be moved as a shape without changing its size or angle. Hold the left mouse button down and drag the center line to the required new position. Release the mouse button to display the center line.

Figure 108. Draw a centerline

3.5.3. Cross distance

By activating this tool it is possible to draw two lines rectangular to each other to measure the cross distance. Once the lines were drawn, the program automatically changes to the edit mode and the annotation can be moved directly to the required position by clicking on the small squares that mark its corners.

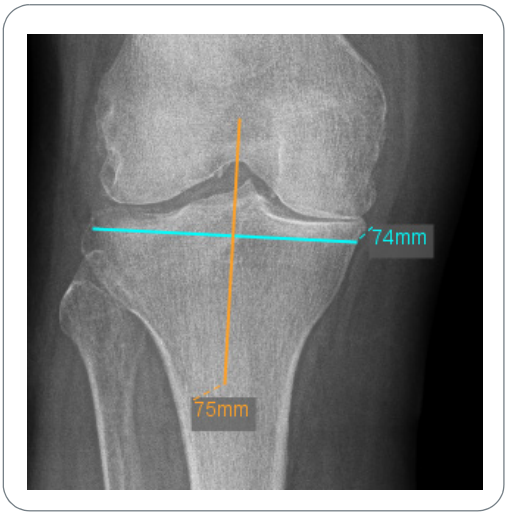


Figure 109. Measure to crossing distances

The context menu of the horizontal and vertical line in the tab „Measurements“ allows to display or hide the given point distance, i.e. the length of the line.

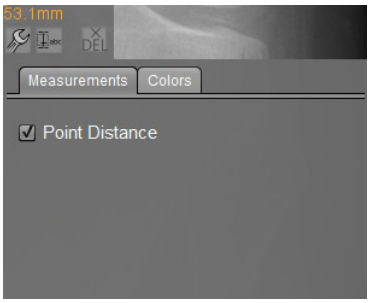


Figure 110. Context menu tab „Measurements“ of cross distance

3.5.4. Weighted center point (e.g. knee)

Use this annotation, e.g. to determine the center point of a knee for knee prostheses. After the annotation was activated, position the mouse pointer near the end of the annotation. The program automatically changes to the edit mode and the annotation can be moved directly to the required position in the „active" colour (e.g. red). The end points can be picked up and moved to a new position with the left mouse button held down.
Once it is displayed in the „active" colour (e.g. red), it can be moved as a shape without changing its size or angle. Hold the left mouse button down and drag the annotation to the required new position. Release the mouse button to display the center point.

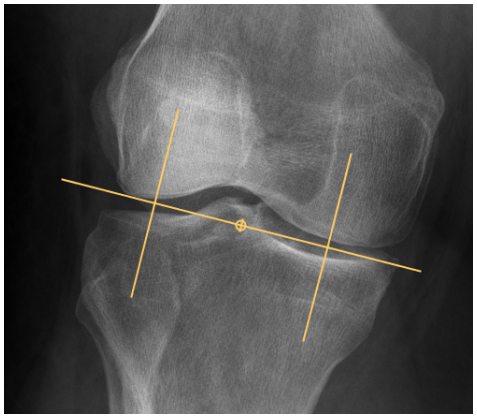


Figure 111. Determine a centerpoint

3.5.5. Corrective osteotomy

By clicking on this button, a complex annotation appears to determine the hip-leg statics. It consists of a center line, an annotation to determine the center point of the knee, and an annotation to determine the statics. This annotation may be used and moved in the same way as the other annotations.

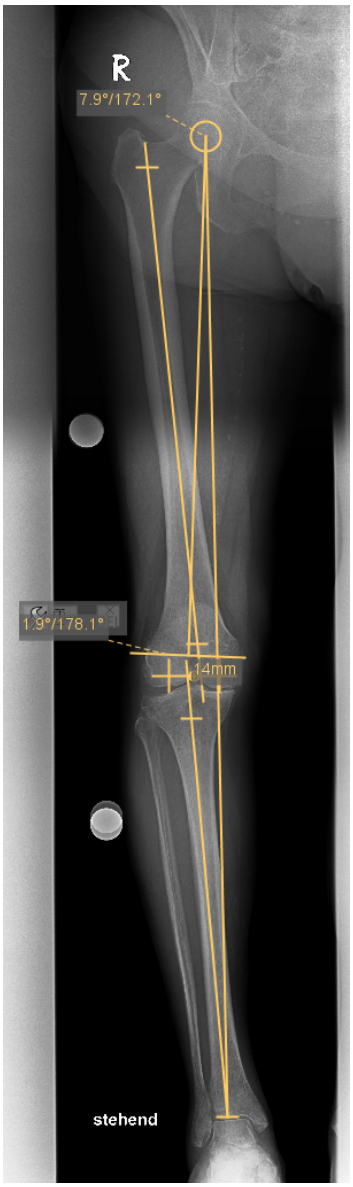


Figure 112. Annotation to determine the hip leg statics

3.5.6. Vertical and horizontal aberrancy

This tool calculates the horizontal or vertical aberrancy to the horizontal or vertical axis. By default the nearer axis is used for the calculation of the aberrancy.
By clicking on this button, e.g. the angle of the pelvic obliquity can be determined in the active image. Left click on the starting point, hold the mouse button down and move the mouse pointer to the ending point of the line to be measured. Then release the mouse button. For a horizontal obliquity, a dashed horizontal line is displayed for the basis of determining the angle. For a vertical obliquity, a dashed vertical line is displayed as the basis for determining the angle.

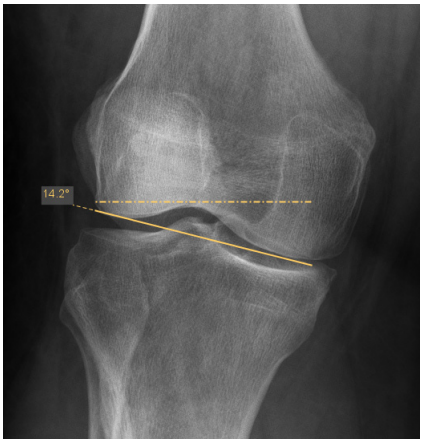


Figure 113. Measure the aberrancy

The calculation of the aberrancy is displayed automatically.

You can also determine the aberrancy for other annotations by holding the Shift key down and clicking on the desired base line. Thus, the aberrancy angle and the auxiliary line is displayed. This function is available for the following tools:

- line
- distance
- density within a line
- angle
- center line
- orthogonal line
- axis line

The display of the calculated aberrancy can be deactivated in the edit mode in tab „measurements".

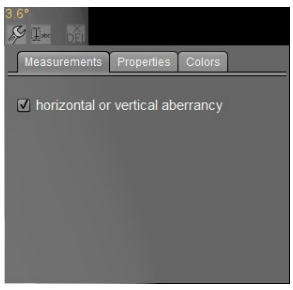


Figure 114. Edit mode „horizontal or vertical aberrancy"

It is also possible to configure the „Properties" of the tool.

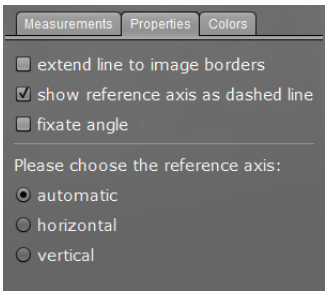


Figure 115. Properties of „horizontal or vertical aberrancy“

The following properties can be activated:

- „extend line to image borders“ - extends both the auxiliary line as well as the drawn line to the image borders
- „show reference axis as dashed line“ - shows the axis as a dashed auxiliary line (enabled by default)
- „fixate angle“ - fixes the drawn angle, while the auxiliary lines can still be moved in the edit mode

The following options are given when selecting the reference axis:

- „automatic“ - the reference axis and the auxiliary line are aligned automatically based on the drawn line (nearer axis)
- „horizontal“ - the reference axis and the auxiliary line are aligned horizontally
- „vertical“ - the reference axis and the auxiliary line are aligned vertically

NOTE

The angle between the plotted and the dashed line is shown in degrees °.

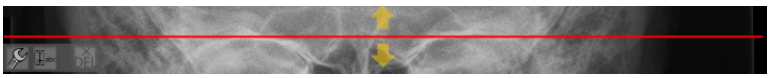
CAUTION

The horizontal and vertical direction always refers to the monitor mounting, regardless of how the image has been rotated.

3.5.7. Axis line

The tool creates a vertical or horizontal axis by holding down the left mouse button, depending on the direction, in which the mouse pointer is moved.

In the edit mode, accessible by holding down the Alt key, the axis of take on a red editing color and you can move the axis either horizontally oder vertically to the desired position.



By default, the axes are extended to the image border. This can be changed in the edit mode.

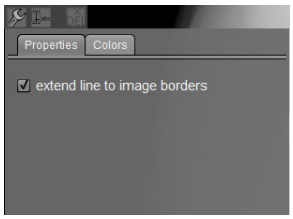


Figure 116. Properties of „Axis line“

If the checkmark in front of „extend line to image border“ is disabled, the length of the axis is shortened and can be extended or shortened in the edit mode. When the cursor is placed on the end of an axis with the left mouse button hold down, the cursor indicates two arrows.

Figure 117. Shorten or extend an axis

Also the position can be changed. When the cursor is placed in the center of the axis in the edit mode, you can move the axis in all directions. This is also indicated by four directional arrows.

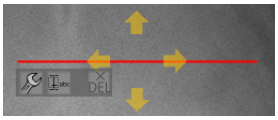


Figure 118. Moving an axis

The sensitivity of the capture range to mark annotations and for directional arrows to move annotations can be adjusted in the configuration dialog „Annotation Common Options“ in the section annotations. Furthermore, the size of the dots and edit helper to create annotations can also be configured.

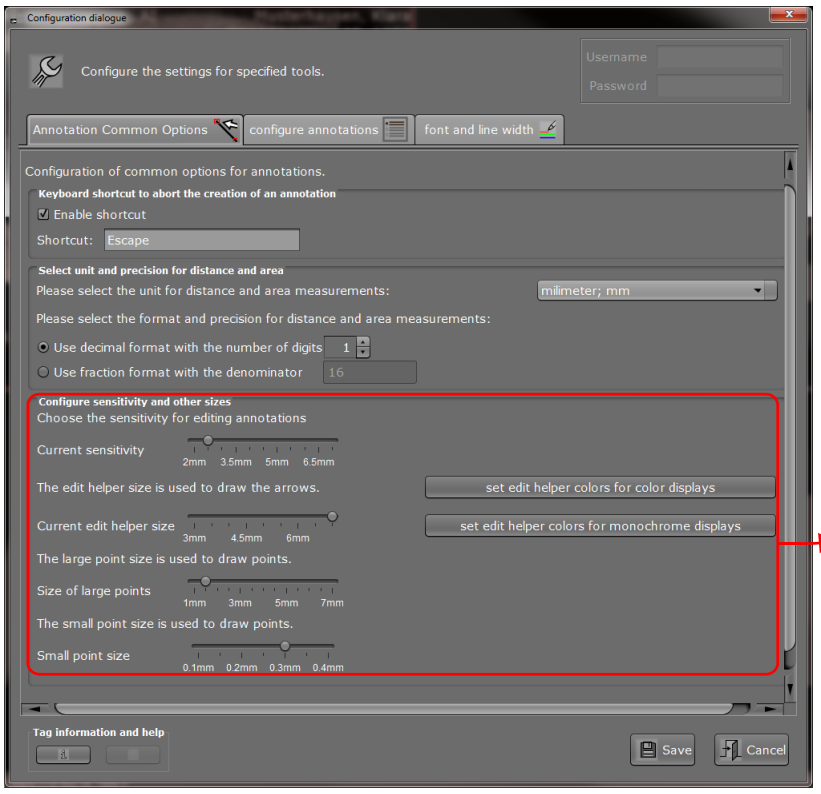


Figure 119. Configuration dialog „Annotation Common Options“

If more than one vertical or horizontal line has been drawn, you can move several axes at the existing distance in the edit mode. To do that the axes must be clicked. This causes that the axes turn into dashed lines in a red editing color, which can be moved to the desired position.

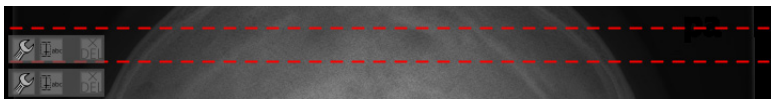


Figure 120. Moving several axes

3.5.8. Center point

This tool  displays the center point between a set start and end point.

The center point of the marked points is displayed as a cross „x“ by default.

In the „Properties“ of the center point it can be selected how the center point should be displayed. The selection is then automatically changed for the selected center point.

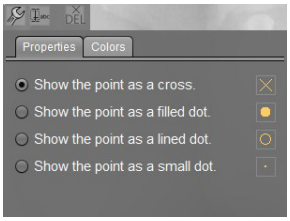


Figure 121. Selection of how the center point should be displayed

3.5.9. Orthogonal line

This tool  is used to mark perpendicular lines on existing or yet to be drawn baselines. Furthermore the aberrancy of the x/y-axis (nearer axis) is displayed by default.

By pressing the left mouse button set a point as the start of the line and then mark the end of the line. The angle of the horizontal aberrancy is calculated automatically. By pressing the left mouse button again the end point of the baseline is marked. Then you can determine the position and length of the perpendicular through the corresponding positioning of the mouse. Another left click with the mouse and the annotation is complete.

Existing lines cam be included by pressing the „Shift“ key.

The baseline and the perpendicular must be configured separately in the edit mode. Therefore two context menus are displayed when pressing the „Alt“ key.

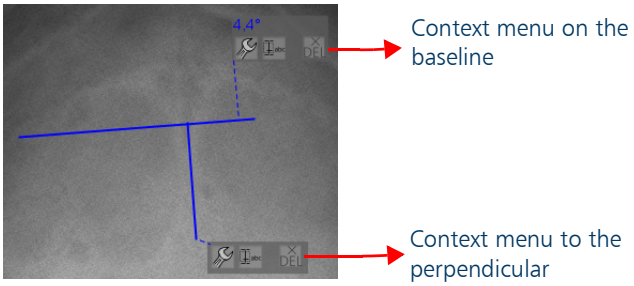


Figure 122. Edit mode for „orthogonal line“

The context menu on the baseline offers the following configuration options:

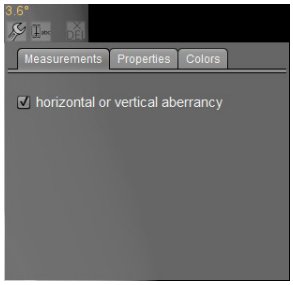


Figure 123. Edit mode „orthogonal line“ on the baseline

The display of the calculated aberrancy can be de-/activated in the tab „measurements“.

In addition, it is possible to configure the „Properties“ and the „Color“ of the baseline.

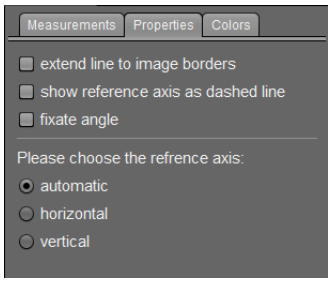


Figure 124. Properties of „orthogonal line“ on the baseline

The following properties can be activated:

- „extend line to image borders“ - extends both the auxiliary line as well as the drawn line to the image borders
- „show reference axis as dashed line“ - shows the axis as a dashed auxiliary line (enabled by default)
- „fixate angle“ - fixes the drawn angle, while the auxiliary lines can still be moved in the edit mode

The following options are given when selecting the reference axis:

- „automatic“ - the reference axis and the auxiliary line are aligned automatically based on the drawn line (nearer axis)
- „horizontal“ - the reference axis and the auxiliary line are aligned horizontally
- „vertical“ - the reference axis and the auxiliary line are aligned vertically

The context menu for the perpendicular offers the possibility to configure the „measurements“.

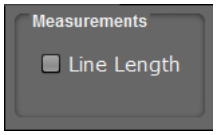


Figure 125. Measurements of „orthogonal line“ at the perpendicular

By activating „Line Length“ the line length of the perpendicular is displayed.

3.5.10. Spinal curve

This tool  is used to draw an arc in the lateral view of the spine. The annotation uses a fixed radius set by default to 220mm. The tool consists of three points which indicate the lumbar curve with reference to the standard and the aberrancy, calculated in mm and degree.

First, mark a start point of the arc with a left click and then mark the end point again with another left click. The direction of the curve of the arc is dependent on whether the arc was drawn caudal (towards the coccyx) or cranial (towards the skull). The cross „x“ displays the centre point of the circle.

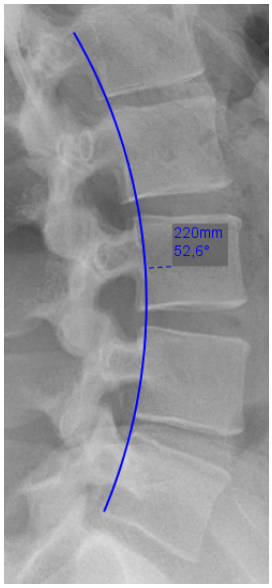


Figure 126. Spinal curve

The curvature of the selected arc can be selected to be curved to the left or the right in the edit mode in the context menu in the tab „Properties“. In addition, it can be selected whether the angle or the radius is defined in its size.

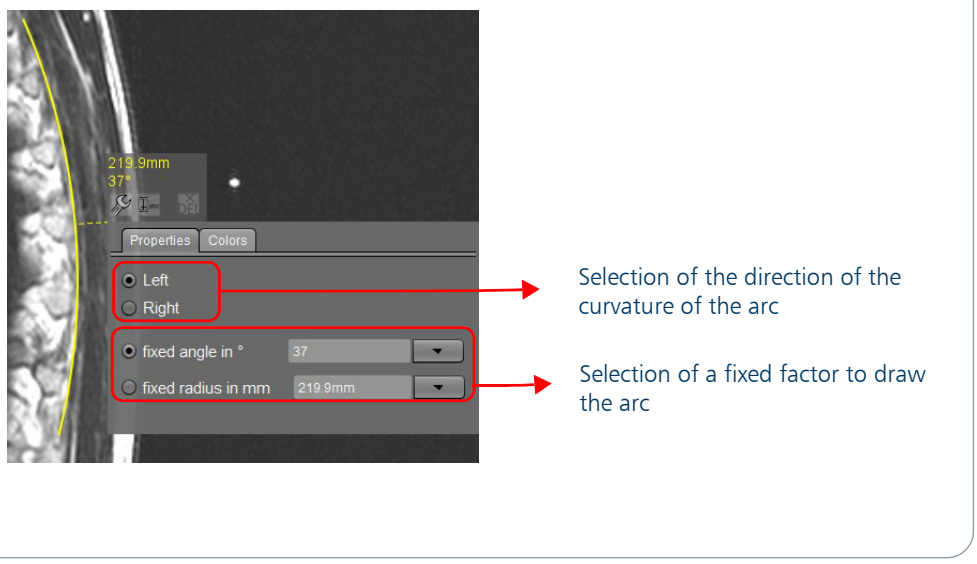


Figure 127. Edit mode of „Spinal curve“

3.5.11. George's line

This tool  is used to draw vertical lines on each vertebra along the spine in a lateral view and to calculate their distances (in mm).

The default display of X-ray images regarding the patient orientation for the use of the George's line can be defined in the configuration dialog (screw wrench button in the section annotation) in the tab „configure annotations“. There you can select between the patient orientation PA and AP as a default setting.

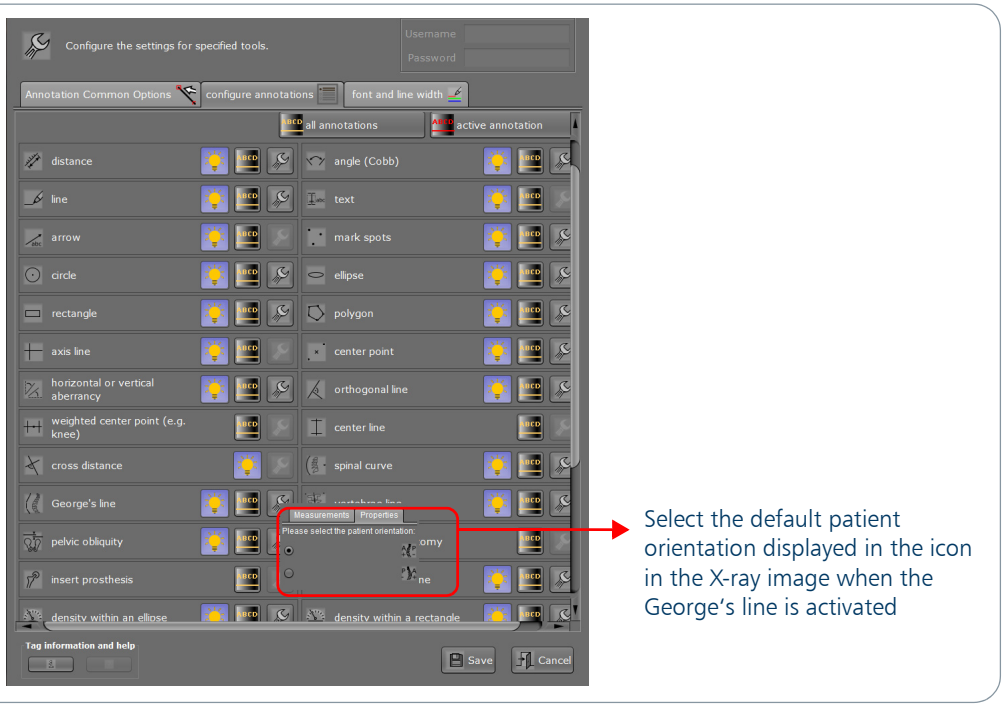
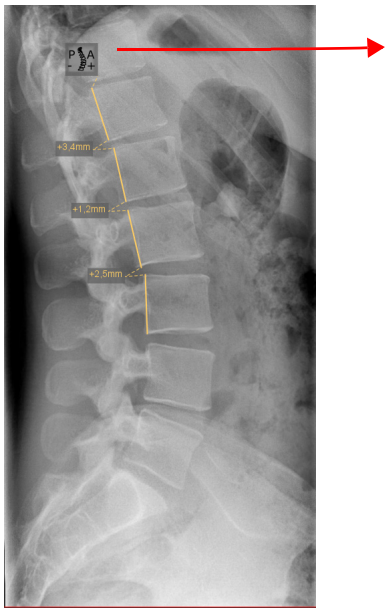


Figure 128. Configuration dialog „configure annotation“

Once the tool is activated, an icon in the X-ray image displays the default patient orientation (PA or AP). The patient orientation can be changed in the edit mode for each individual X-ray image.

Mark each start and end point of a line along the vertebral body with a left click. Note that always the tip and the end of the vertebral body is included when drawing the lines. And always proceed from cranial to caudal and repeat the steps until a part of the entire spine is covered.

The edit mode is only active when the end of the drawing the annotation is indicated by a double click or when another tool is selected.



Display of the default setting of the patient orientation, which can be changed for the individual image in the edit mode

Figure 129. George's line

3.5.12. Vertebrae line

This tool  generates a vertical line of six points (2x3) along the spinal canal and displays the lateral aberration in degrees.

Proceed as follows:

- First click on the left side of the vertebral body (point 1)
- Then click on the right side of the vertebral body (point 2)

The program generates a mid point of the vertebrae from points 1 and 2 to indicate the center of the spinal canal.

- Place point 3 on the junction of the lamina or the tip of the spinous process

The difference between points that were marked and mid points that were generated can be recognized each by its graphical display: the points are drawn and the cross is generated.

- Place point 4 on the left side of the following vertrebral body
- Place point 5 on the right of the following vertrebral body

The program generates a mid point of the vertebrae from points 4 and 5.

- Place point 6 on the junction of the lamina or the tip of the spinous process

A line is generated, which represents the center of the spinal canal and displays the lateral aberration.

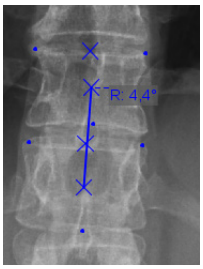


Figure 130. Vertrebrae line

In the edit mode the display of the lateral aberration can be de-/activated in the tab „measurements".

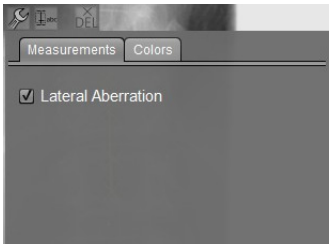
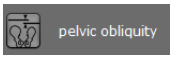


Figure 131. Edit mode tab „Measurements" of vertebrae line

3.5.13. Pelvic obliquity

This tool 

is a measurement that is generated by two horizontal lines and two simple clicks indicative of the distance between these two lines. In the edit mode, the two lines can be moved by holding down the left mouse button. The distance in mm is automatically calculated and displayed.

For the angle measurement, the tool „Vertical and horizontal aberrancy" can be used.

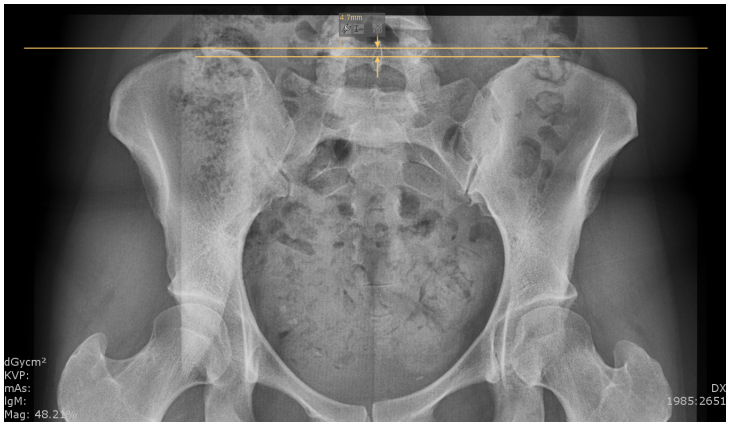


Figure 132. Pelvic obliquity

3.5.14. Three point circle

The three point circle creates a circle with a center point, which is uniquely determined by any three set of points that define its bow.

In the edit mode in the tab „Measurements“ the following values can be enabled or disabled:

- Radius
- Diameter
- Perimeter
- Area Measurement
- Density
- Standard Deviation
- Signal-to-Noise-Ratio

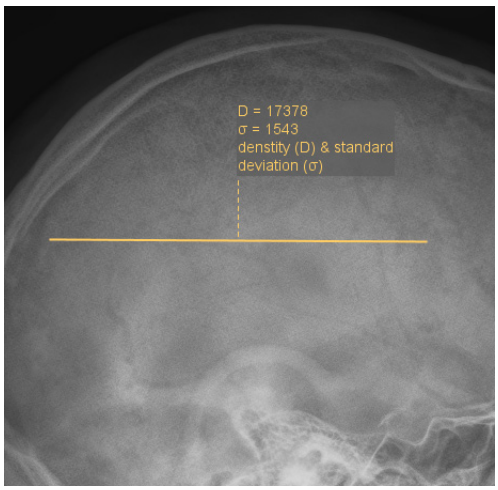


Figure 133. Measure the density within a line

The values are automatically displayed after the selection.

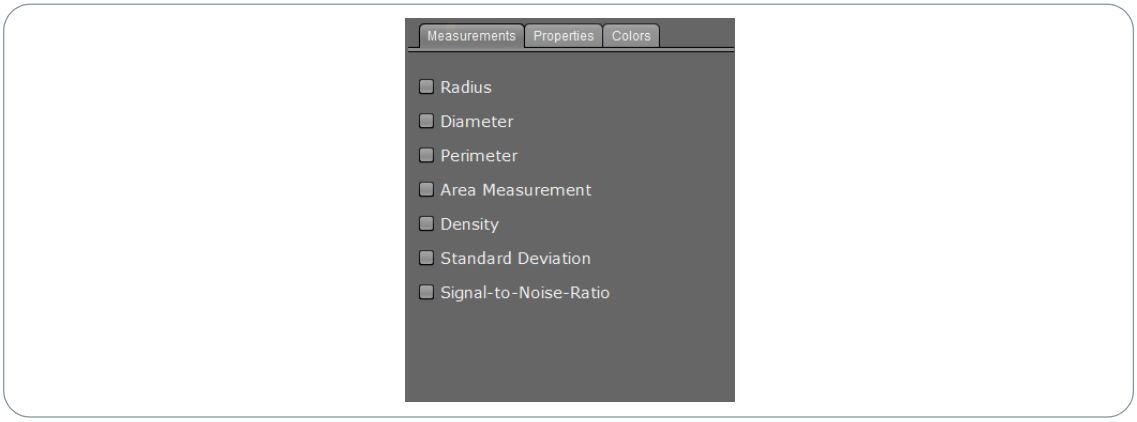


Figure 134. Edit mode tab „Measurements“ of three point circle

In the tab „Properties“, the display of the center point and the defining points can be adapted. The selection will be applied automatically.

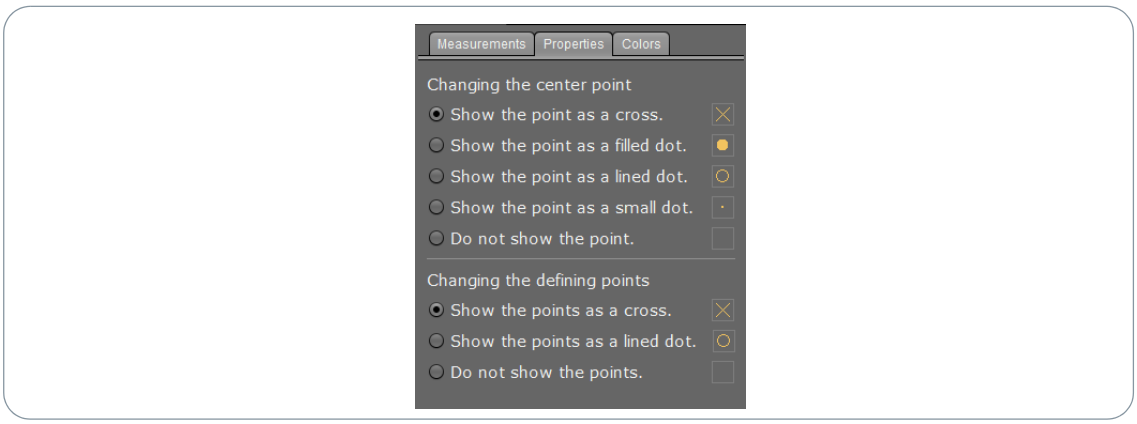
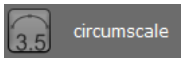


Figure 135. Edit mode tab „Properties“ of three point circle

3.5.15. Circumscale



Circumscale is a measurement tool used on a nasium/frontal view.

An arc is drawn through three defining points and the diameter of the corresponding circle is displayed by default.

In the edit mode (Alt key or „hand" button) you can change the position of the points or the entire arc.

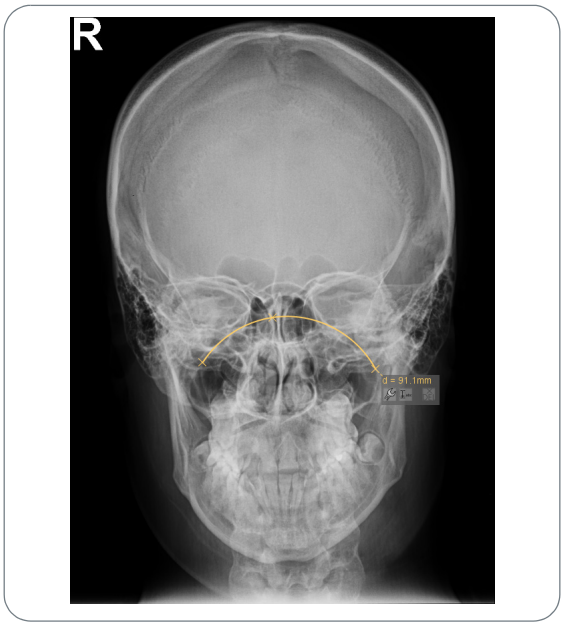


Figure 136. Circumscale

Furthermore, you have the option to display the radius, in addition to the diameter in the tab „Measurements".

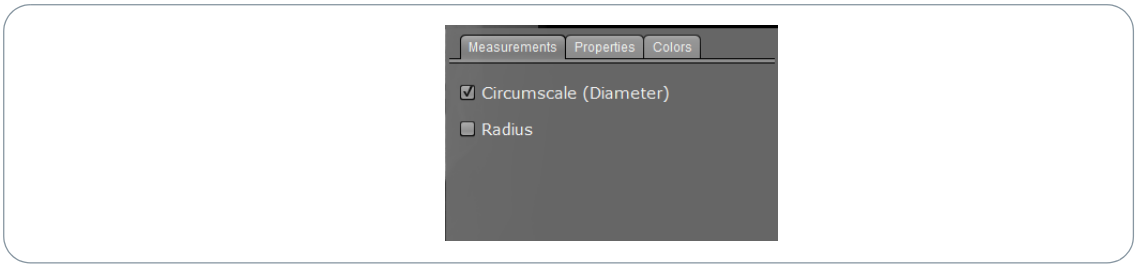


Figure 137. Tab Measurements of circumscale

The following properties for the display of defining points can be selected:

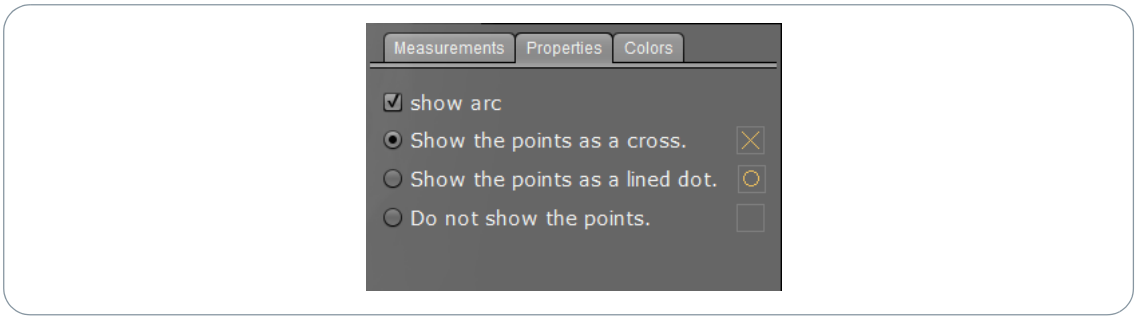


Figure 138. Tab Properties of circumscale

3.5.16. Distance comparison

This tool compares the distances between three set points (between point 1 and point 2 and between point 2 and point 3).

The value of the larger distance is displayed.

In the edit mode, the defining points can be moved.

Figure 139. Distance comparison

3.5.17. Mark intersection

This tool marks the intersection of two intersecting lines. The default display of the intersection is a filled dot.

Figure 140. Mark intersection

In the edit mode it is possible to select the display of the intersection.

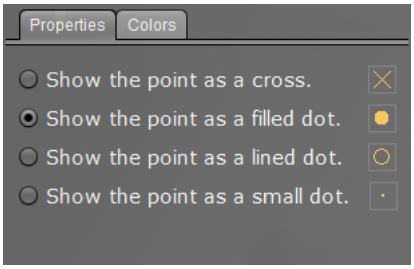


Figure 141. Edit mode of mark intersection

3.5.18. Insert a template

You have the option to define and save templates, so that they are callable at any time and can be applied to other X-ray images. You can create your own selection of custom templates, which can be used for certain types of images or recurring examinations. This allows for an even more effective work with the program.

Saved templates are stored in the database and are thus available at all work stations.

Once you have arranged the tools that should be saved, click on the icon „insert a template“. A dialog is displayed with the message that no templates are available.

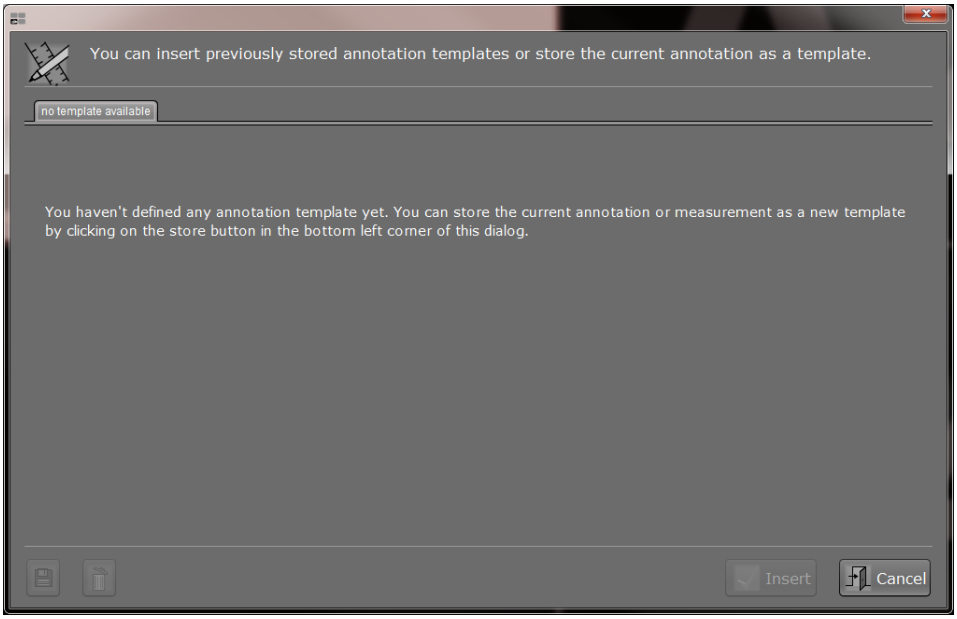


Figure 142. Dialog to save templates

NOTE

If no annotation has been drawn in the X-ray image, no template can be saved. Only the „Cancel" button to exit the dialog is active.

Click on the save icon (floppy disk) to save the template. A dialog to save the inserted annotations opens. It is mandatory to fill the fields „Name" and „Group", where you can enter the a unique name for the set of annotations and associate it with a group. For clarity, the annotations are displayed in a greatly minimized preview image. Furthermore, it is possible to add an optional description for the individual templates.

Clicking on the „Save" button opens a dialog in which the template is saved and can be recalled or deleted.

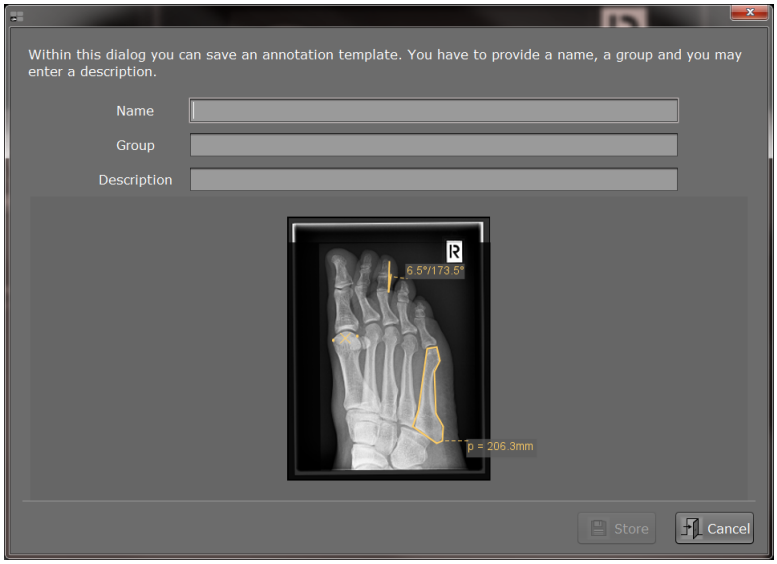


Figure 143. Creating a template

The entered group is represented in tabs accordingly, the corresponding names of the respective templates can be found on the left frame below. When multiple templates are saved, the template to be used can be selected. The corresponding template is shown as a minimized preview image.

You can save any number of templates.

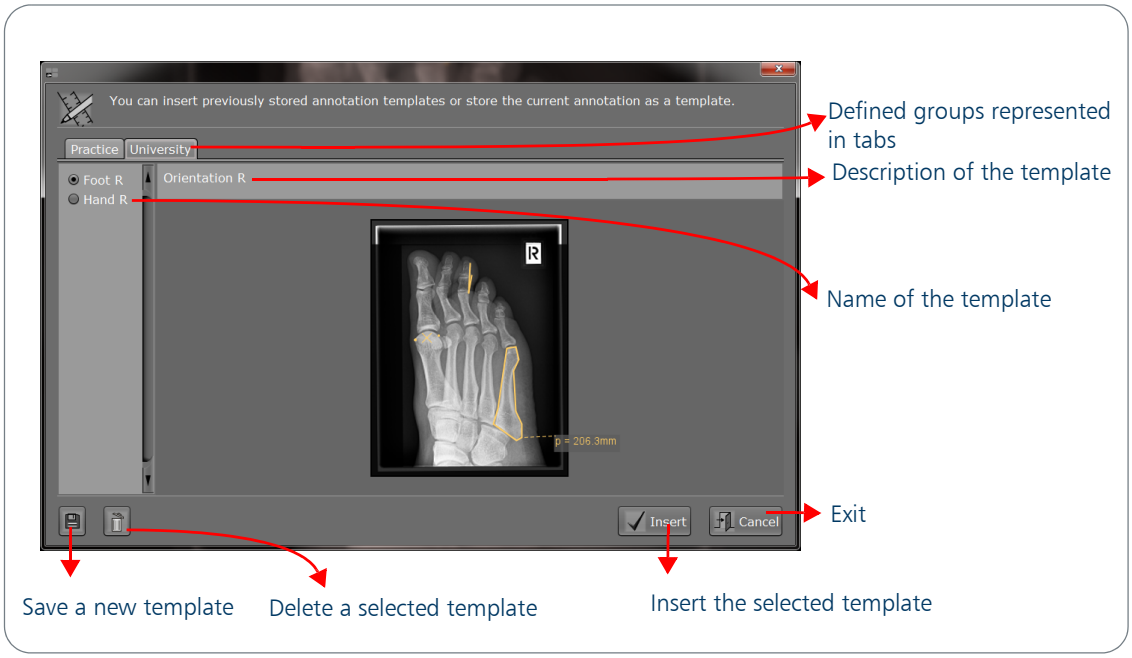


Figure 144. Inserting a template

To insert the template in a loaded X-ray image, click on the tool „Insert a template" and select the template from the corresponding group. The template is inserted exactly at the same position. If measurements, such as density, standard deviation or signal-to-noise ratio etc. were saved in the template, they are calculated exactly in the same position for the new image.

NOTE

It is not possible to add further measurements in an X-ray image, that are available in the edit mode of the annotation, when it was not saved as a template, e.g. the perimeter of a rectangle, when only the density was saved.

Saved templates are stored in the database and are thus available at all work stations.

The deletion of templates is possible using the delete icon (trash bin). A security question to acknowledge the deletion must be confirmed to delete the selected template.

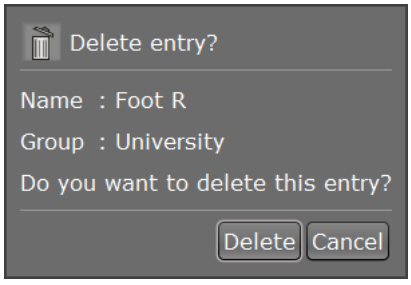


Figure 145. Security question to delete templates

It is possible to export or import the saved templates. To do this click on the wrench icon in the section „annotations“ - „advanced“. This opens the configuration dialog for annotations. In the tab „configure annotation“ allows the configuration dialog to export or import open when you click on the wrench behind the tool name „insert a template“. There you have the option to import individual files or entire folders with templates or to export all existing templates in a directory. It exports all saved templates, it is not possible to export only a selection of templates.

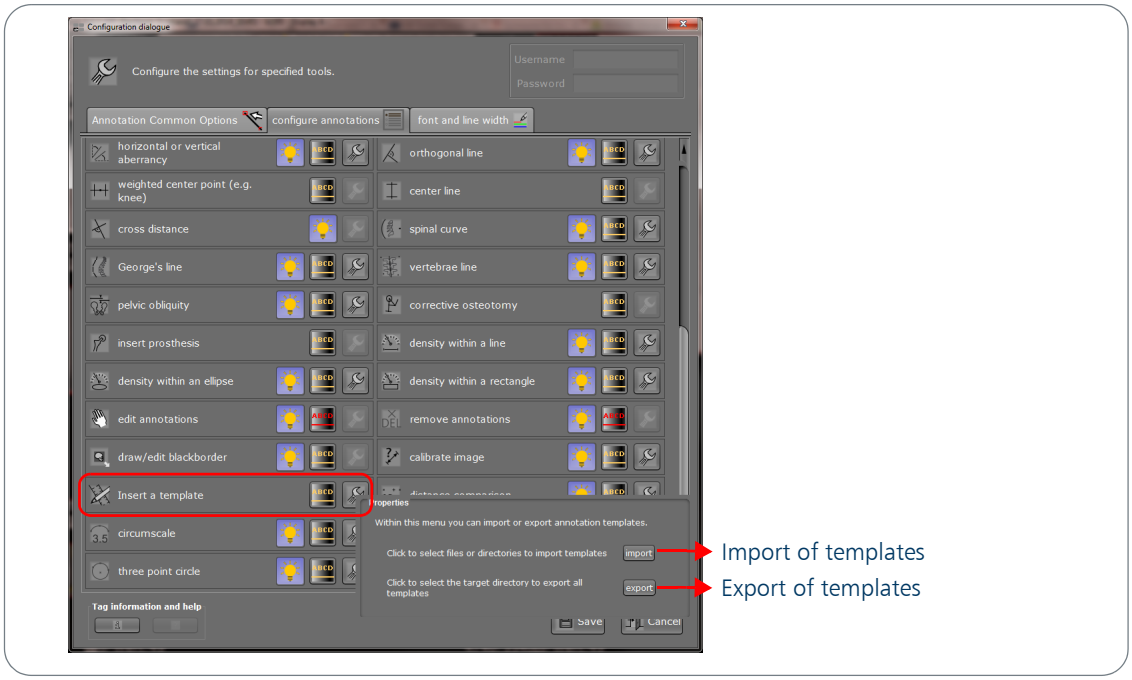


Figure 146. Configuration dialog to export/import templates

3.6. Annotations - consistency

3.6.1. Density within a line

When the tool is activated, the density value of the pixel currently under the pointer is shown. Left click on the starting point of the measurement, hold the mouse button down and drag it to the end of the line. On release of the mouse button, the average density over the measuring line is immediately displayed next to it immediately after releasing the mouse button.

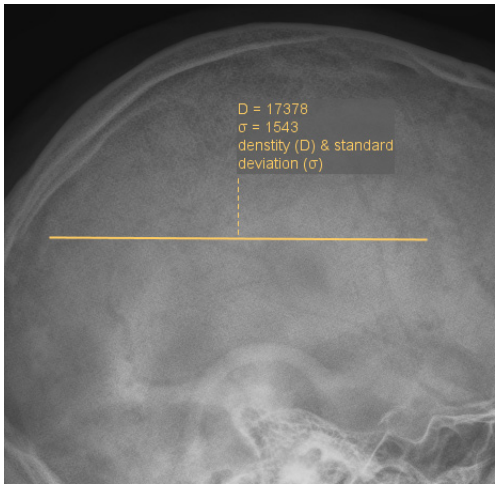


Figure 147. Measure the density within a line

3.6.2. Density within a rectangle

When the tool is activated, the density value of the pixel currently under the pointer is shown. Left click on the starting point (one corner of the rectangle) hold the mouse button down and drag it to the opposite diagonal corner of the rectangle. Then each corner point of this rectangle can be moved and placed individual by using the edit annotation function . So it is possible to cover irregular shapes with this tool. The average density over the area is displayed next to it immediately after releasing the mouse button.

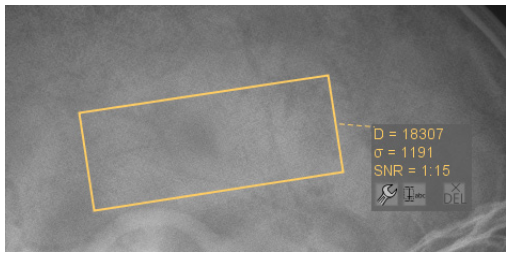


Figure 148. Measure the density within a quadrilateral

3.6.3. Density over an ellipse

When this tool is active, the density value of the pixel currently under the mouse pointer is shown. In CT images the indicated value reflects the physical density of the tissue range. The value is indicated here as Hounsfield unit (HU). Left click on the starting point (one corner of a hypothetical rectangle surrounding the circle or ellipse) hold the mouse button down and drag to the diagonally opposite corner of the rectangle. The average density over the circled area is displayed next to it immediately after releasing the mouse button.

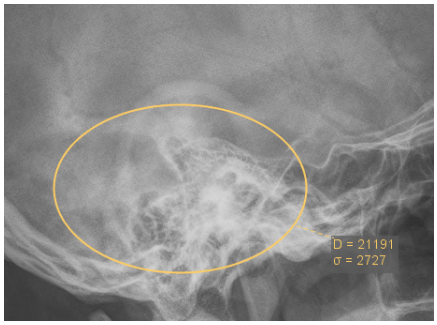


Figure 149. Density over an elliptical area

3.7. Annotations - edit

3.7.1. Draw blackborder

The digital X-ray process usually creates troublesome white borders around the image. These white borders can be cut and darkened by using the black border annotation.

The saturation of the black border can be configured by an authorised software dealer. It can be set from slightly dark to 100% black.

By clicking on the button, a frame can be drawn around the region of interest. After activating the button, click with the left mouse button on the upper left corner of the displayed region of interest.

Figure 150. Black border

Drag the mouse to the end of a line and then press the left mouse button again. When moving the mouse, a rectangle is formed. Once the rectangle has reached the desired size, click the left mouse button again. The image is shown immediately with the activated black border.

It is possible to draw just one blackboder in an X-ray image; additional blackborders can only be drawn via the context menu. After the blackborder was drawn, the edit mode is enabled automatically and the context me is displayed. After clicking on the screw wrench button a dialog opens, in which the shadowing can be adjusted from 70-100% (100% represents black) and in which you can add another blackborder by clicking on the button „Add another ROI".

If you have the preview image open, you will see that at the same time when drawing the blackborder, a shaded area is drawn. This area represents the area of the image that has been shaded off by the blackborder.

To edit the positioning and size of the blackborder, please use the directional arrows, squares and dots that are always displayed. In the edit mode, the line of the blackborder turns into a red color. A blackborder can be deleted via the delete icon in the context menu.

Figure 151. Drawn black mask with context menu

NOTE

The performance of the black border of the toolbar in the X-ray view differs from the annotation draw black border. In the X-ray view, the black border is disabled once a certain size of the black border is reached.

Once the frame is in the desired position, the black border can be activated by clicking on the button „Activating and deactivating the black border".

Figure 152. Activated black border

The digital X-ray images in this section are shown with a drawn frame; a black border function is deactivated and activated respectively.

3.7.2. Edit an annotation

After selecting the tool, move the mouse pointer close to the measurement or annotation to be edited. As soon as it is displayed in red, several options of editing are available:

3.7.2.1. Move the complete element

Position the mouse pointer in the middle of the shape to be moved (line, ellipse, etc.). Once this is displayed in the „active" colour (e.g. red), it can be moved as a shape without changing its size or angles. Hold the left mouse button down and drag the shape to the required new position. Release the mouse button.

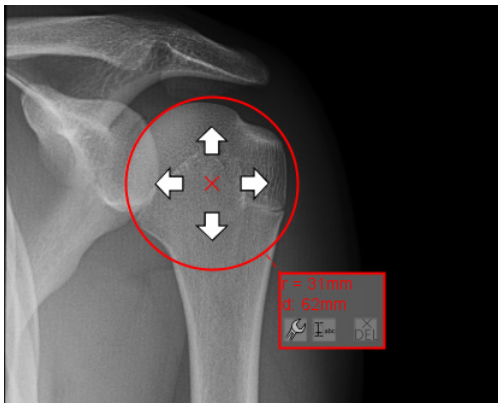


Figure 153. Move a shape

3.7.2.2. Move the edges of an element

Position the mouse pointer on an edge of the element to be moved (line, rectangle, etc.). Once this is displayed in the „active" colour (e.g. red) and no small squares mark its corners, the edge can be moved as a shape without changing its size or angles. Hold the left mouse button down and drag the edge to the required new position. Release the mouse button.

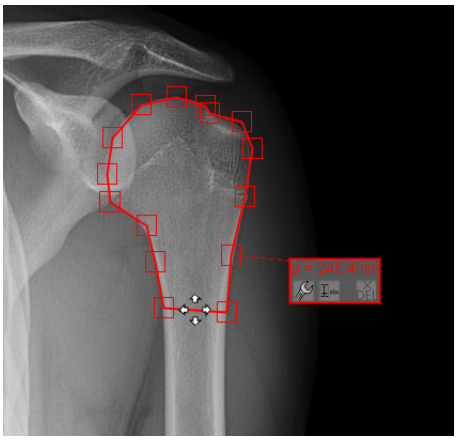


Figure 154. Move the edges of an element

3.7.2.3. Move a corner point

Position the mouse pointer near the corner of the element to be edited (line, rectangle, etc.). Once this is displayed in the „active" colour (e.g. red) and the small squares mark its corners, click on the corner point to be moved. The point can now be picked up and moved to a new position with the left mouse button held down. Release the mouse button.

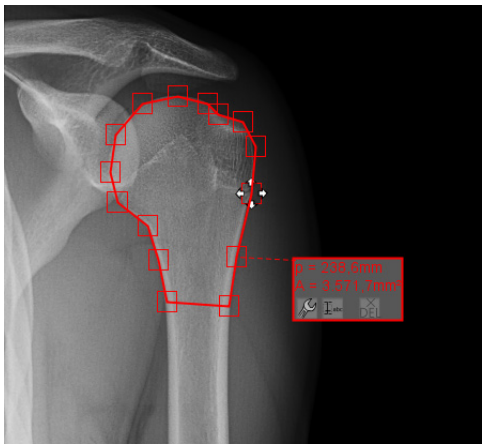


Figure 155. Move a corner point

3.7.2.4. Mark, move and rotate elements

Position the mouse pointer near the element to be marked (line, ellipse, etc.). Once this is displayed in the „active" colour (e.g. red), the element can be marked. Click on the element with the „Shift" key held down. The line of the element turns in a red dashed line when it has been marked. Further elements can be marked in the same way.

To move marked elements, hold the left mouse button down and drag the shape to the required new position. Release the mouse button.

With the „Ctrl" key and the left mouse button held down, the marked elements can be rotated around its centre of gravity.

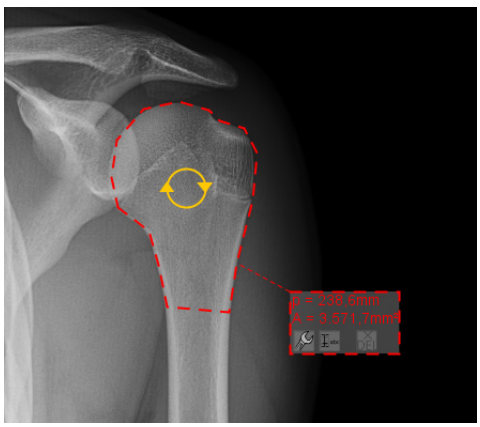


Figure 156. Marked element

To remove the marking, click next to the element without pressing a key.

3.7.2.5. Rotate elements without prior marking

Position the mouse pointer near to the element to be rotated (line, ellipse, etc.). Once it is displayed in the „active" colour (e.g. red) and no small squares mark its corners, the element can be rotated with the „Ctrl" key and left mouse button held down.

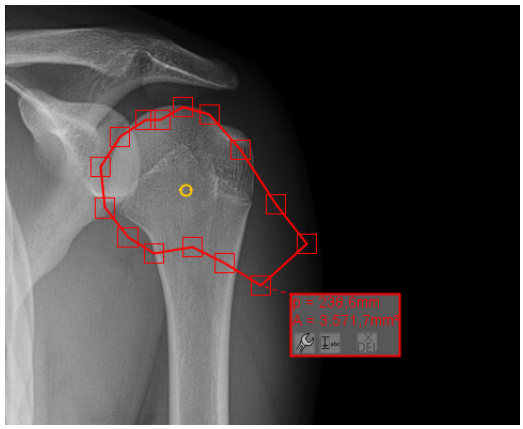


Figure 157. Rotate elements without prior marking

3.7.3. Annotations on/off

With a click on the button, all measurements and annotations are hidden or shown.

3.7.4. Delete an annotation

This tool is used to delete single measurements. After activating this tool, bring the mouse pointer over the measurement or annotation to be deleted. All lines, arrows and texts appearing in red as well as the black border tool will be deleted by a left mouse click.

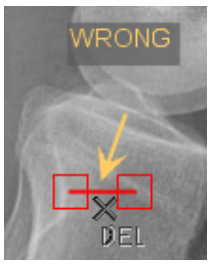


Figure 158. Remove a wrong annotation

3.7.5. Clear all annotations

With a click on this button, all measurements and annotations are deleted, except the black border tool.

NOTE

Please note that the action of deleting all annotations cannot be „undone".

3.7.6. Calibration of images

 If lengths or areas are to be measured in a specific measurement unit such as centimetres, a so-called reference scale is required. Modalities such as CT (computer tomography), MRI (magnetic resonance imaging), CR (computed radiography) or DR (direct radiography) usually include this reference scale in their images. Measurements may be taken at once.

In order to measure images that do not contain a reference scale, e.g. images acquired from an analog source such as arthroscopy, the reference scale has to be defined before measuring. This process is called calibration. Also DICOM images that have received a pixel spacing due to the calibration, can be recalibrated.

For calibration, a distance of a known true length is marked in the image. This distance might be the focus of the arthroscope, a ruler added in by the machine or other image details with a known length or diameter. To calibrate image material, it is necessary to place a reference object of known dimensions in the same height as the body part to be examined. E.g. metal balls can serve as reference objects; they should have the largest possible diameter to ensure the best possible accuracy.

The calibration can be preformed independent of the unit of measurement e.g. in mm, cm, dm, inch etc. The unit of measurement is automatically detected at the input. In the configuration dialog of the section „edit" (configuration button, tab „Annotation Common Options") the unit that should be used as default (mm, cm, inch) can be configured.

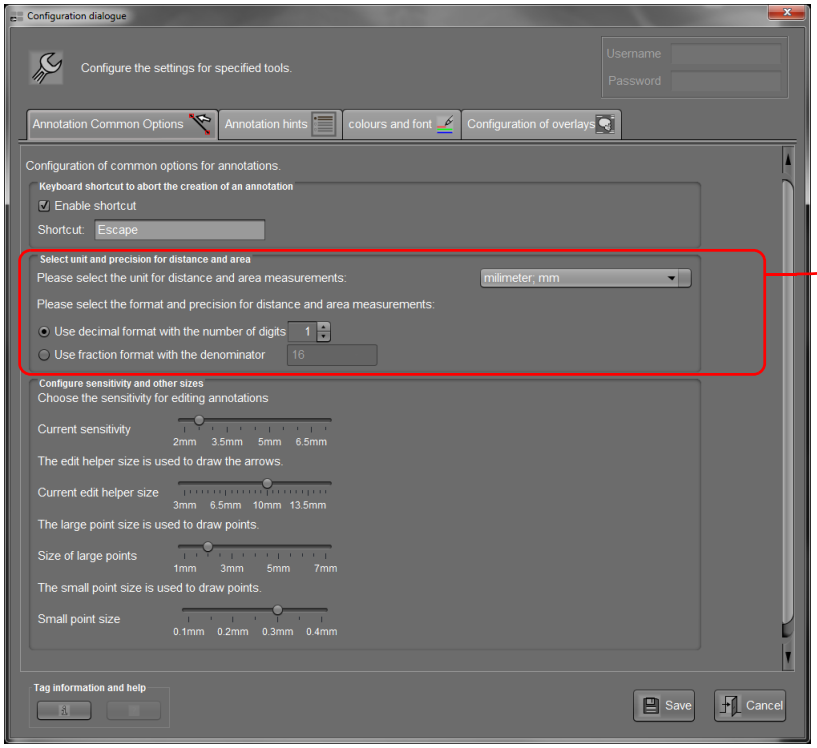


Figure 159. Selection of the measurement unit

For the calibration, a reference length has to be drawn in the X-ray image. Then a window opens, in which the reference length must be entered in the appropriate unit.

Start the measuring process by left clicking on the icon „calibrate image“. Then find the starting point of the distance to be marked. Click and hold the left mouse button on the starting point and then drag the mouse pointer to the finishing point. A window will open automatically for you to enter the known value and measuring unit (see screenshot below).

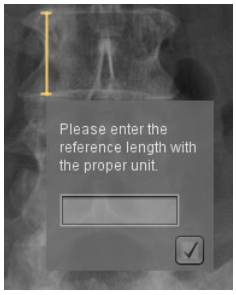


Figure 160. Calibrate image

If the calibration line has not been positioned accurately it is still possible to adjust it. Position the mouse pointer near the starting or ending point of the line until a small yellow square appears. Please click on the square, hold the mouse button down and drag it to the correct position. Should

the calibration line interfere with viewing the image, the whole line may be repositioned in the same way. A dashed line connects the measuring data with the line to visualise the connection. Once all of these are correctly positioned, press Enter.

Now the yellow line appears together with the entered value and measuring unit. All further measurements of distances or areas are now conducted with reference to the scale defined by you and shown on screen. It is also possible to draw lines or areas in an image first and calibrate later. The existing drawings will be marked with the correct value and unit afterwards.

If a warning dialog appears after the calibration, the reason is that the magnification factor is unusual. You should check the given value again for plausibility.

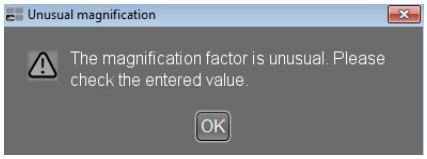


Figure 161. Warning dialog „Unusual magnification“

The specified reference length is displayed above the context menu and it can be corrected afterwards when clicking on the icon „calibrate image“. The screw wrench button below the given reference length allows you to change the color of the reference length; the „DEL“ icon deletes the annotation.

Figure 162. Calibrated image with the display of the reference length

To refer to a manual calibration on an already existing image, the following yellow warning symbol  is displayed at the top of the image. The additional calibration allows the measurement in patients. If you click the icon, the information on the manual calibration will be displayed and the magnification factor relating to the original image. When the magnification factor is below 0%, a note will is given to check the given value again. Furthermore it is possible to reset the calibration.

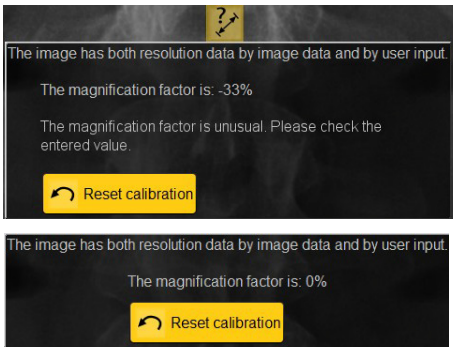


Figure 163. Symbol and note for the manual calibration for already calibrated images

3.8. Configuration dialog of the annotations

 The configuration dialogue appears by selecting the screw wrench icon and offers the settings for the specified tools.

3.8.1. Configuration of the annotation colour

With this configuration dialog, the colour and other settings of annotations can be edited according to the user's preferences.

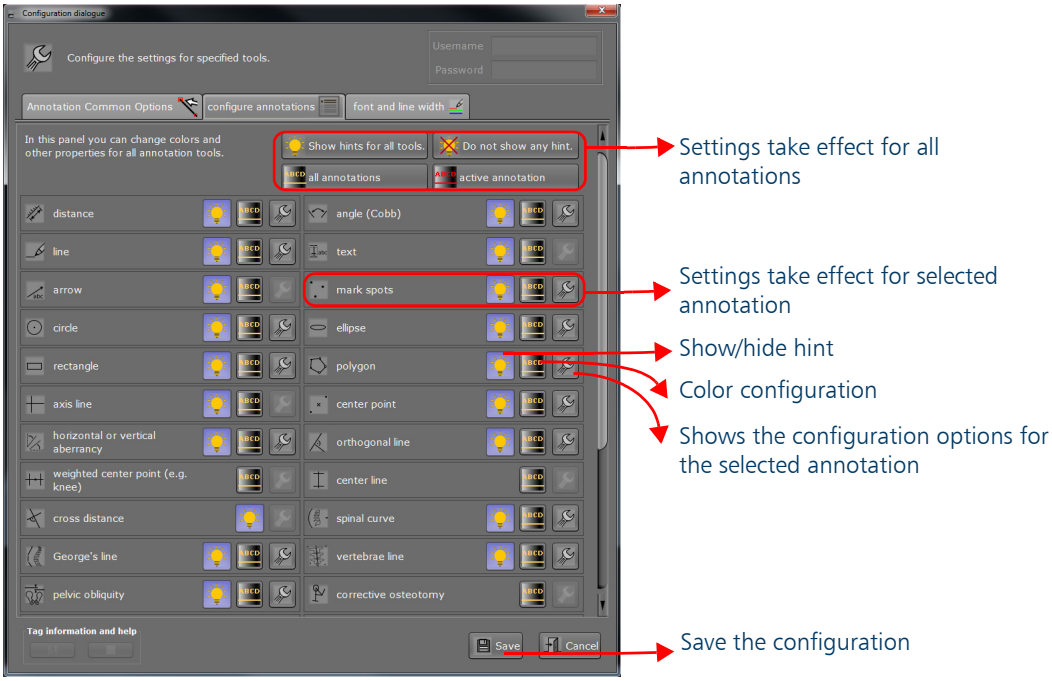


Figure 164. Configuration dialog configure annotations

NOTE

The active annotation colour is the colour which is shown while drawing and editing the annotation; the standard colour is the colour in which the annotations are displayed after the completion of the drawing.

If the check box next to „Colour" is ticked in the section active measurement(s), the active colour can be changed by clicking into the colour palette.

If an image is shown in the viewer, sample annotations are displayed in the active colour when the colour box is ticked. When the colour is changed, it is made immediately visible in the viewer.

3.8.2. Configuration of font and line width

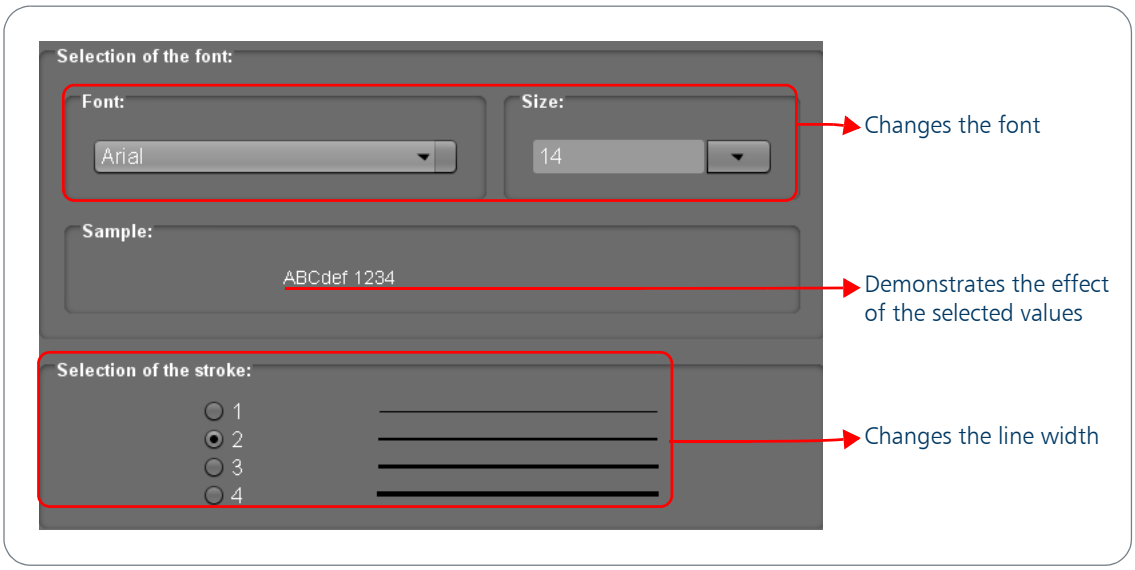


Figure 165. Font and line configuration

In the section „Font and line width", the favoured font can be selected. The font size can also be selected or directly typed into the selection field. Changes to the font are immediately visible in the sample text below.

The line width of the annotations can be selected by clicking into the round boxes next to the different line widths.

3.8.3. Configuration of the position marker Left/Right

In this configuration dialogue, it is possible to predefine the position markers.

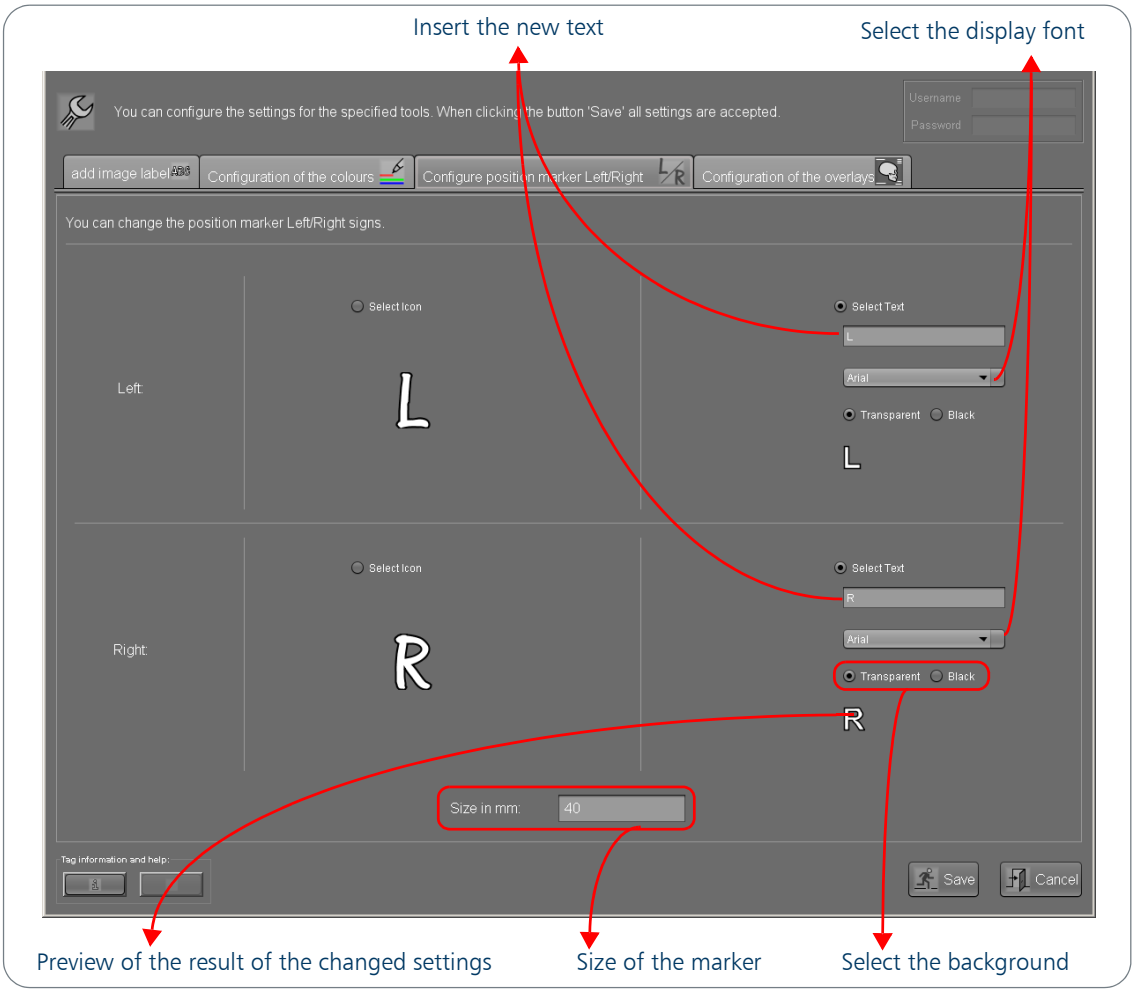


Figure 166. Configuration dialogue box of position marker Left/Right

To predefine a position marker activate „Select Text" and define the settings. Otherwise the default marker will be used. Enter the new text into the input field and select the font which should be used. The font size can be changed, also the background of the text can be set black or transparent. Additionally the size of the marker can be edited. Therefore, simply change the value. The images must be calibrated so the specific size of the marker can be used.

3.8.4. Configuration of the overlays

In this configuration dialogue, the overlays for all or for different output devices (e.g. monitor, print and export) can be edited. Overlays are information that is incorporated in DICOM images, like e.g. patient data, modality, creation date and further examination-related data.

The following image shows examples of different overlays.

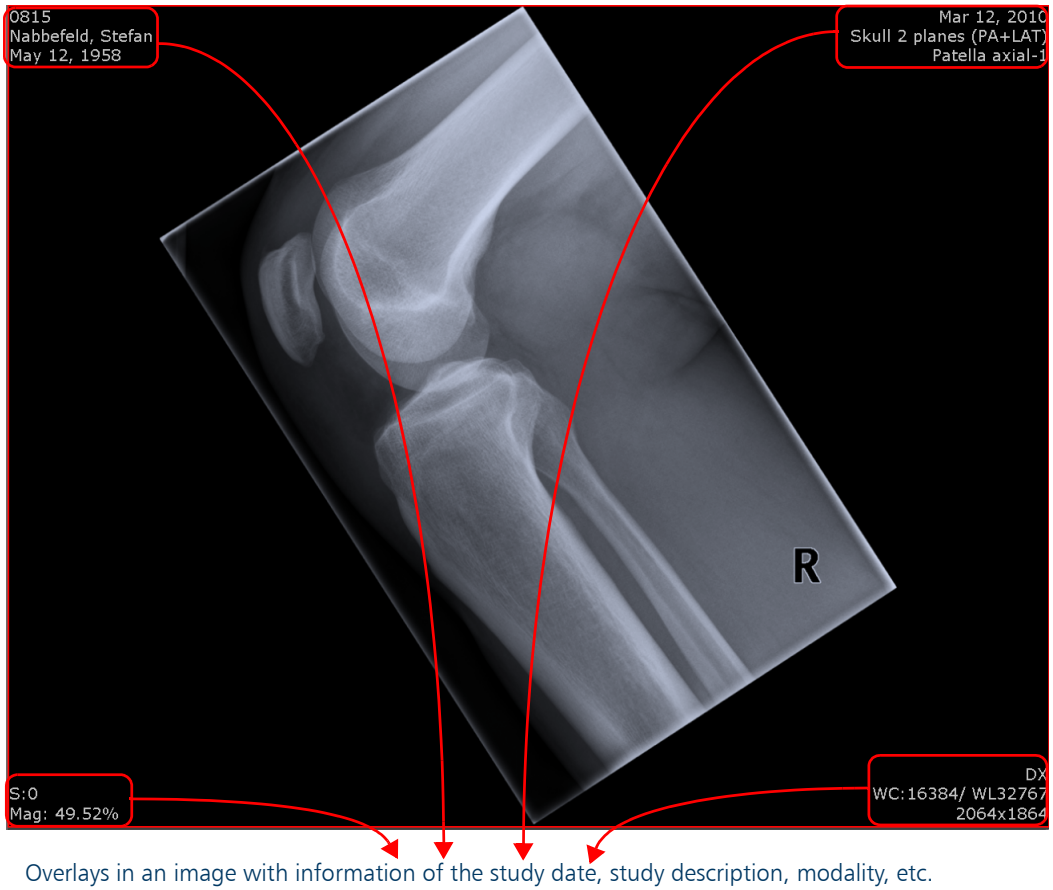


Figure 167. Image including overlays

If for example a CR image is loaded, the overlays for all CR images are configured. When exiting the dialogue, the CR image is shown with the newly configured overlays.

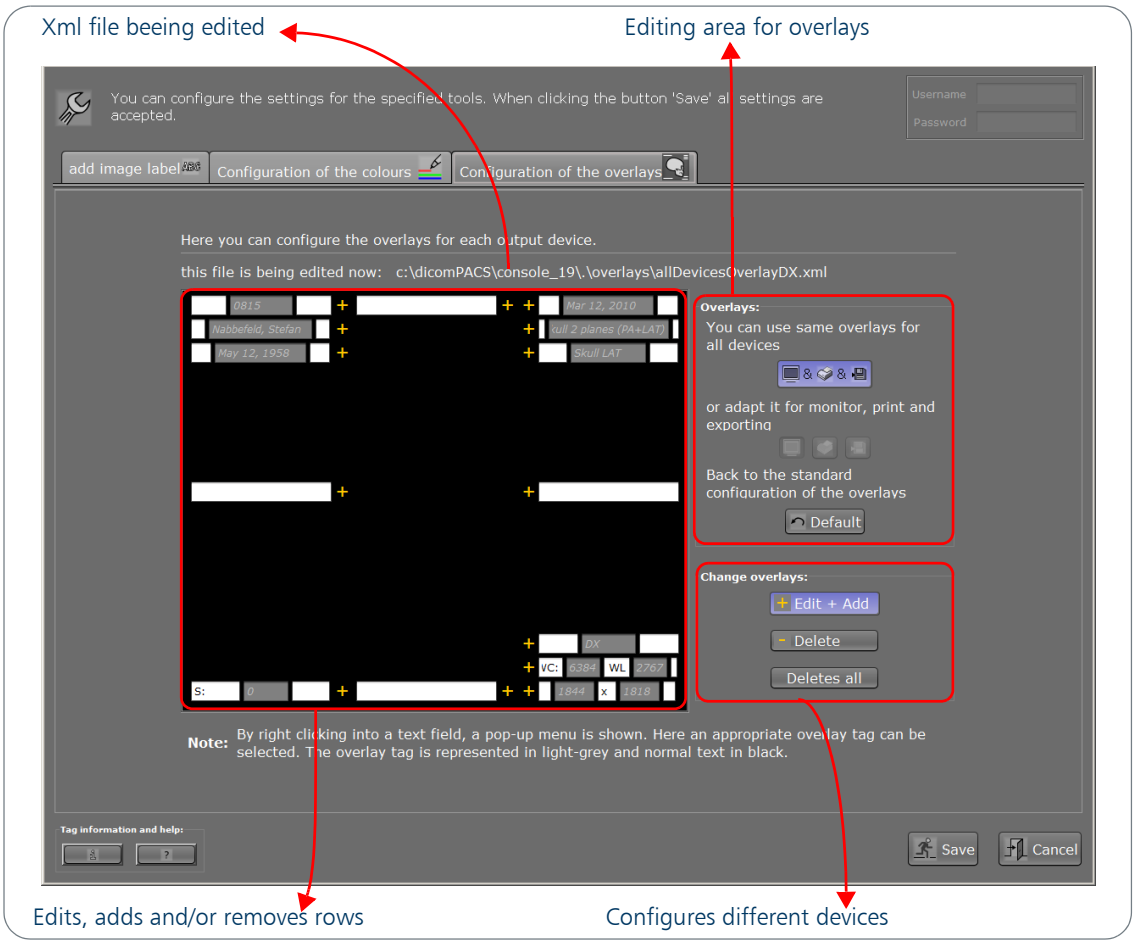


Figure 168. Configuration dialogue for overlays

Overlays can be configured for all output devices (monitor, print and export). The button for all devices is activated and the buttons for the specific devices are greyed out and cannot be selected. If something is changed, it affects the display of the overlays for all devices. There is only one configuration file (XML file) that is generated.

The display of overlays can also be configured separately for the respective devices. The button for all devices has to be deactivated by left clicking on the mouse. Afterwards the configuration for the monitor is shown. By clicking on the according buttons, the respective configuration can be displayed and edited. A configuration file (XML file) is created for each device. In order to return to the display for all devices, the according button is again to be activated. After that the files for the different devices are deleted.

By clicking on the „Default" button, the standard configuration of the overlays is displayed. From here, new changes can be entered.

When the button „Edit + Add" is selected, text can be written into the lines with a mouse click. The text is shown in black. When right clicking into a text field, a pop-up menu appears from which the overlay tag can be selected.

NOTE

An overlay tag is a part of the information stored in the image, e.g. patient data or study data. The overlay tag is shown in light grey. If no overlay tag is to be inserted, the pop up menu can be closed by clicking outside of the pop up window or by pressing the „Esc" key. If a tag is already contained in an overlay tag field (black background), the pop up menu appears at a left or right mouse click. The overlay tag can be changed.

Figure 169. Example of an overlay tag

Clicking again outside the pop up menu before selecting another tag will close the pop up window without applying any changes.

Clicking on the „plus" button (+) before clicking in the text field will insert a new line below the text field.

When the „Delete" button is selected, a „minus" button (-) appears before the text field.

If there is more than one row at a given position (e.g. top left), the entire row is deleted by clicking on the „minus" button. If there is only one row at a position, only the contents of the row is deleted; the text field is not deleted so that new entries can be inserted.

By clicking on the button „Deletes all", all text fields are deleted, so that no overlays remain. All rows are deleted and an empty text field appears at each position.

3.8.5. Configuration of the image label

In this configuration dialogue it is possible to predefine image labels. It is possible to individualise the label to the user's needs by defining font sizes and predefining texts.

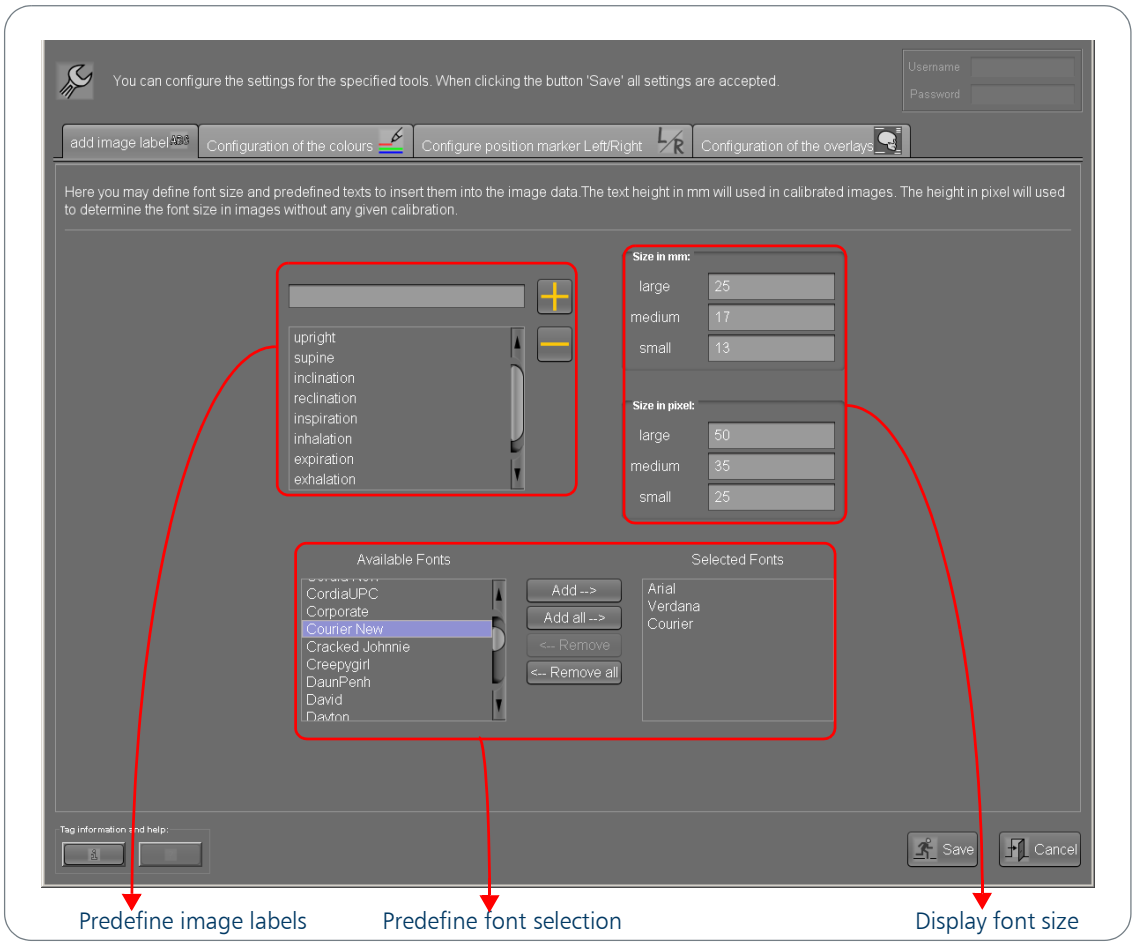


Figure 170. Configuration dialogue box Add image label

The font size in millimetres is used for calibrated images and the font size in pixel is used for not calibrated images. For both options it is possible to define three size steps (large/medium/small). This preselection and the preselection of the fonts are used for the according tool. To predefine a label enter the text into the input field and press the plus button. The text then appears in the list with predefined image labels. For removing labels from the list select the entry and press the minus button.

3.8.6. Configuration of the Flipped Hint

With this dialogue it is possible to configure the size and the font of the hint that the image is flipped.

Each change is directly displayed in the preview.

The possible font size has a range from 4 to 16 mm; and a great variety of different fonts can be selected.

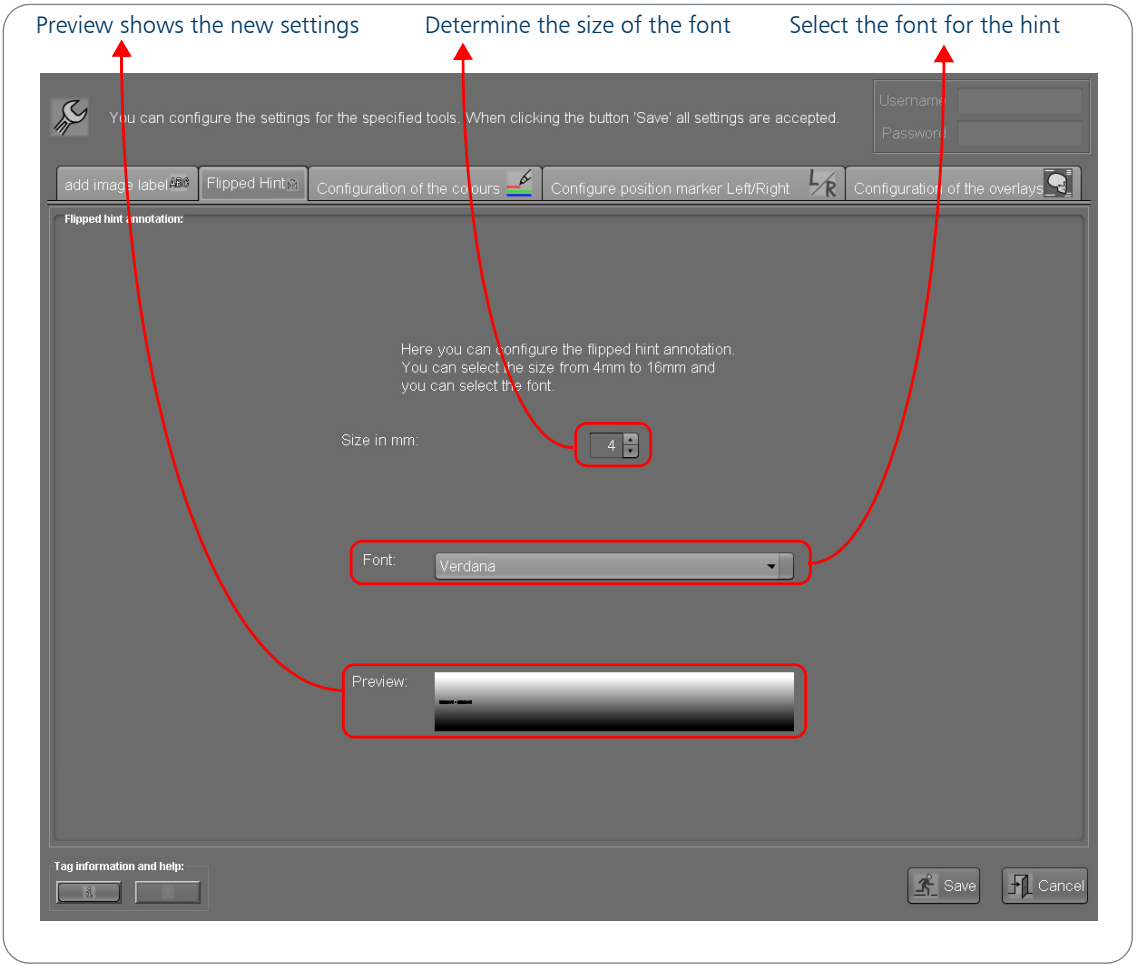


Figure 171. Configure the hint of a flipped image

3.8.7. Tool area turn / mirror

Figure 172. Turn / mirror

Images can be rotated by 90° clockwise or counterclockwise as well as flipped horizontally or vertically. By clicking on „reset orientation", the image returns to its original orientation.

The user may furthermore define keyboard shortcuts for accessing the turn/mirror tools.

3.8.8. Tool area grid

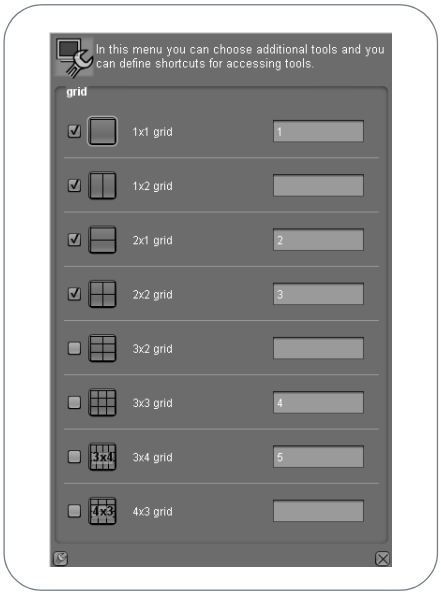


Figure 173. Grid

In the tool area grid, the user may divide the working area into various grids, for example to compare images. The user may furthermore define keyboard shortcuts for accessing the different grid options.

NOTE

A qualified service engineer can easily configure even larger grids.

3.8.8.1. Configuration dialog for grids

The grid configuration dialogue offers the opportunity to create a grid for the viewer display as well as for series. Thus, it is possible to use individually configured grids for the toolbar. The display of the grid icons and descriptions can be changed between „row x column" and „column x row". By using the configuration dialogue, it is possible to delete existing grids or those that are configured incorrectly.

To create a new grid, the configuration dialogue has to be opened, therefore select the screw wrench icon at the left lower corner inside the toolbar menu of the grid section. When clicking on the icon, the following configuration dialogue opens.

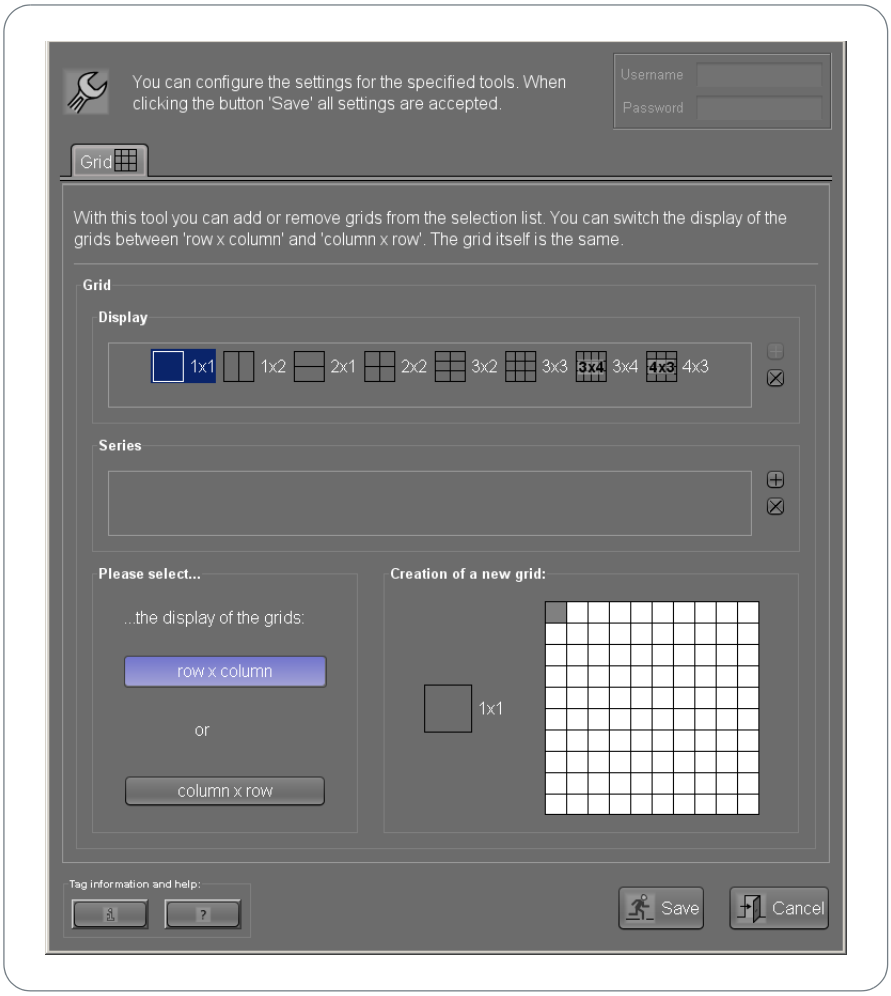


Figure 174. Create and configure grids

All existing grids are displayed inside the dialogue according to series or to a display. A new grid can be configured or the display of the grid icons and descriptions can be changed. After the changes have been made, close the dialogue using the „Save“ button.

Create and add a new grid

To create a new grid it must be drawn inside the section „Creation of a grid“, e.g. a 2x5 grid. For drawing a grid in the specified area, press the left mouse button in it and drag the mouse to select the preferred grid size. The grid size is immediately shown next to the drawing area on the left.

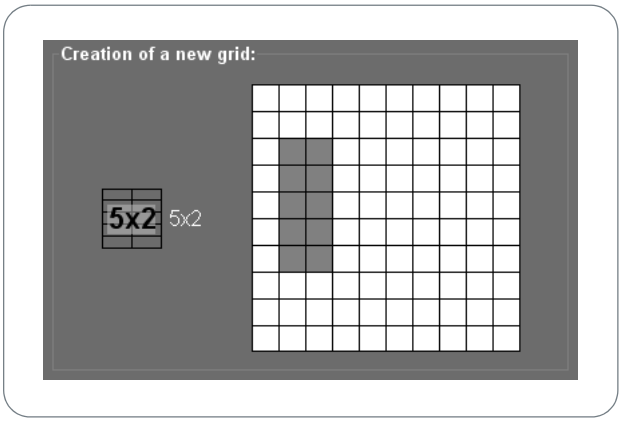


Figure 175. Draw a new grid

When the preferred grid is drawn, it should be added to the display section or to the series of the graphic displays. Press the „+“ button besides the according section (marked red in the image below).

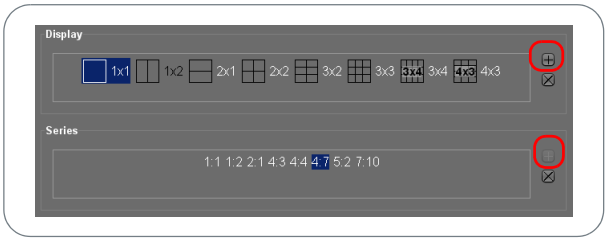


Figure 176. Add a new grid

The grid is added and available inside the toolbar menu of the grid section immediately after adding it.

Figure 177. Toolbar menu of the grid section

The newly configured grid can be used like the default grids.

Display option of the grid

The user may switch between the display option of the grid icons and descriptions, which means to switch between „row x column“ and „column x row“. All grids are displayed as „row x column“ by default.

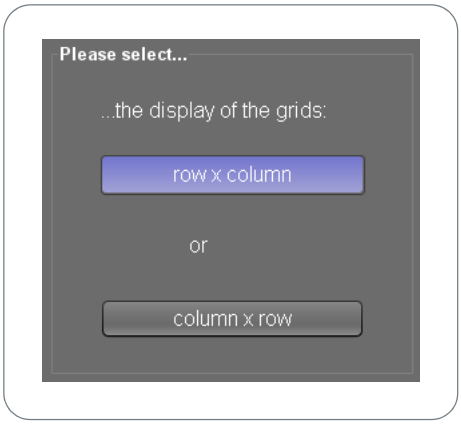


Figure 178. Configure the display option

To change the display option, select the preference by pressing the according button.

Delete a grid

To delete a grid, open the configuration dialogue of the grid section. Select the grid to be removed and press the „x" button next to the according section on the right (marked red in the image below).

Figure 179. Delete a grid

3.8.9. Tool area brightness

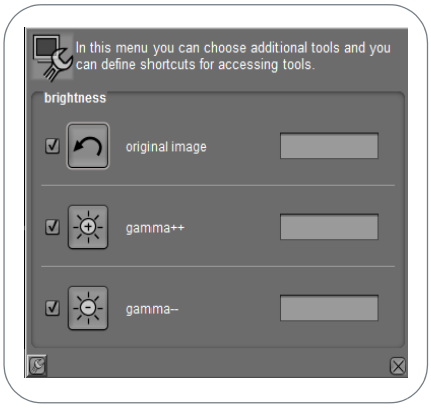


Figure 180. Brightness

In the tool area brightness, the user can configure the perceived brightness of an image. The user may furthermore define keyboard shortcuts for accessing the brightness tools.

NOTE

The function of the brightness buttons in the X-ray view differ from the tool are brightness in the viewer. In the X-ray view, the values are assumed when the image is accepted. In the tool area brightness this is not the case.

PRACTICAL HINT

The window levelling can be adjusted by pressing the right mouse button and moving the mouse up and down, see page 156.

3.8.9.1. Brightness tools

Original image - Reset the image to default

With a click on the original image button, all brightness changes (dynamics) are reset to the default setting and the original image is displayed.

Gamma ++/-- - Change the perceived brightness of an image

The gamma ++ and gamma -- tools allow the user to brighten or darken the image. This is achieved by changing the dynamic range of the image (gamma curve).

3.8.9.2. Configuration dialogue of the brightness tools

The configuration dialogue appears by selecting the screw wrench icon and offers the settings for the specified tools.

Colour LUT

It is possible to define coloured LUT. The preset blue is the default setting and can be deactivated or configured in this dialogue. Therefor it is necessary to login to unlock the controls.

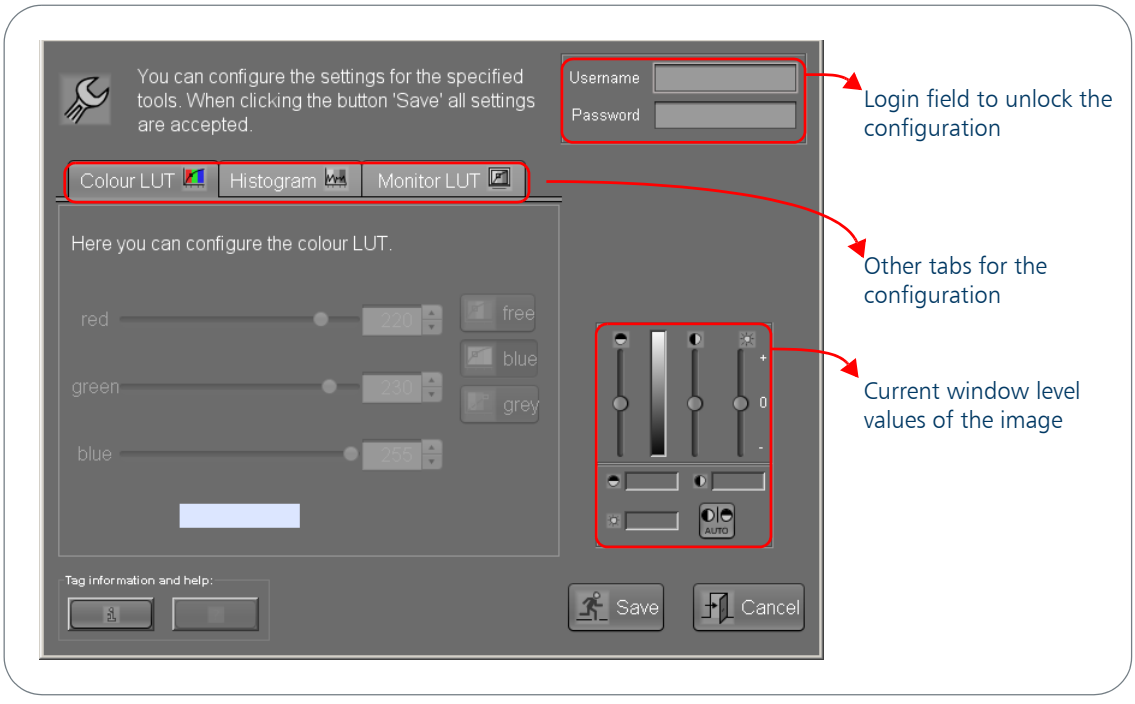


Figure 181. Colour LUT tab

Histogram

The window level values are shown and can be adjusted in this histogram by moving the coloured, vertical line.

> **PRACTICAL HINT**
>
> To use this tool it is advisable to enlarge the dialogue by dragging the corner holding the left mouse button down. This is useful to get a more detailed histogram.

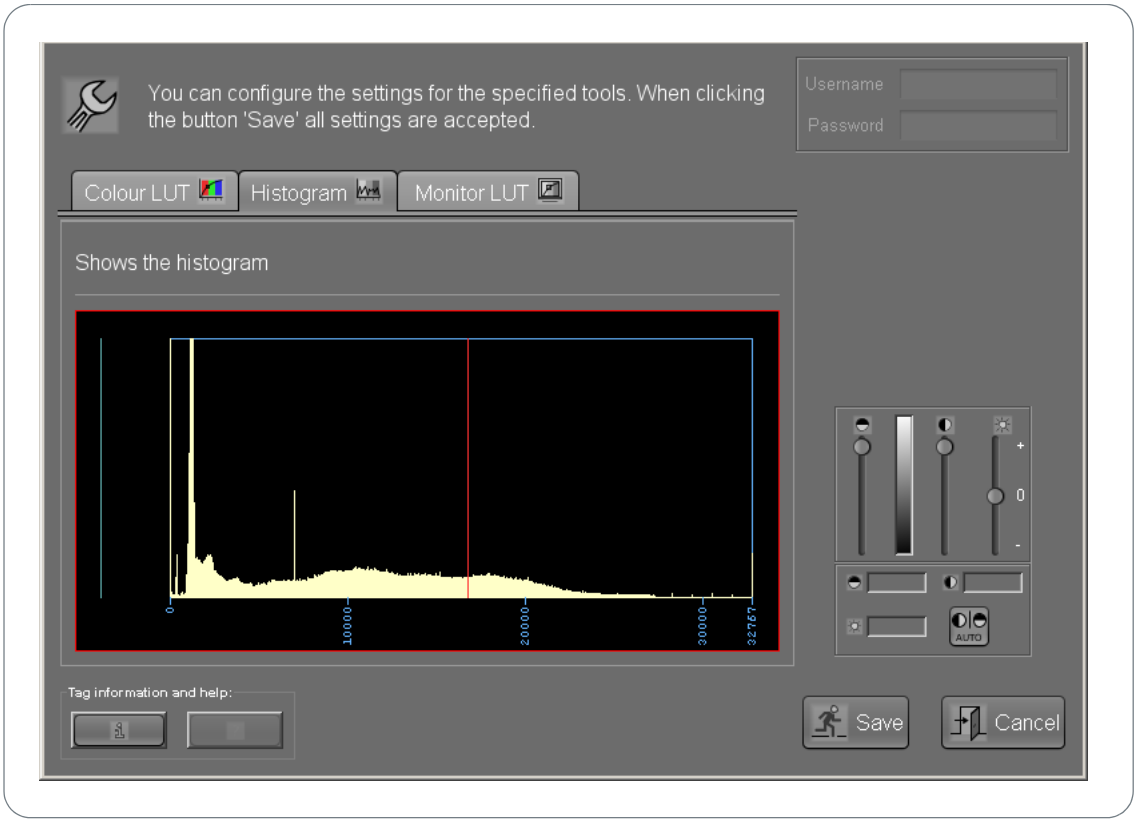


Figure 182. Histogram tab

Monitor LUT

The monitor LUT can be used to adapt the grey values of the monitor if not realised by the graphic card or the monitor directly.

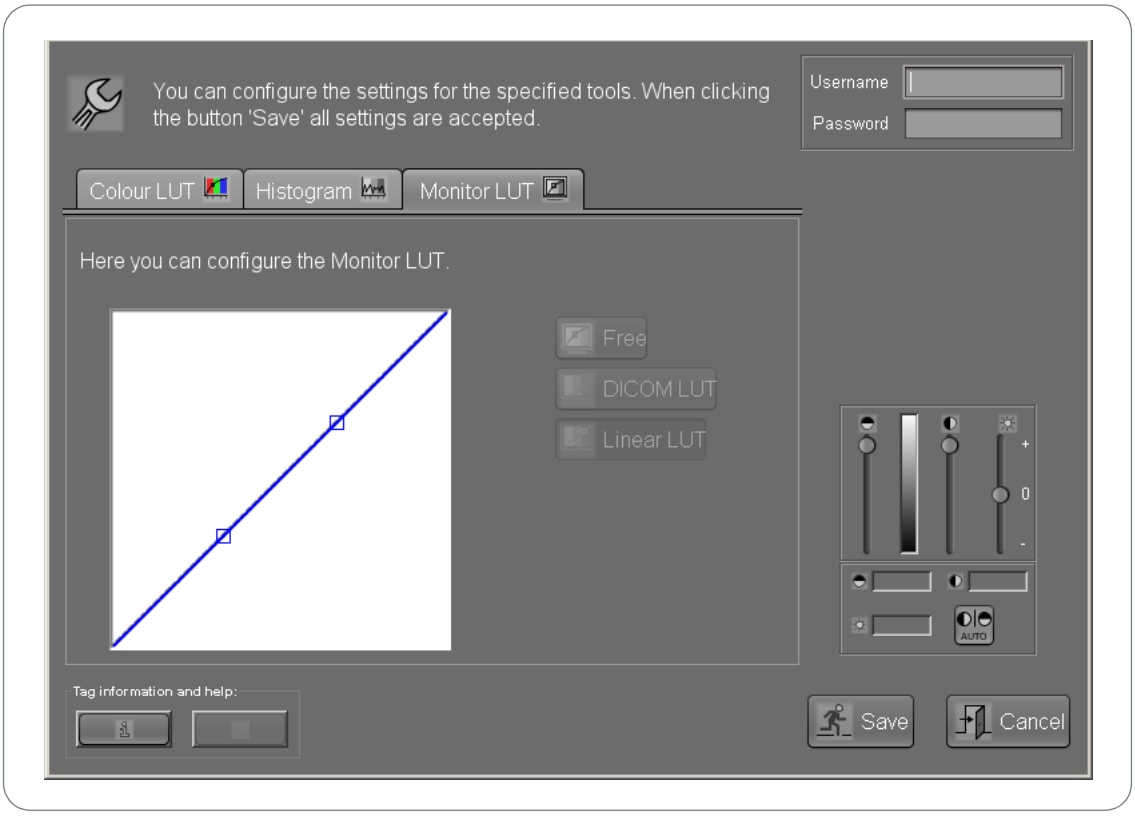


Figure 183. Monitor LUT tab

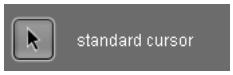
3.8.10. Tool area image selection

Figure 184. Image selection

In the tool area image selection, the user can configure the tools which facilitate to work with the images in the viewer. The user may furthermore define keyboard shortcuts for accessing the image selection tools.

3.8.10.1. Image selection tools

Standard cursor - default cursor



The selection of this tool deactivates the last selected tool and returns the default mouse pointer.

PRACTICAL HINT

It may be useful to allocate the key „Esc" to this tool, so that the default mouse pointer will always be displayed by pressing „Esc".

Tools for right mouse button - allocate a tool to the right mouse button

The right mouse button can be used for three different functions: magnifying glass, window levelling (brightness and contrast) and zoom. Each function can be selected from the configurator and in addition, the user may define keyboard shortcuts for the different functions.

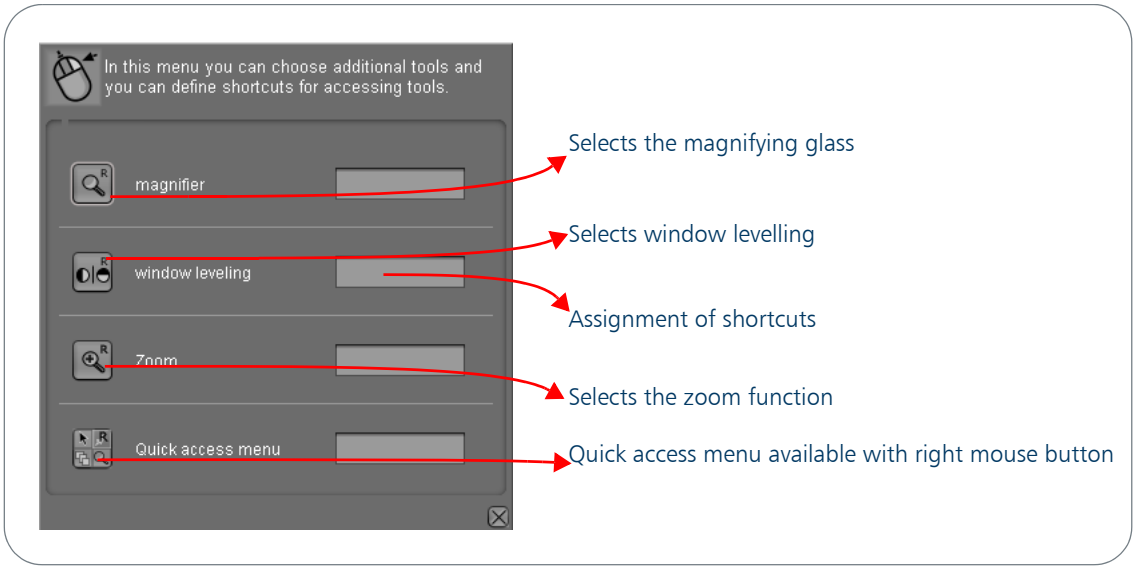
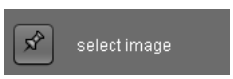


Figure 185. Tools for right mouse button

Select image - select an image (pick-up tool)



With the activated pick-up tool, images can be selected on the navigation bar or within the working area. Serial numbers are allocated to the selected images which are shown in yellow at the upper left corner in the working area next to the pick up icon. The purpose of this function is to prepare a selection of images for further use, i.e. printing or export. The size of the images that have been picked up with the tool is also shown in the information bar on the right next to the pick-up icon, see page 156. The display is convenient e.g. when burning CDs in order to know the size of the data.

Deselect all images - remove a selection

This tool removes the selection and serial numbers of all images with one click.

3.8.10.2. Configuration dialogue for the image selection tools

By selecting the screw wrench icon, the configuration dialogue of the quick access menu is displayed. In this dialogue it is possible to assign the quick access menu to the middle mouse button by clicking on the corresponding checkbox to activate the function.

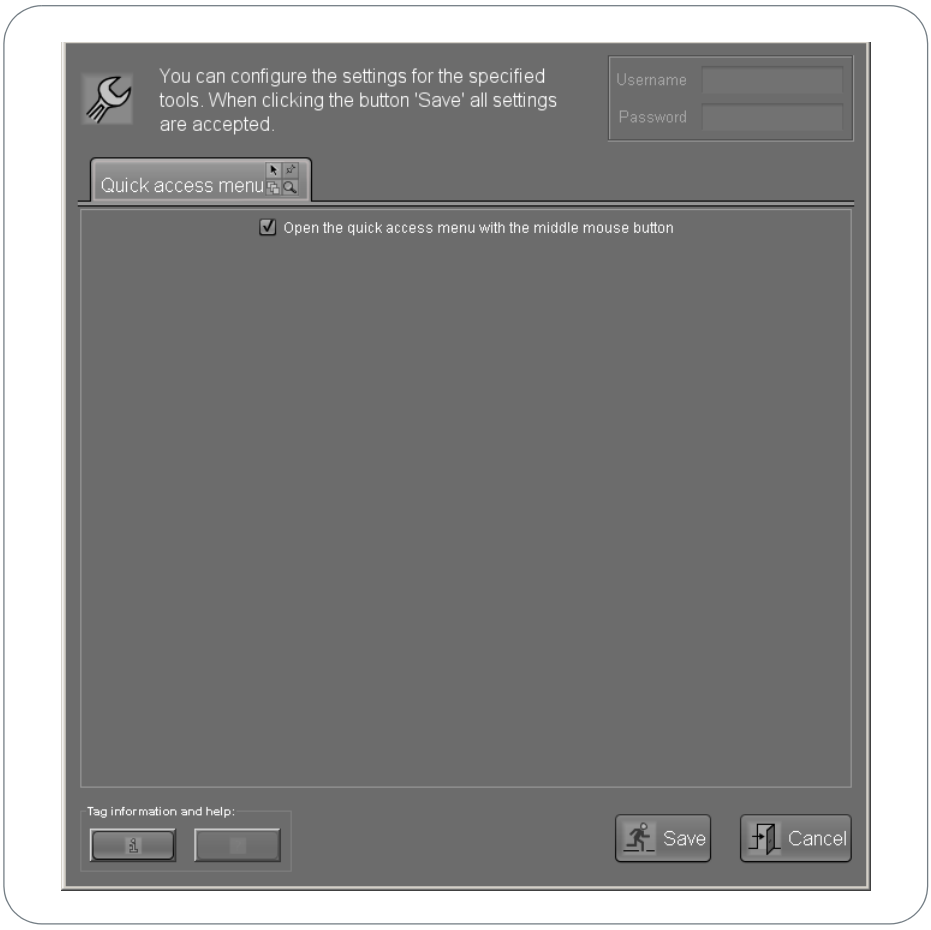


Figure 186. Configuration dialogue of quick access menu

3.8.11. Tool area magnifier / zoom

Figure 187. Magnifier / zoom

In the tool area magnifier/zoom, the user can configure the zoom tools. The user may furthermore define keyboard shortcuts for accessing the zoom tools.

3.8.11.1. Magnifier / zoom tools

Magnifier - mouse pointer as magnifier

The magnifying glass is activated by clicking on this button. The activation of tool is indicated by a mouse pointer in the shape of a magnifying glass, which can be moved across the image. When the left mouse button is held down, the magnifying glass takes effect. The magnification is always 100% above the zoom factor of the displayed image. If the image is displayed at zoom factor 100% (original resolution), the area within the magnifying glass is displayed at a zoom factor of 200%, i.e. enlarged by 100%. When the tool is active and the left mouse button is held down, the user may also select the preferred masking of the magnifier as described in the help text.

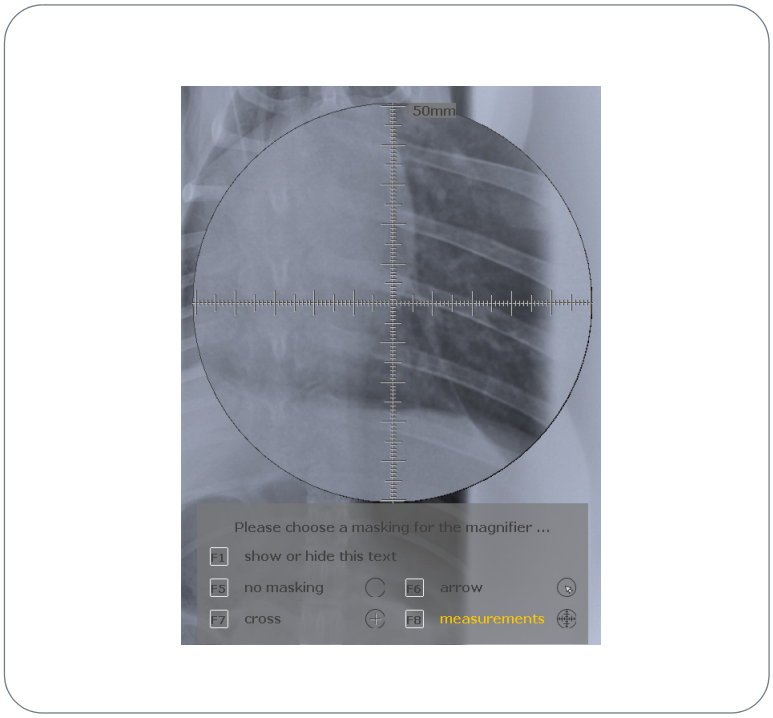


Figure 188. Magnifier with selectable masking

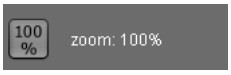
NOTE

The magnification process is based on the interpolation of pixels in order to achieve the impression of a smooth image.

PRACTICAL HINT

By , the magnifying glass is activated with the left mouse button and moving the scroll wheel. The user may however also allocate this tool on the right mouse button, if no other tool (e.g. window level) should be activated via the right mouse button – please see the section tool area image selection for further information on page 156.

Zoom: 100% - 100 percent representation of the image



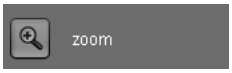
After activating this tool, the active image is set to its original resolution within its current grid area. This means that each pixel of the displayed image is displayed as exactly one pixel on the screen. The image is displayed in the original resolution, which means that the complete image information is shown.

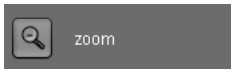
This tool is especially important for all images whose original resolution is greater than it can actually be displayed on a screen, e.g. digital X-ray images. These images are generally scaled down in order to display them as a whole, so that only part of the image information is shown. It is very important to view all of the information when making a primary diagnosis. This can be achieved by clicking on the 100 % button. Certainly it is possible to enlarge the image further by using the zoom tool.

NOTE

The 100 % representation of the image does not conform to the actual size of the depicted object (measured in cm or similar) but only to the resolution of the imaging device (CR, DR).

Zoom - Zoom +/- (in / out)





When clicking on one of these buttons, the active image is enlarged or scaled down in pre-determined steps. The same is achieved by:

- pressing the right mouse button and turning the mouse wheel
- placing the mouse pointer in the overview image and turning the mouse wheel
  or
- holding down the „Ctrl" key and turning the mouse wheel while the image is activated in the working area.

Fit image - fit an image to the grid area

When pressing on this button, the entire active image is displayed in its grid area and fitted to its size (e.g. it is scaled down or enlarged).

Fit width - fit an images to the grid width

By clicking on this button, the currently active image is fitted to the width of its grid area.

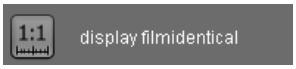
Black border on/off - activate and deactivate the black border

The digital X-ray process usually creates troublesome white borders around an image. By clicking on the black border on/off button, a black border frame can be activated and deactivated. If the black border is activated, the white borders around the image are coloured black. When the black border is deactivated, the white borders around the image will be displayed again.

NOTE

In the toolbar, the currently active image is shown as an overview. Here it is easily visible whether the black border is activated. If it is, the border is represented by hatching. If the black border is deactivated, the image is shown as when it was taken.

Display filmidentical



By clicking on this icon the current image is displayed filmidentical, that means in the same scale like on conventional x-ray film. To use this tool it is necessary to calibrate the monitor. This can only be done with administration rights.

Figure 189. Display filmidentical

3.8.11.2. Configuration dialog of the magnifier/zoom tools

By selecting the screw wrench icon, a configuration dialogue for the magnifier and zoom tools is displayed.

The tab Interpolation may only be configured by the administrator.

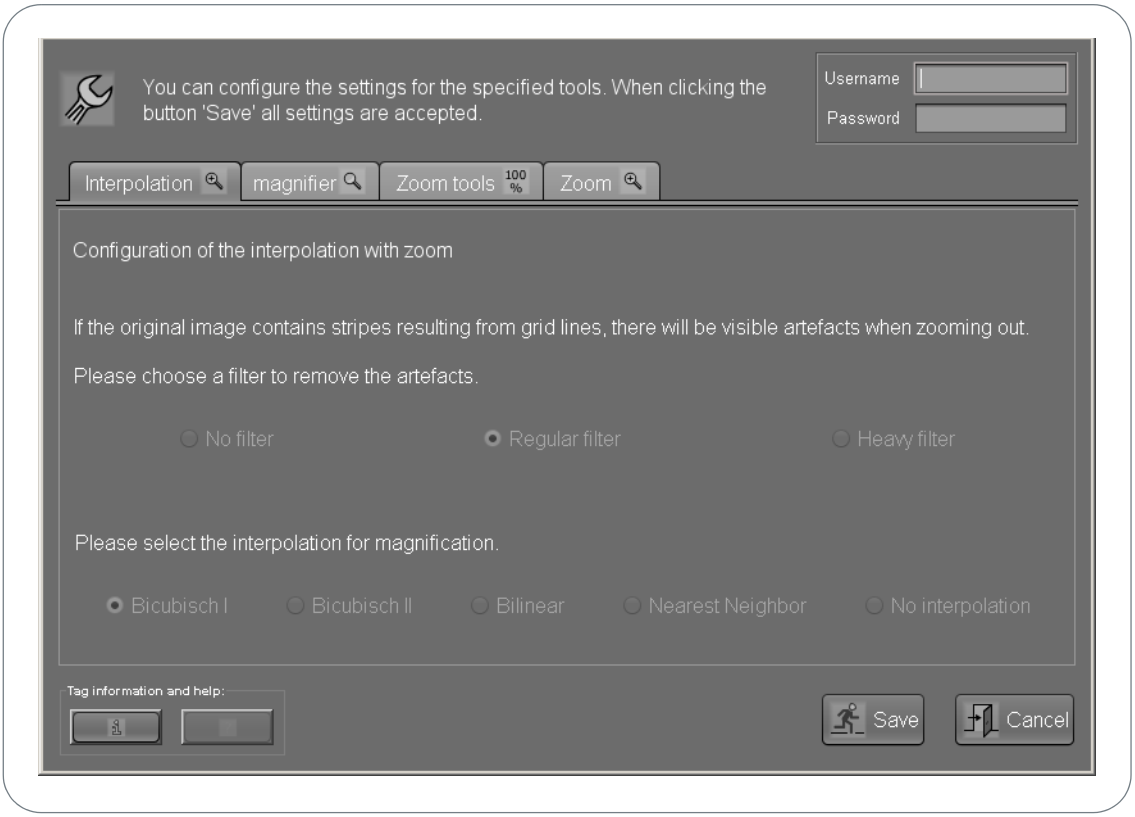


Figure 190. Configration tab Interpolation

In the tab magnifier, it is possible to configure the magnifier size in pixel, the magnification and the display of the help text.

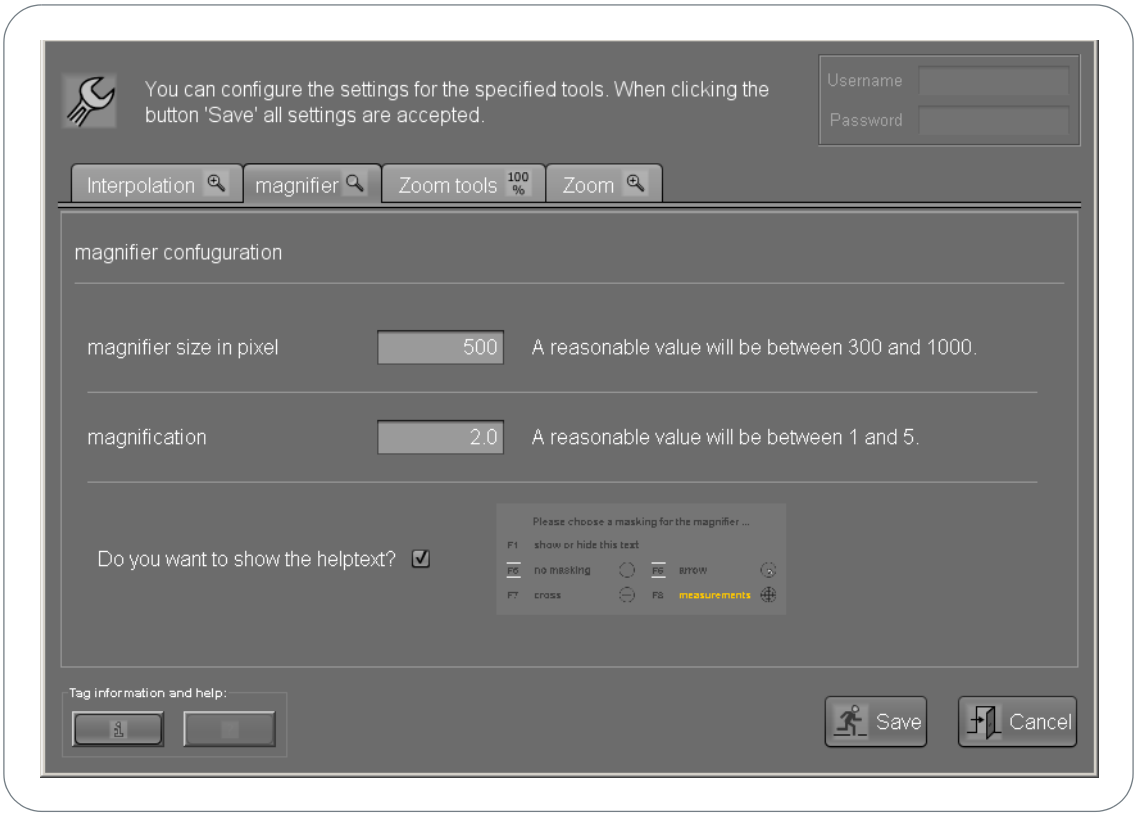


Figure 191. Configuration tab magnifier

There are several ways to zoom into images. In the configuration dialogue of the toolbox magnifier/ zoom you can find the tab Zoom tools and Zoom to individualise the zoom options.

In the tab Zoom tools, the user can configure any number of new zoom tools, which enlarge the image by the set zoom factor, e.g. 35%. This works analogue to the already available 100% zoom tool.

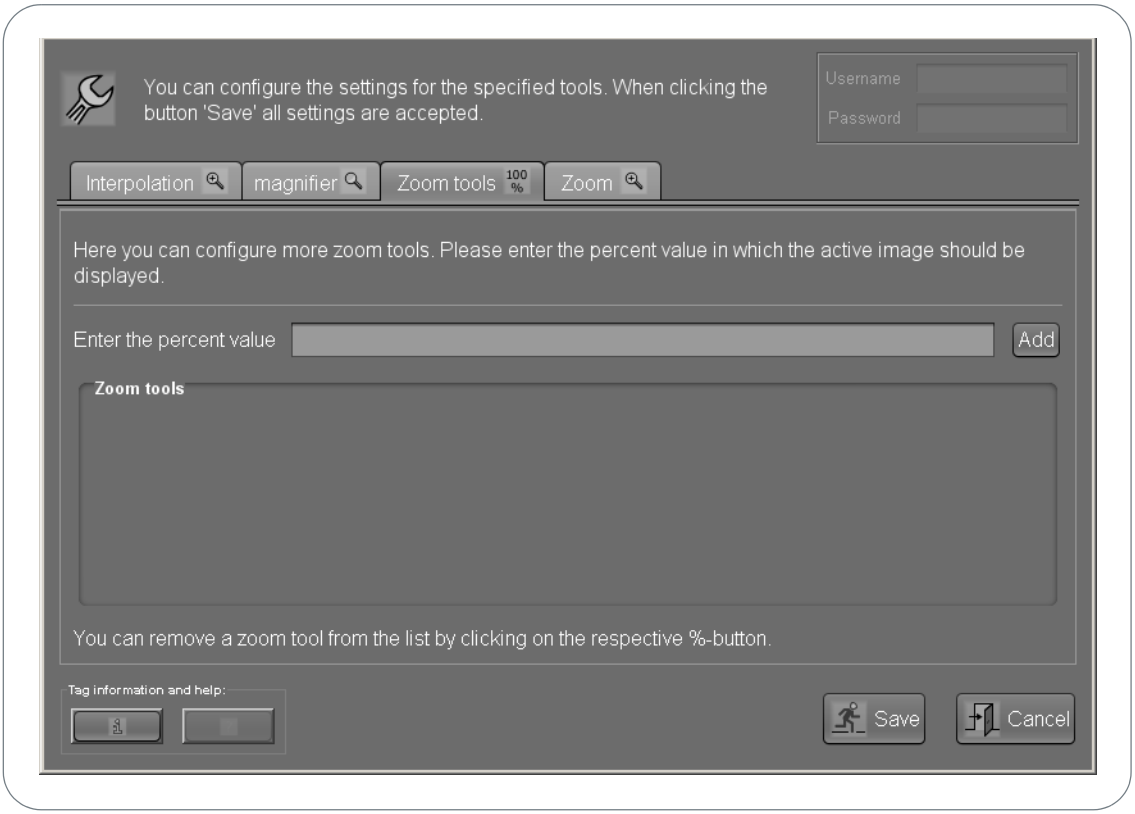


Figure 192. Configuration tab Zoom tools

In the tab Zoom, the user can set the zoom factor by which the image is enlarged when selecting the zoom tool. The user can also set the zoom factor for zooming with the use of the mouse wheel + Ctrl key.

Additionally, it is possible to zoom with the left mouse button + mouse wheel and configure the zoom factor in the configuration dialogue.

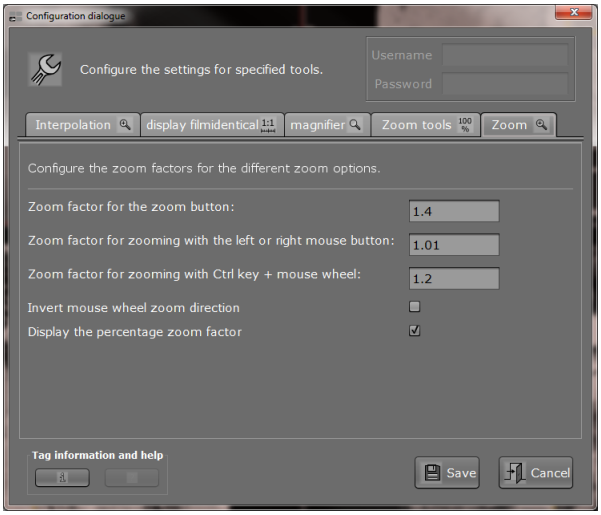


Figure 193. Configuration tab Zoom

The display of the percentage zoom factor can be configured individually for each user profile and is stored accordingly. If the option is selected, the percentage zoom factor is displayed in the lower left work area as „Mag: xxx%".

3.8.12. Tool area management

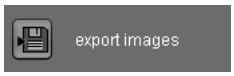
Figure 194. Management

The management tools allow working with the archive. It is possible to create a finding or to archive images on an external medium, using the patient CD functionality. The user may furthermore define keyboard shortcuts for accessing the management tools.

Using the configuration dialogue of this tool area, it is possible to configure or change the practice stamp or to edit the export directory and formats.

3.8.12.1. Management tools

Export images



The export of images is initiated via the following dialogue box after clicking on the icon for exporting images.

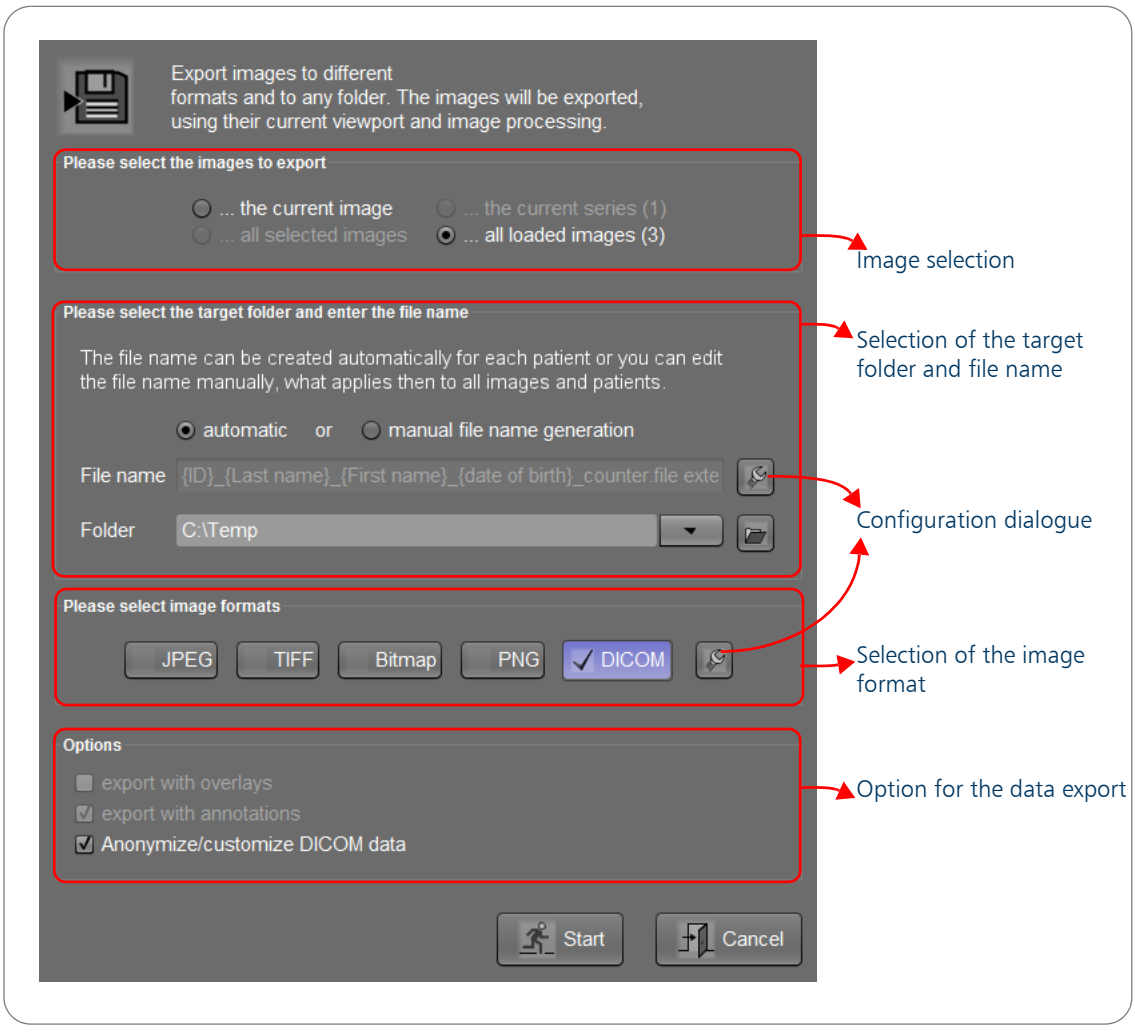


Figure 195. Export images

The user can choose between exporting the current image, all selected images (which were selected with the select image tool of the toolbox image selection, see page 156), the current series or all loaded images.

The file name of the data to be exported can be individualised by a manually given file name or an automatically generated name. The appropriate option is to be selected.

If „manual file name generation“ is selected, the user simply has to write in the name of the data in the field file name.

The automatically generated option can be customised by selecting between given parameters that should appear in the file name.

The screw wrench button next to the data field „file name“ opens the configuration dialogue.

The following parameters, that form the file name, can be selected and deselected by clicking on the checkboxes:

- ID
- Last name
- First name
- Date of birth
- Sex

NOTE

The manual file name generation is always used for all images that are loaded, irrespective if the data belongs to different patients.

The export target folder can also be configured in the configuration dialogue.

Two options are possible:

- to always use the same given directory or
- to set the last used directory as default

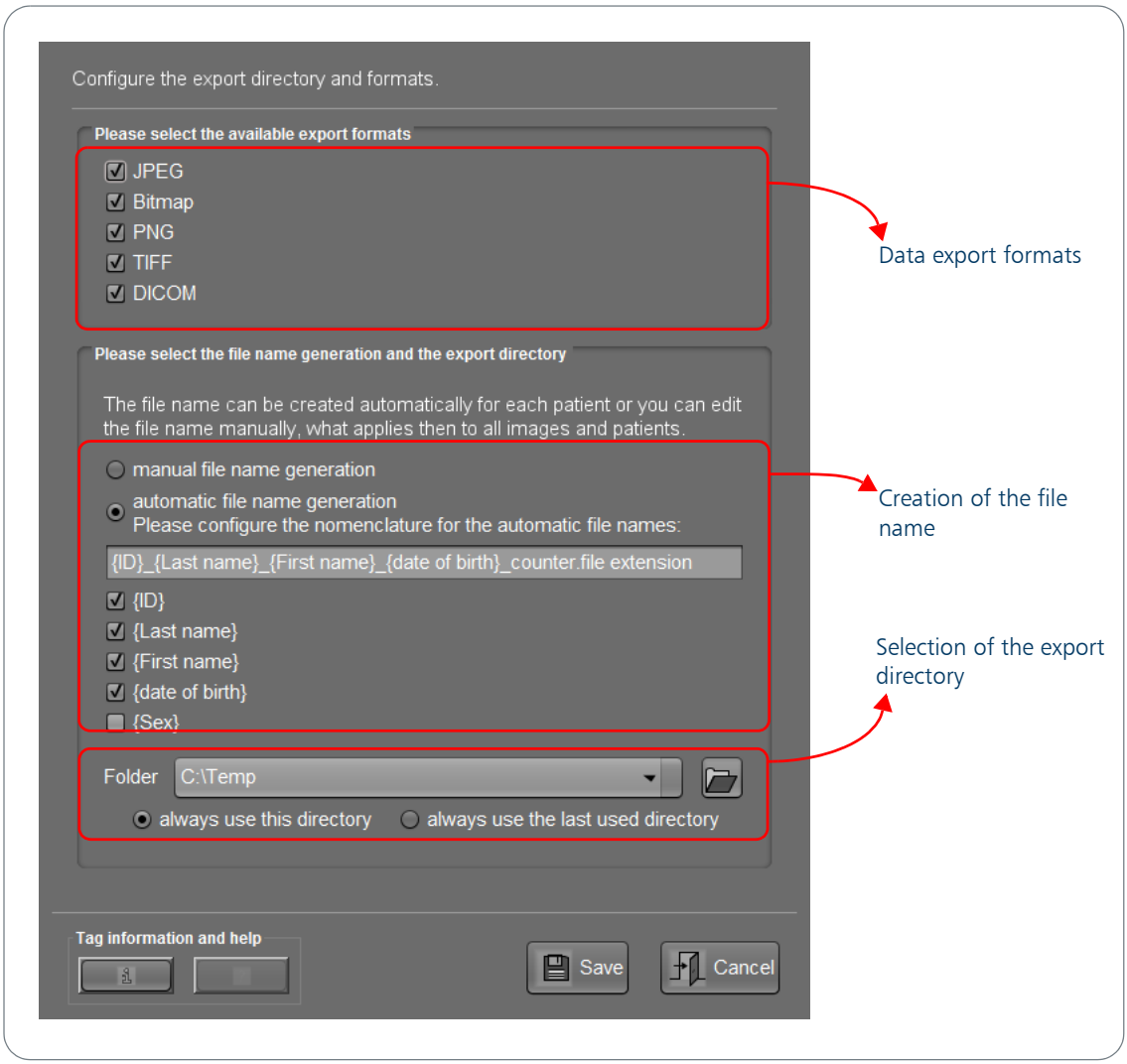


Figure 196. Configuration dialogue of exporting images

It is also possible to export just findings. Images can be exported in the following formats:

- DICOM
- JPEG
- Bitmap
- TIFF
- PNG.

It is possible to choose more than one format for the export.

If several images are exported, a number from zero to n (number of images) is added to the file name. The shown export formats in the export dialogue can also be configured in the configuration dialogue by selecting or deselecting the relevant checkboxes. Clicking on „save" stores the selection.

It is also possible to set different options for the export of images:

- export with overlays (image format JPEG, TIFF, Bitmap or PNG must be selected)
- export with annotations (image format JPEG, TIFF, Bitmap or PNG must be selected)
- anonymize/customize DICOM data (image format DICOM must be selected, see page 195).

Print - printing of images

The printing dialogue permits selective printing of loaded images via the installed Windows printer drivers or DICOM printers (optional). Single images can be printed by selecting them with the pick-up tool (see page 228).

A print preview including the configured print margins are displayed on the right hand side of the print dialogue. The print preview displays each page to be printed with its selected grid and considers the ratio of the set paper / film and the orientation (landscape / portrait). The arrow keys left and right in the print preview allow scrolling through the selected pages.

NOTE

All selected pages are printed as shown in the print preview.

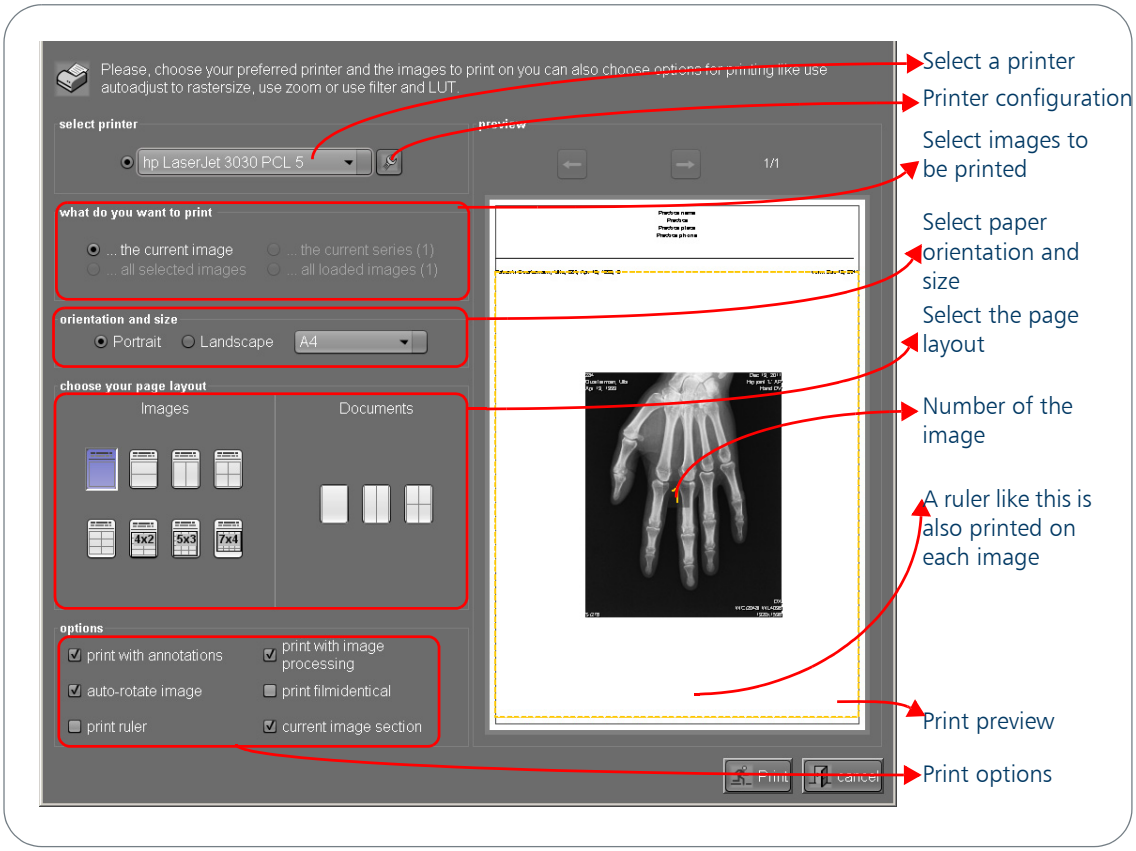


Figure 197. Print configuration dialogue

In the print preview it is also possible to zoom into the image by scrolling the mouse wheel and to pan the image by holding the left mouse button down.

NOTE

The option print filmidentical must be deselected for zooming and panning in the print preview.

While the print dialogue is open, the images can be processed further. Brightness and window level changes are transferred immediately to the dialogue, while zoom, filters, LUT and inverse representation are only taken up if the appropriate print options have been selected.

The print layout is selected in the category „choose your page layout". The grid is chosen and also whether the institution's stamp is to be printed at the top of the document or not.

Figure 198. Page layout

If the images are to be printed in irregular grids or in a particular order, a specific procedure has to be followed:

- At first, the images in the viewer must not be selected. The print dialogue is opened by clicking on the print button. A page with the current image in the 1x1 grid is displayed as a preview in the dialogue. The grid is selected by clicking on the relevant grid button in the dialogue.

PRACTICAL HINT

To maintain a particular sequence of images when printing, the selection tool must be activated in the viewer and the images marked in the required sequence.

- The images are then displayed on the printing dialogue preview page in that sequence. When the image in the last free grid field is added to the preview page, the preview automatically jumps to a new page. After all images have been positioned they can still be edited further.

The images to be printed are numbered in sequence in the print preview.

The following print options can be selected for the printout by selecting the screw wrench icon next to the selected printer in the print configuration dialogue:

- Print with annotations:
  All added measurements, comments, arrows, etc. are printed.
- Auto rotate image:

X-ray images in landscape format, e.g. 35x43, are automatically rotated by 90° for the printout.

- Current image selection:
  The images are printed in the size displayed in the working area with the zoom function.
- With image processing (filter, LUT and inverting):
  All image processing, e.g. the effect of filters, etc. is printed.
- Print filmidentical:
  The image is printed like on films by the selected printer.
- Print ruler:
  A ruler to confirm e.g. a distance can be printed on the image.

When the print process is started by clicking on the print button, a progress bar appears. It shows the progress of the printing process.

NOTE

If the printing has not yet been completed, the use of the Viewer and other functions is blocked.

The layout and print options can be configured for DICOM printer by selecting the screw wrench icon next to the selected printer.

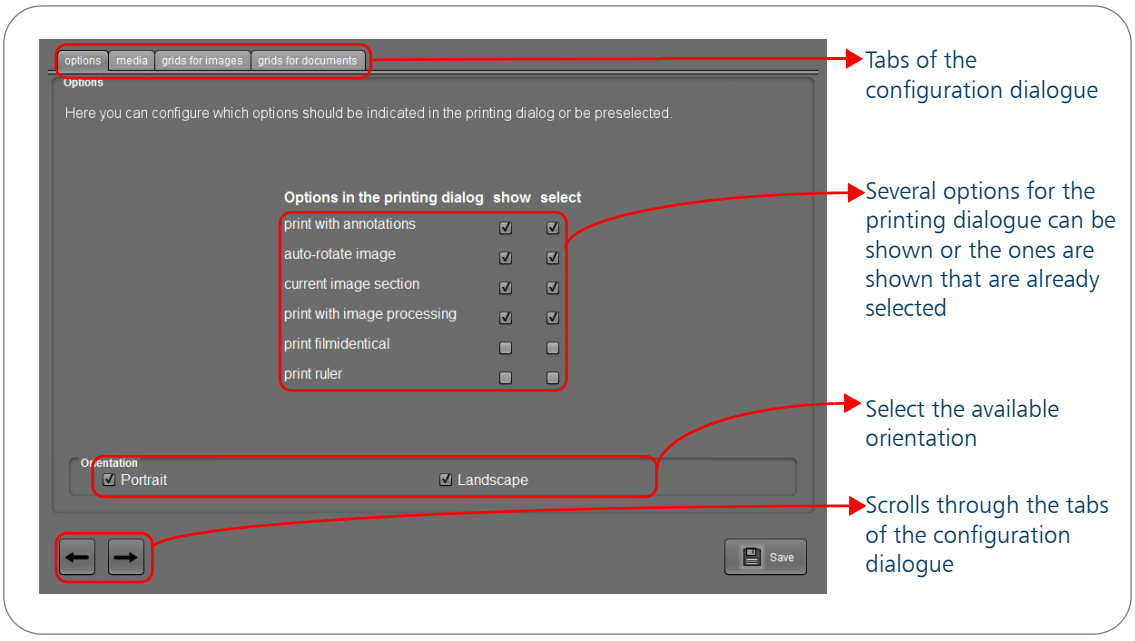


Figure 199. Printer configuration - options

To print images filmidentical and to print a ruler confirming a distance on the printed image, two checkmarks can be activated in the configuration dialogue above.

For paper and film printer, calibrated images (DICOM or manually calibrated) can be printed so that its size is exactly the same as if they had been taken on the media. In addition, a scaling factor is specified for calibrated images. This factor corresponds to the magnification of the filmidentical print. This factor is given in percent. 100% corresponds to the filmidentical print. Another option is to print the ruler. The scale and the length correspond to the scaling factor.

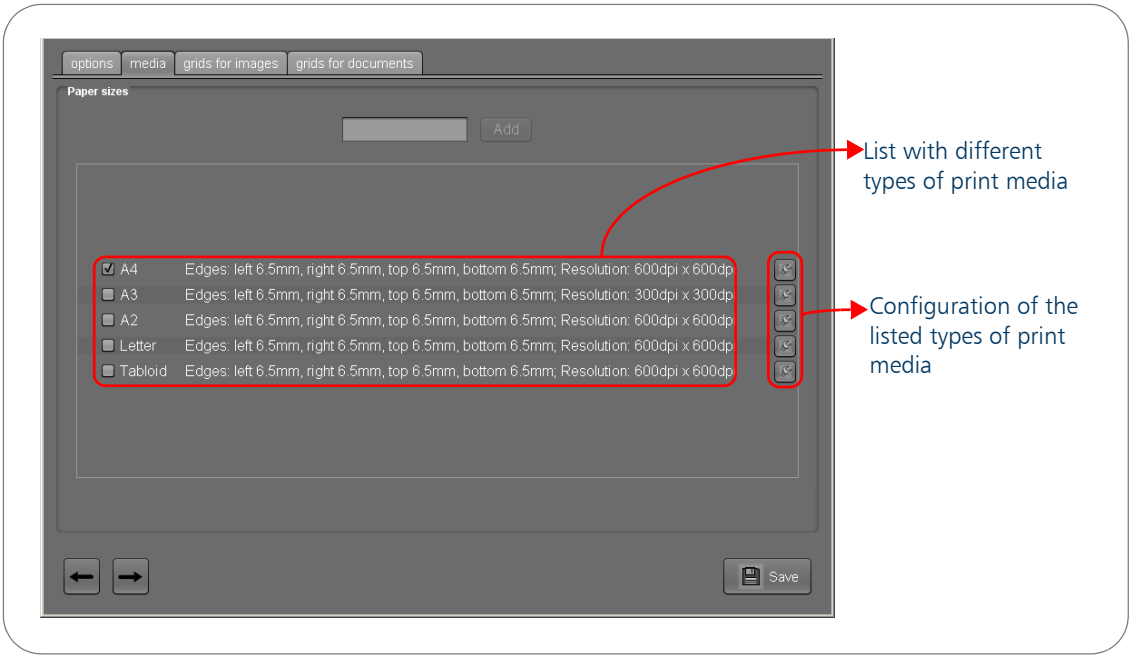


Figure 200. Printer configuration - media

By selecting the screw wrench button next to the type of print media that has been chosen, the above configuration dialogue below appears and allows to enter the preferred print resolution and to configure the print margins manually.

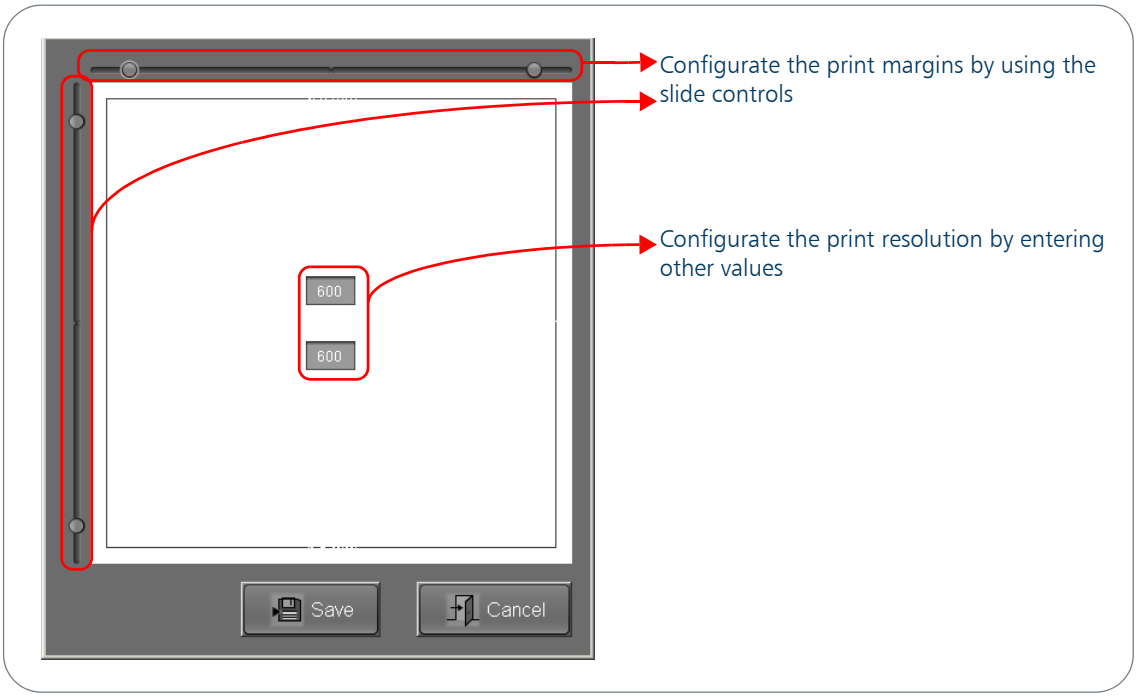


Figure 201. Configuration of the print media

To confirm the changed setting, press the „Save“ button.

In the tab grids for images it is possible to create a new or delete selected grids in addition to the already available standard grid sizes. To create a new grid, click on the matrix on the right of the tab. By clicking in the fields of the matrix and holding the left mouse button down, the user may draw irregular grids. It is also possible to create grids inside an already drawn grid, which are highlighted in different colours.

By clicking on the „Add“ button, the drawn grid is added to the list of available grids.

Clicking the right mouse button removes the last clicked field. By pressing the „Reset“ button the grid fields become empty.

The slider below the matrix or turning the mouse wheel changes the size of the grid.

The configuration of grids for documents is exactly the same as for images.

For specific requirements all layouts and print options can be configured individually by a technician.

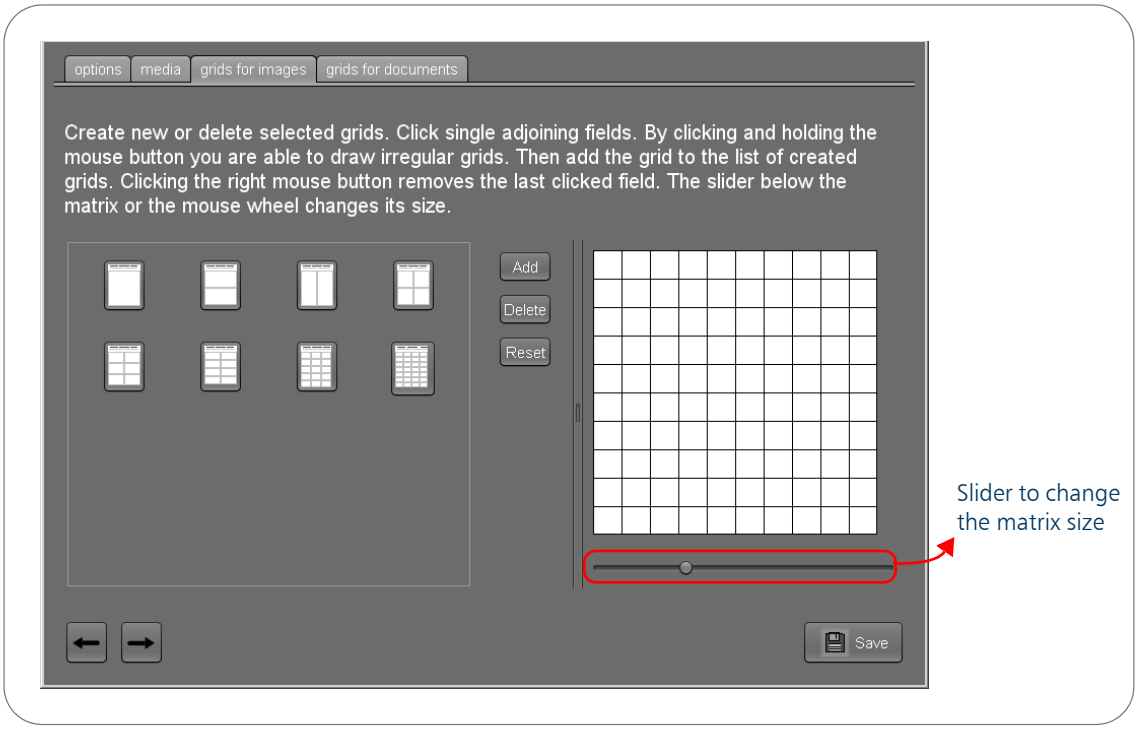
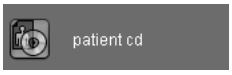


Figure 202. Printer configuration - grids for images

Patient CD - create patient CDs and memory sticks



This function copies all displayed or selected images to a CD or memory stick.

NOTE

Before copying, please make sure that all images have been assigned to the patient data. If this is not the case, you will be notified in the dialogue.

A free of charge version of an X-ray image viewer will be copied to the CD/DVD or memory stick to view the images. The possibilities of this programme module are extremely versatile.

There are various ways of using the patient CD tool. The tool facilitates to save a list of images for copying it at a later stage, and to save images on a CD, DVD or memory stick. Existing list entries can selectively be deleted from the image list.

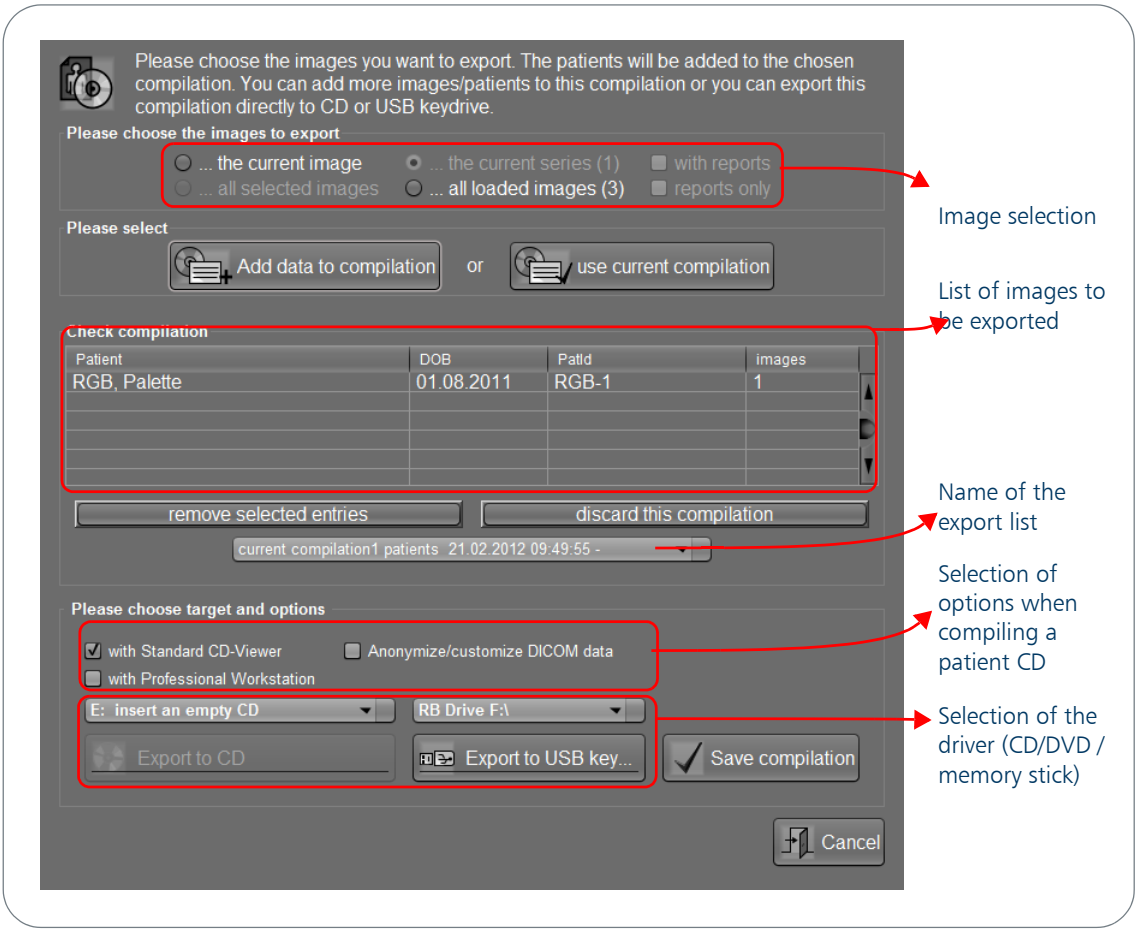


Figure 203. Create patient CD

The image selection provides the choice between adding the current image, all selected images, all loaded images, or the current series to the displayed export list. The number of currently selected and loaded images is shown in brackets after the respective entry. Alternatively, the images currently displayed in the compilation list can be copied straight to a CD/DVD or a memory stick without adding further images.
The compilation list of the images contains the name of the patient, DOB, patient ID and the number of images to be exported. Single entries are deleted by selecting them with the left mouse button and clicking on the button „remove selected entries". There is also an option to delete the complete list („discard this compilation").

NOTE

The viewing application remembers the last ten export lists so that these may be copied again later.

The name of an export list is generated automatically and is assembled as follows:

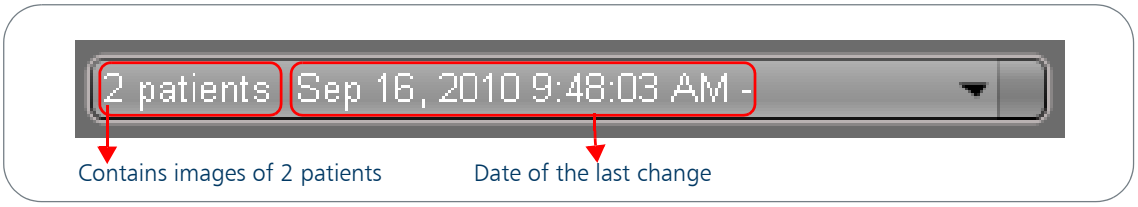


Figure 204. Compilation

By clicking the button „use current compilation", the active displayed compilation list is used for export to the patient CD and/or USB stick.

In the section „Please choose target and options", there is the option to select which Viewer should be burned on the target drive to view the images. There is the choice between the Standard CD-Viewer (HTML Viewer) or the complete Professional Workstation (Java Viewer), which e.g. also allows to perform measurements.

If no Viewer is selected, the DICOM data is used.

To make the right selection it is important to know the following advantages and disadvantages of the two options.

Standard CD-Viewer	Professional Workstation
- fast start of the Viewer	- slower at start of the Viewer and when loading images
- CD creation takes more time	- CD creation faster
- images are twice on the CD (DICOM, jpg), thus 20% more storage space per image	
- the Viewer itself uses little storage space on the CD	- the Viewer uses about 50MB more storage space on the CD
- no measurements are possible	- measurements are possible and are displayed

Table 4. Comparison standard vs. professional Viewer

The programme automatically creates a list of all CD/DVD drives and connected memory sticks. This is where the user may choose the target drive to which the images will be copied. The copying process is then started by clicking on the appropriate button below the selected target.

When inserting a patient CD/DVD or USB in the drive, a list of patients and the corresponding images appear on the patient CD that can be viewed with the selected Viewer.

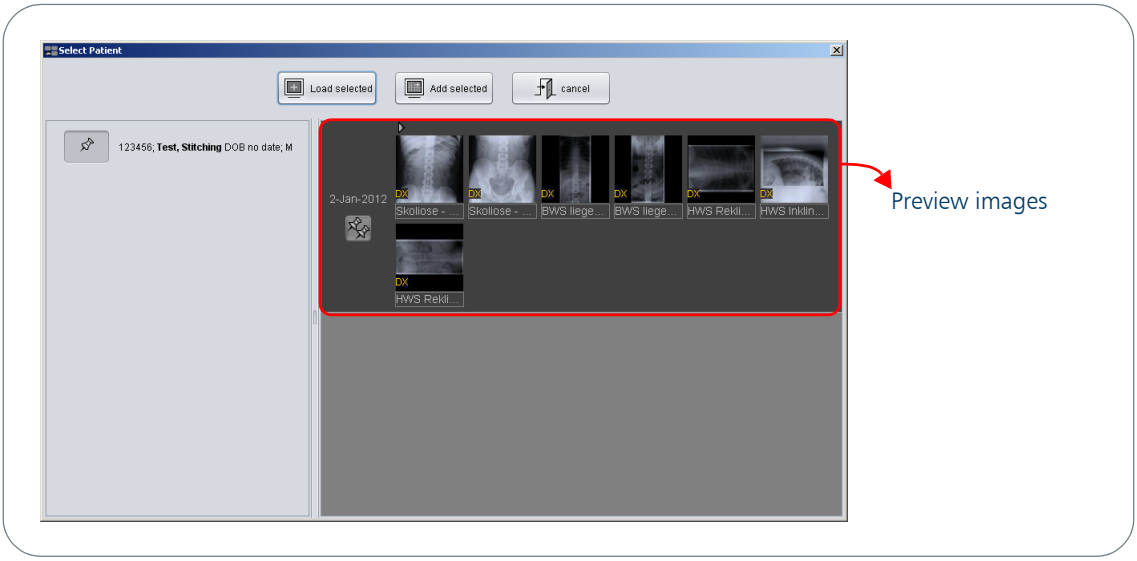


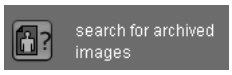
Figure 205. Patient CD with the Professional Workstation - select patient with preview images

Furthermore it is possible to „Anonymize/customize DICOM data" that should be burned on a patient CD by selecting the checkbox. It is necessary to select the relevant data to be burned on the CD/DVD or USB beforehand.

When exporting the data on the chosen drive by clicking on the button „Export to CD" or „Export to USB keydrive", a new dialogue appears that offers to anonymize and customize the DICOM data.

For more information on anonymizing DICOM data, please see page 195.

Search for archived images



By clicking on the button „search for archived images" the patient administration dialogue appears with all patients stored in the database. The selected patient studies are displayed as preview images. It is also possible to display the information of the studies in a table.

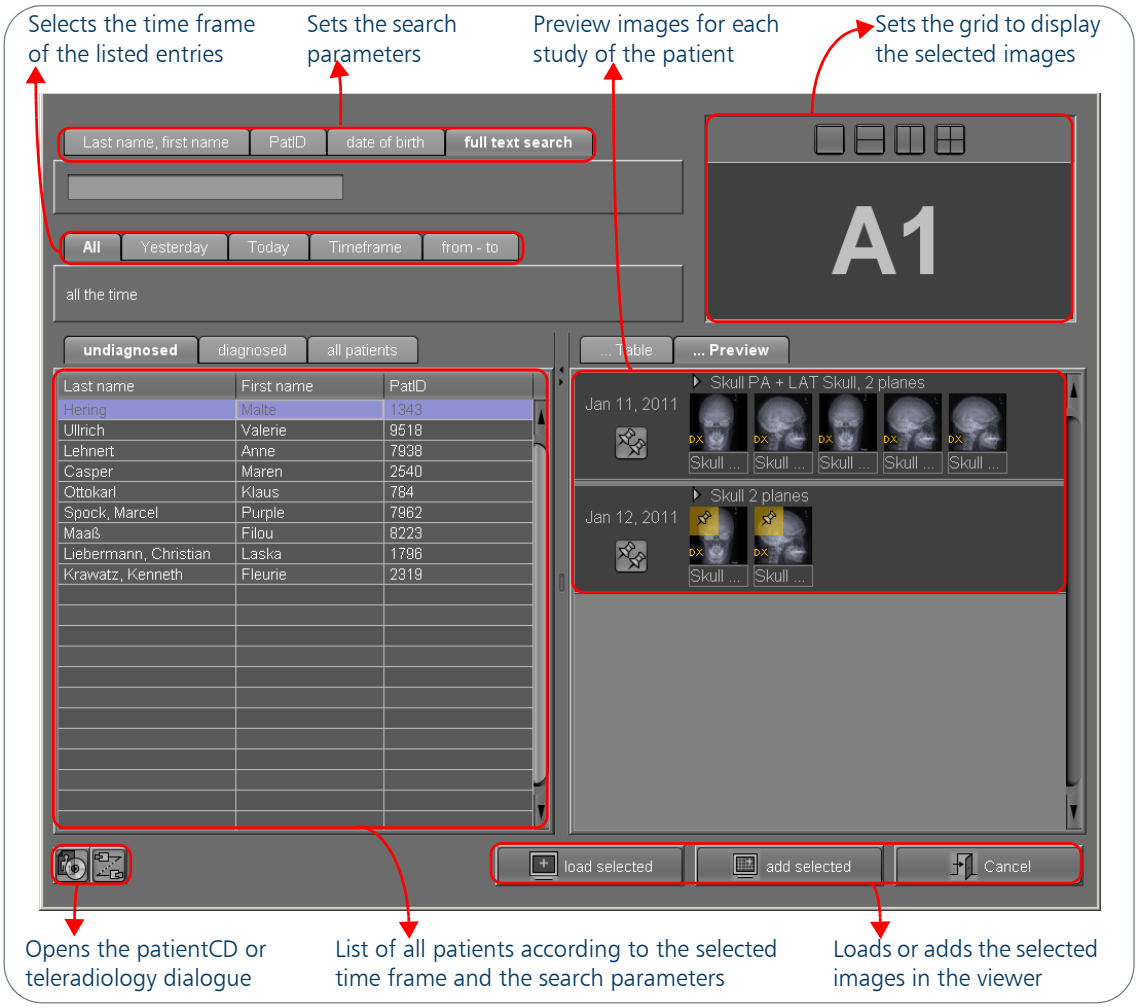


Figure 206. Patient management with preview images

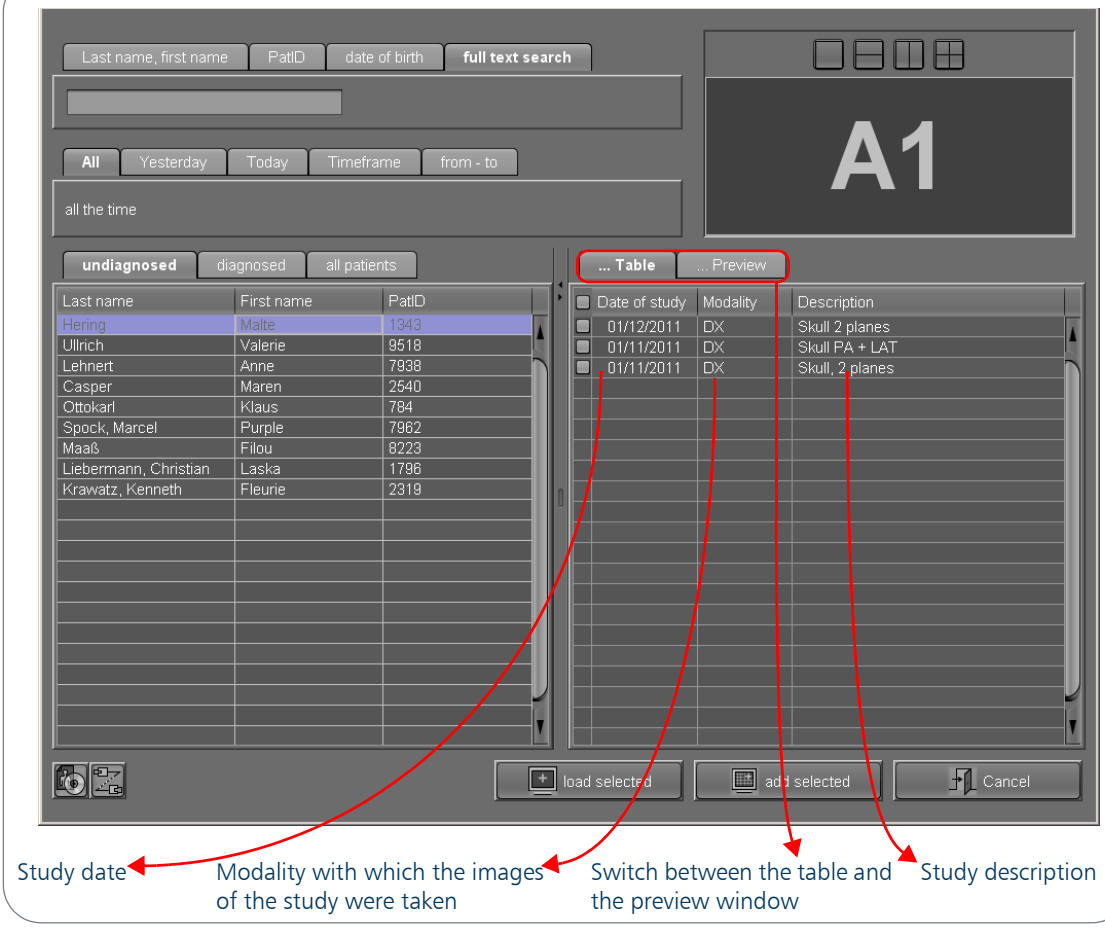
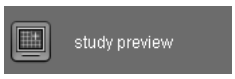


Figure 207. Patient management with table view

Study preview - Overview of a patient's studies



By clicking on the button „study preview", the complete list of images archived for the current patient is displayed as preview images or in a table. There are various ways to load the images. The loaded images are distributed automatically into the selected grids.

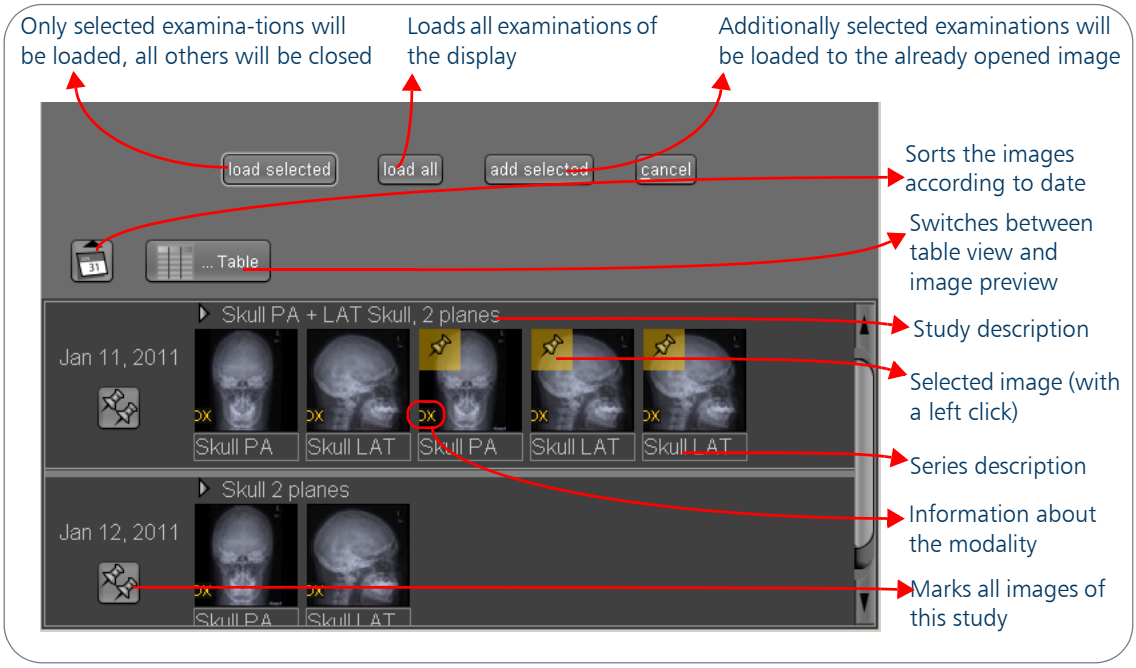


Figure 208. Study preview

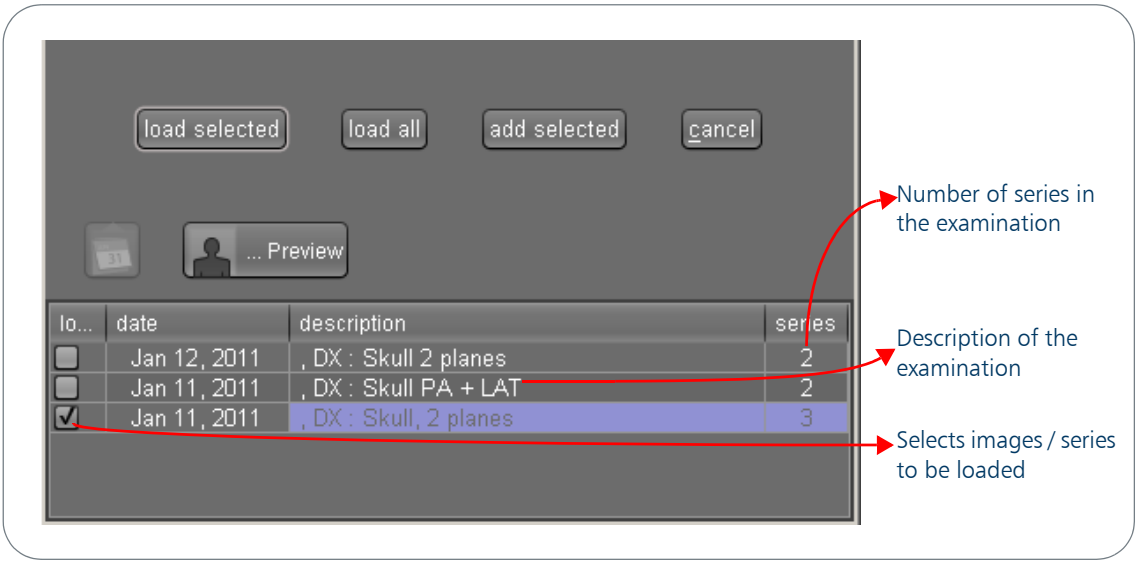


Figure 209. Study preview - table view

Daily visual check

The monitor and the settings of the graphics card have to fulfil a number of legal requirements if they are diagnostic monitors.

CAUTION

After a successful acceptance test, certain values have to be checked by the operator at defined intervals. The accurate display of greyscales has to be checked by sight at least once a day.

This tool has been developed to facilitate logging and documentation of this daily test.

If configured, a dialogue is shown whenever no visual check has been conducted on a given day when starting ***Accuvue***. The test can be done immediately or later. If the test is to be conducted later, the dialogue keeps reappearing during the work with AccuVue

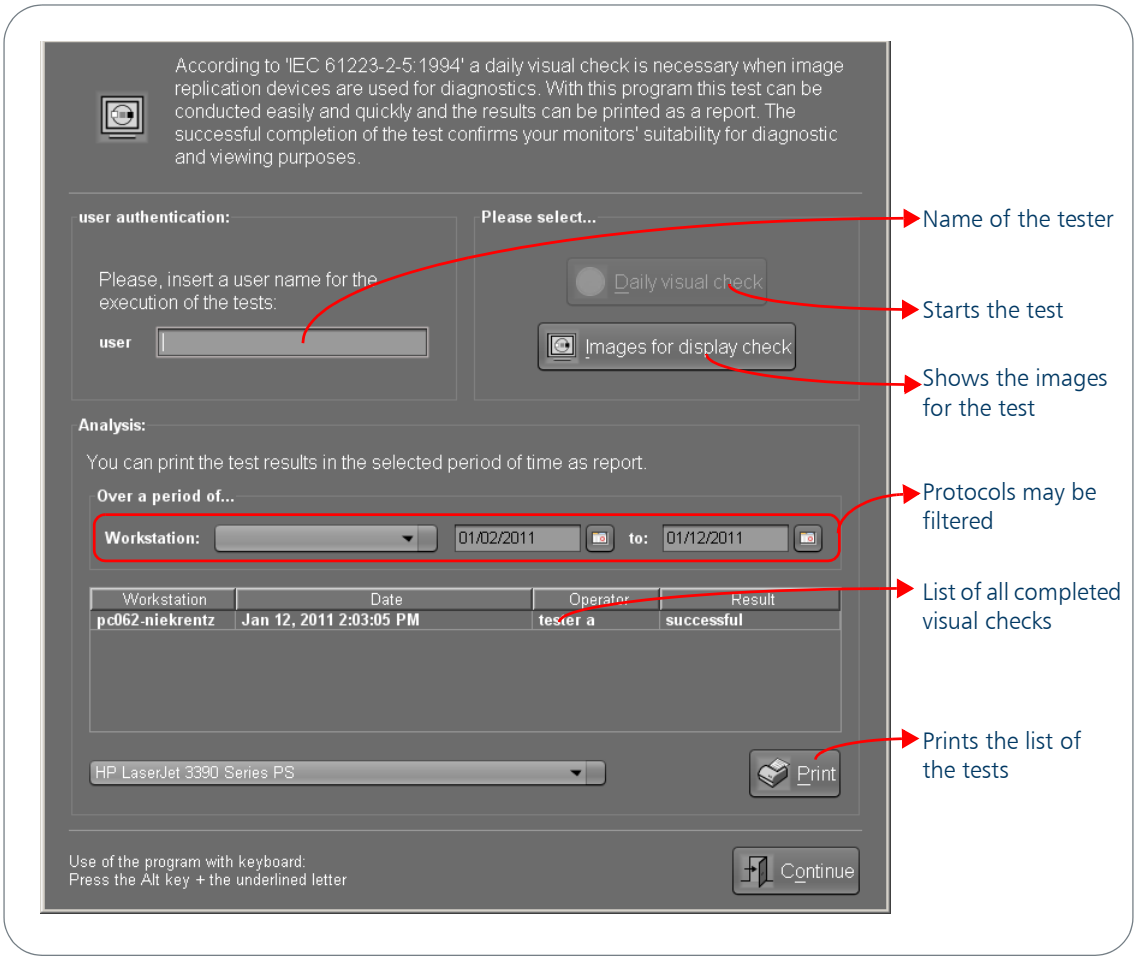


Figure 210. Daily visual check

After the successful authentication and start of the daily visual check, the following information dialogue is shown:

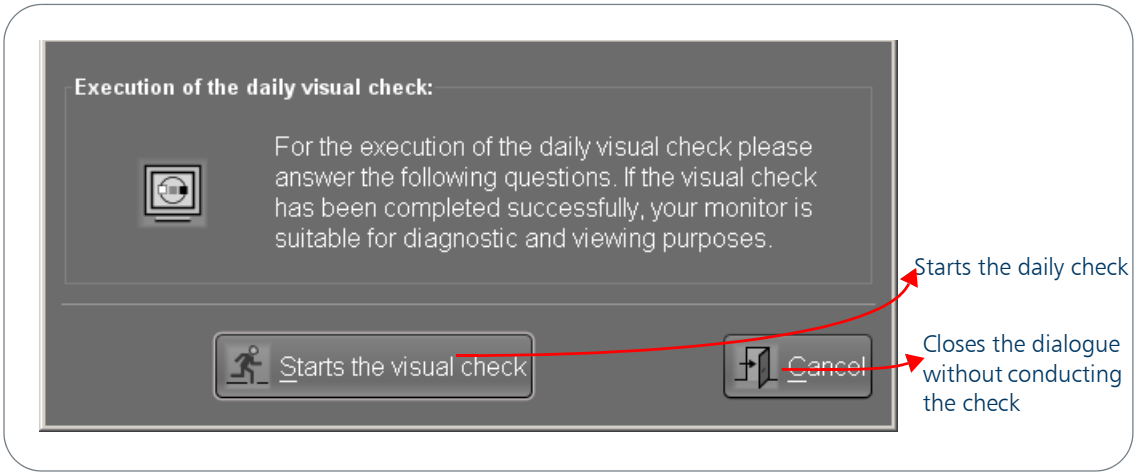


Figure 211. Start the daily visual check

The test images for the visual check are displayed on the monitor after clicking the button „Starts the visual check". For the daily visual check, a so called SMPTE and an ISO test image are used. The relevant elements for each question are marked with a flashing white frame for a short time.

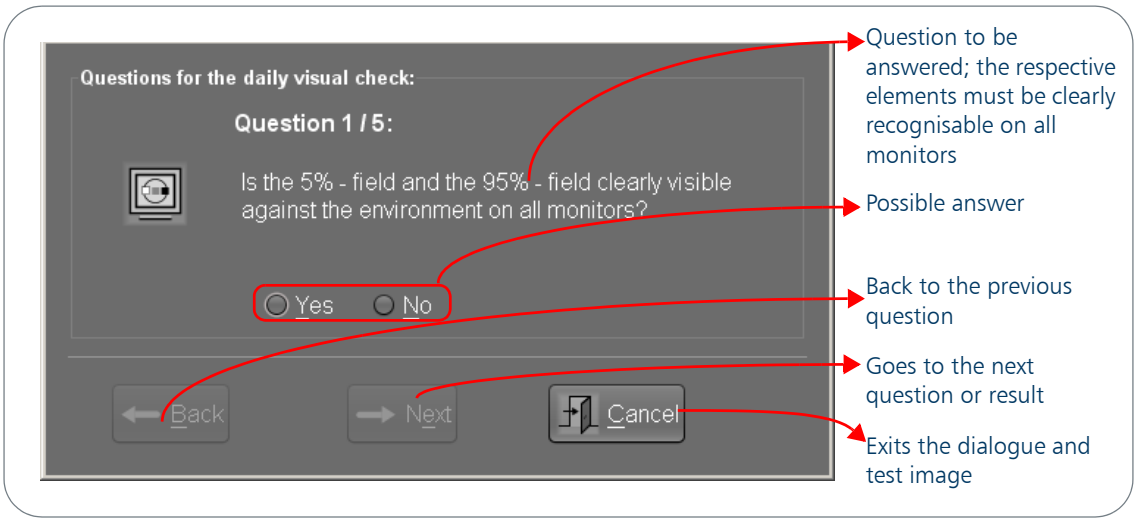


Figure 212. Dialogue box - daily visual check

The next dialogue displays the result of the daily visual check. The test results for a specific period of time and a specific work station can be printed as a report.

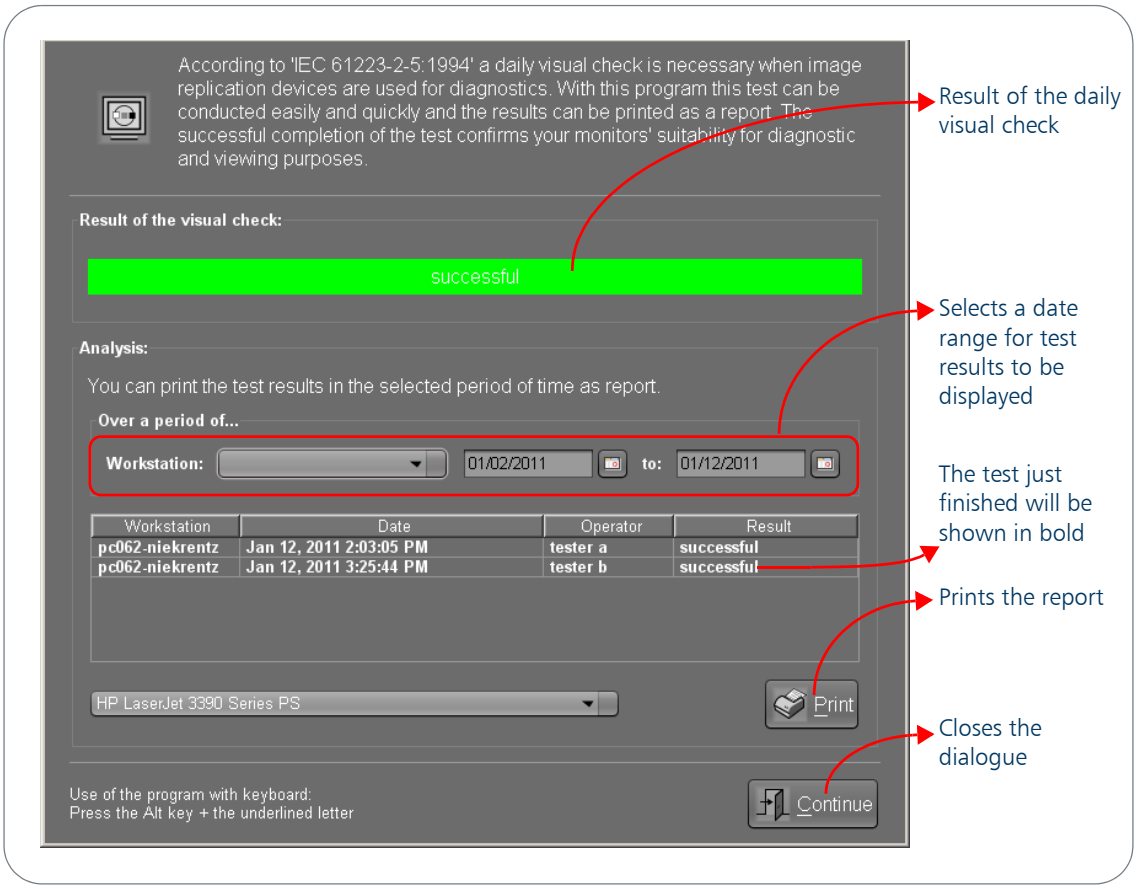


Figure 213. Result of the daily visual check

CAUTION

If the test result is „failed" and images are loaded in the viewer, a warning triangle is shown. It is possible to repeat the test but if it fails again, the monitors are not suitable for diagnostic and viewing purposes. The monitors must be checked by an engineer and readjusted if necessary.

DICOM Send

After a click on this button, the DICOM Send dialogue appears. The recipient can be selected and the study will be sent to the specified recipient by confirming the selection. Additionally, the image quality can be selected which determines the size of the data transfer.

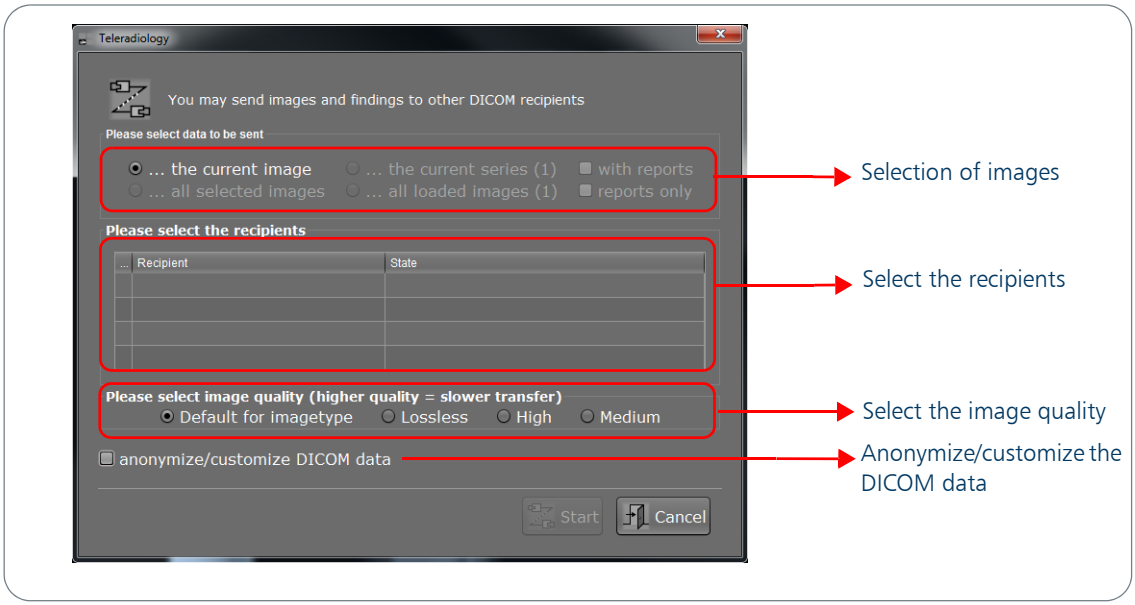


Figure 214. Teleradiology via DICOM Send

The same dialogue appears also in the lists view when clicking on the „Send" button to send images and findings to a DICOM recipient, see page 58.

Sending Emails

This tool allows to send encrypted Emails with DICOM images. Therefore, the recipient has to use the encryption tool GPG4Win.

NOTE

The option anonymize/customize DICOM data can only be selected when the image format „DICOM" is chosen.

The last selection of the options section is stored for the next use.

When the checkbox „anonymize/customize DICOM data" has been selected and it was clicked on the „Send" button, a new dialogue appears that offers to anonymize and customize the DICOM data.

For more information on anonymizing DICOM data, please see page 195.

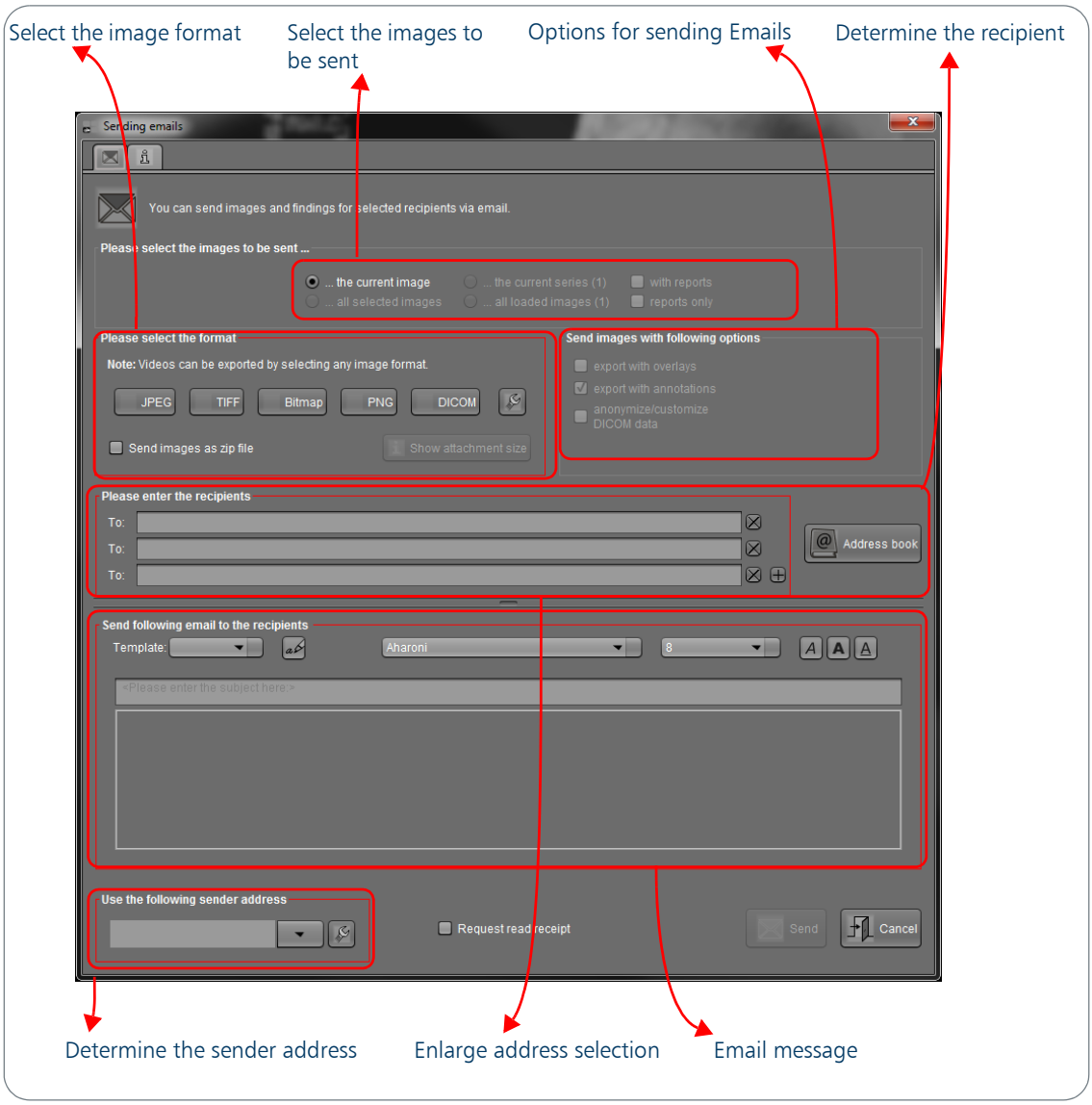


Figure 215. Sending email

In the Email dialog it is possible to select the images to be sent and their format. Multiple image formats can be selected.

The image formats that should be shown in the dialogue can be configured in the corresponding configuration dialogue by clicking on the screw wrench button.

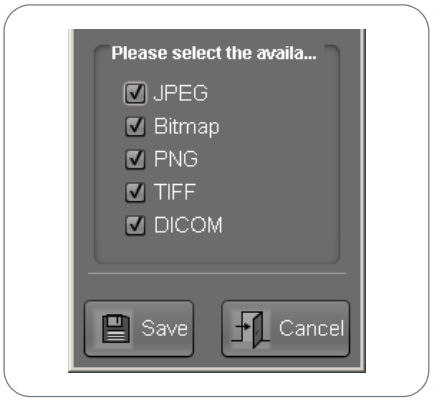


Figure 216. Selection of the image format

There it is possible to select or deselect the checkboxes for the file formats. Clicking on the button „Save" stores the selection.

Furthermore it is possible to select sending the data via a .zip file. This gives not only a small file size, but you can also send multiple image series combined. And the attachment size can be shown when clicking on the 

button.

The following options are selectable when emailing image data:

- export with overlays
- export with annotations
- anonymize/customize DICOM data

The last selection of the options section is stored for the next use.

NOTE

The Email address is coloured black as soon as the Email format is typed in correctly.

Define the sender address

For sending Emails a standard address, the OR account, is pre-configured; it cannot be deleted. To use a different sender address, proceed as follows:

- Load an image
- Open the „sending email" dialogue by clicking on the button

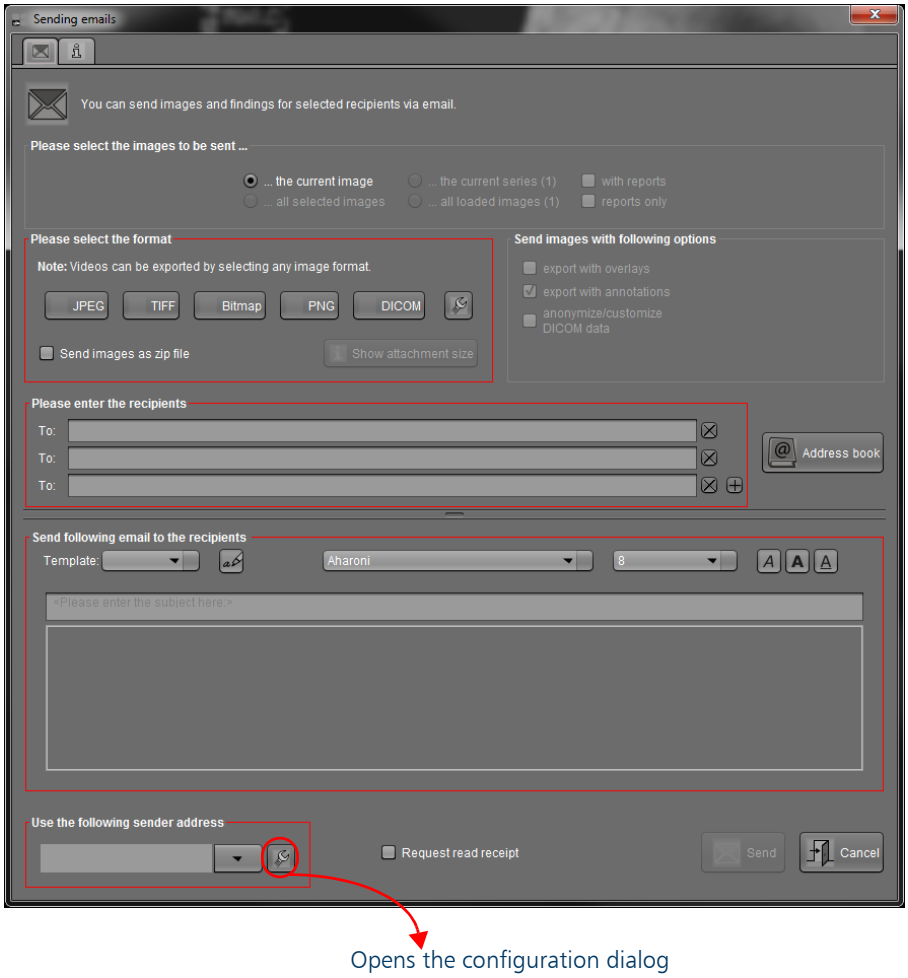


Figure 217. Sending email dialog

- The configuration dialogue appears by clicking on the screw wrench icon

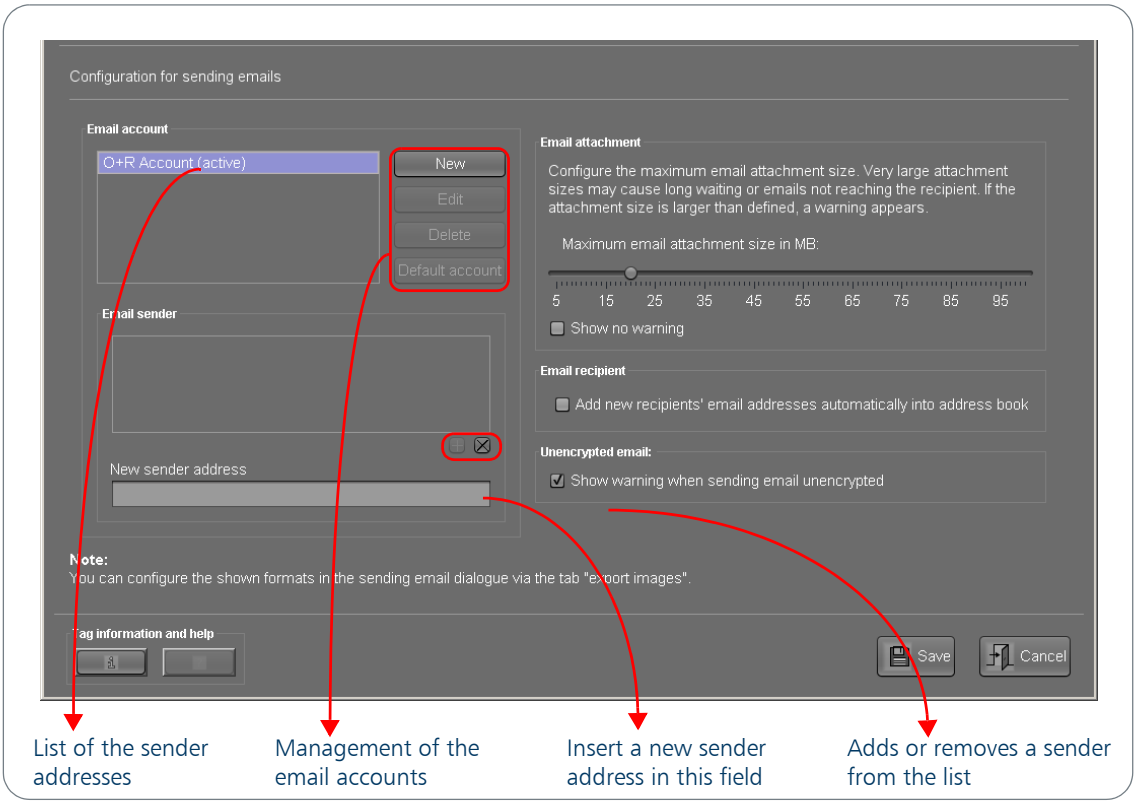


Figure 218. Configuration dialogue

- Select „New“ to configure a new email account
- The following dialog indicates the data to be inserted:

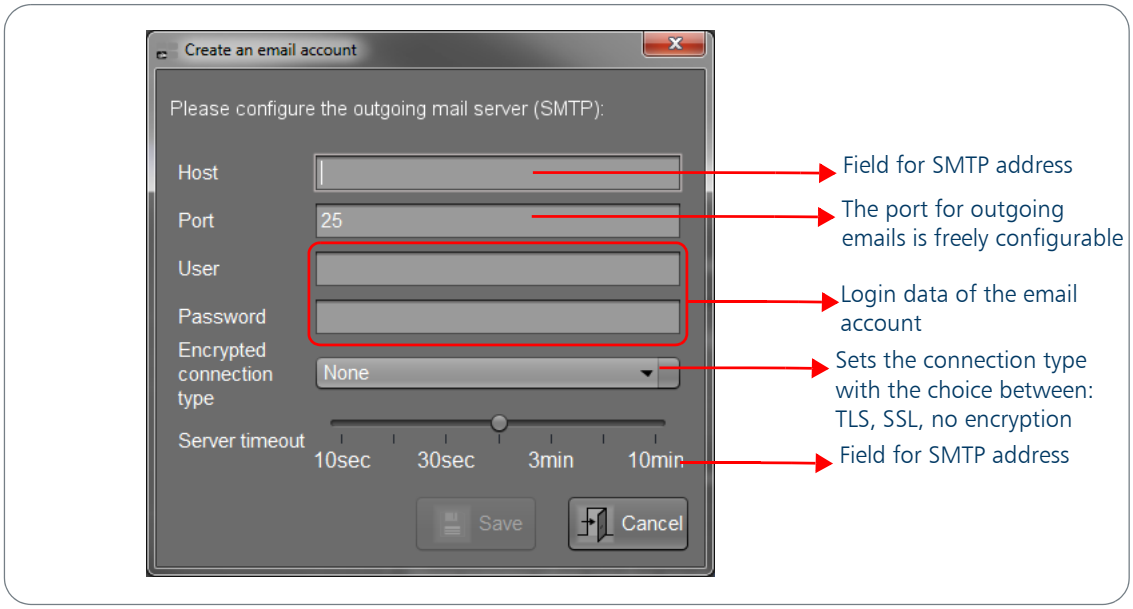


Figure 219. Data for the email account

NOTE

If you do not have the necessary information, ask your responsible Email provider for assistance.

After the input of information, when pressing on „Save“, the dialogue is closed and the data is checked. Any errors are indicated by a message.

Create new recipients

Now that an Email can be sent, recipients must be determined.

For saving recipients into your address book proceed as follows:

- Open the „Send E-mail“ dialog by clicking on the respective button
- Open the address book by clicking on the respective button 

- To add a new recipient, click on 

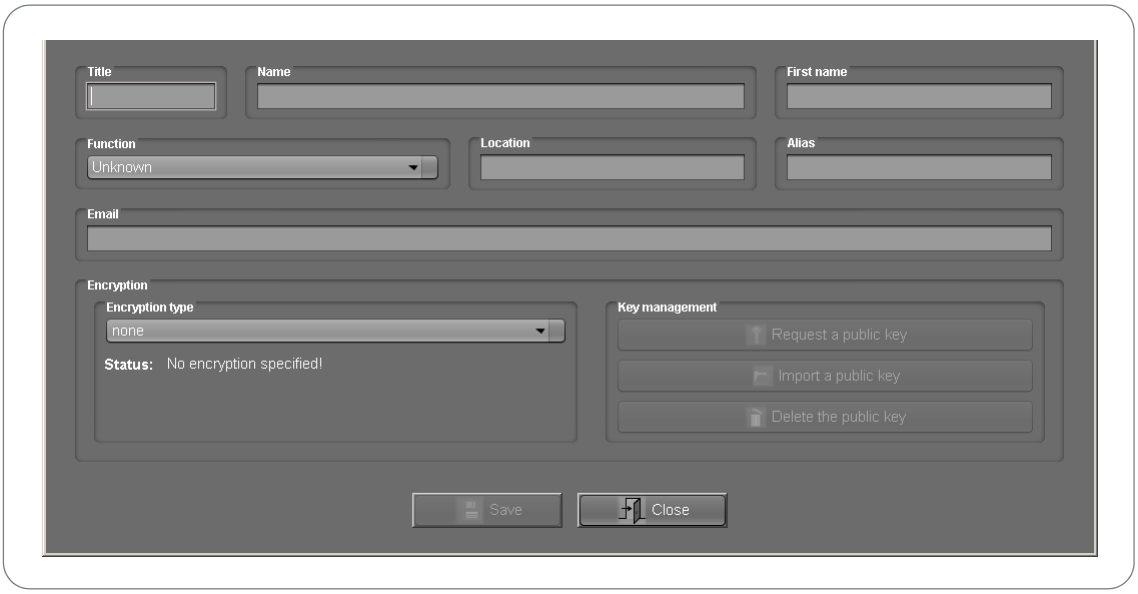


Figure 220. Create a new recipient

- Enter the contact information in the input fields
- Finally, confirm the data by clicking on „Save“
- The new user is then listed in the address book.

Figure 221. Address book

To edit a user, click on the edit button . This will open the input mask where you can edit all information.

Create/edit templates

You can choose between different templates for the Email text. One standard template is included with the installation. Additional templates can easily be created and edited.

To create a new template proceed as follows:

- Load an image or a study and open the tool „Send Email“.

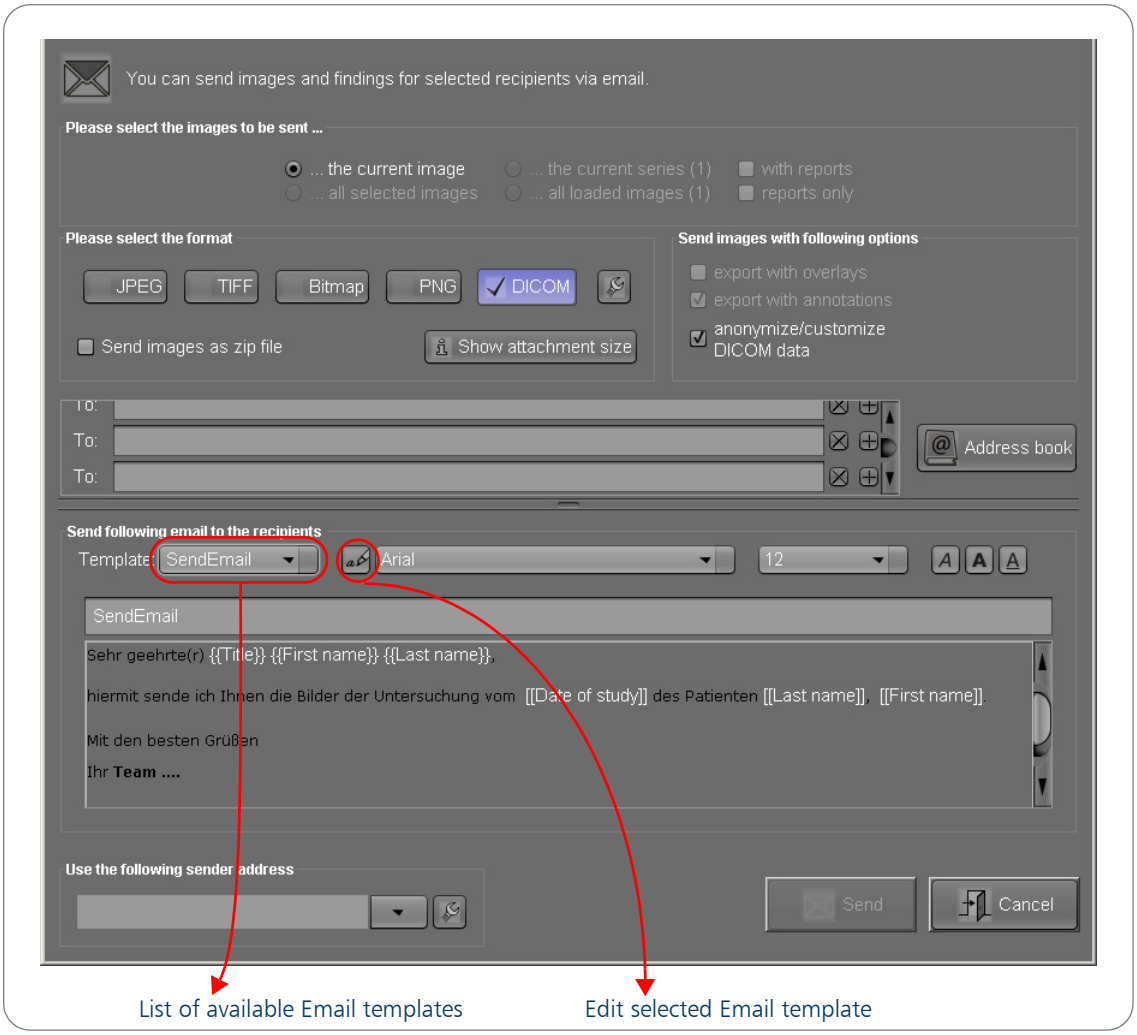


Figure 222. Send an Email

- To create a new template, you must click the edit button, while others may not be selected or you click 
- A new dialogue to create and edit templates appears.

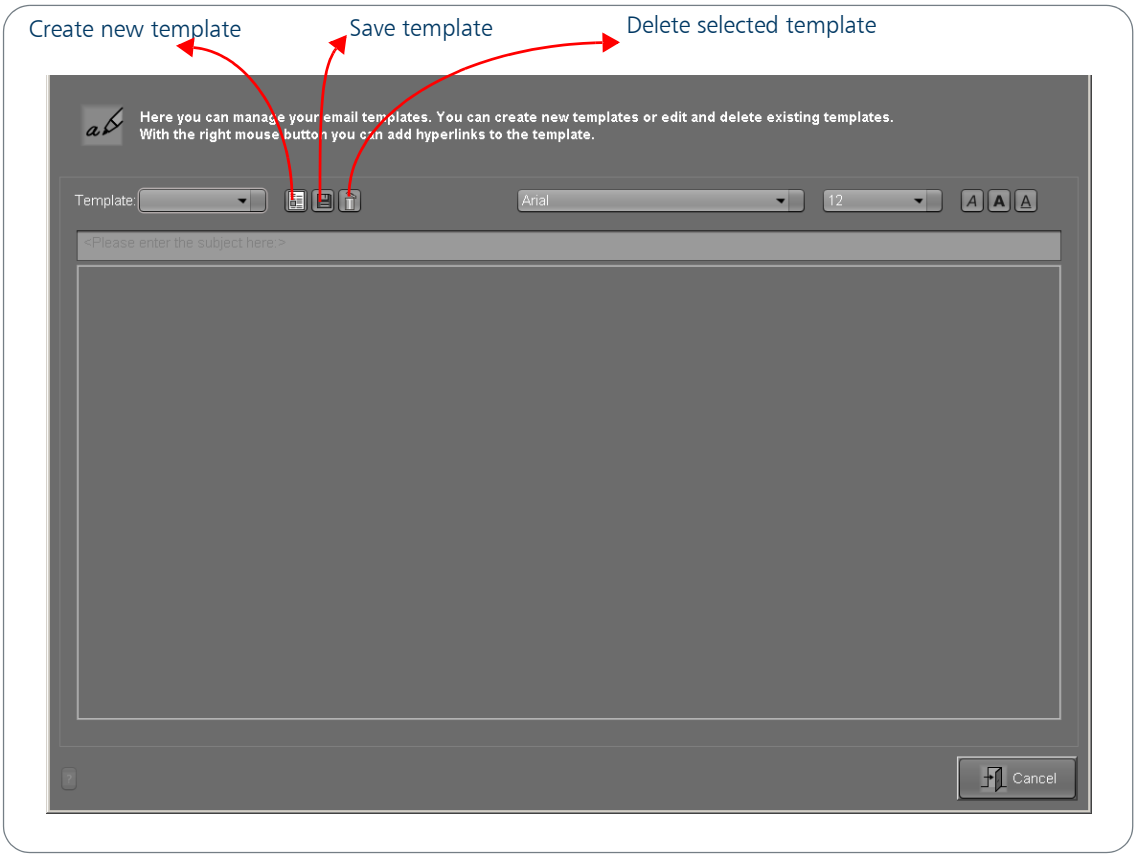


Figure 223. Create and edit templates

- By clicking on the right mouse button in the text field, a window with a selection of wild-cards opens. The wild-cards are replaced with the use of the data.

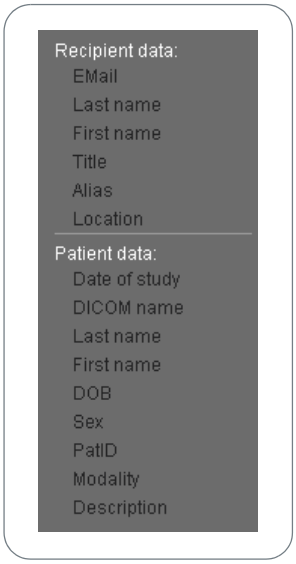


Figure 224. Selection of wild-cards

- To save a template, simply click on the save button 

- This opens a window where you can specify the name of the template.
- Confirm your entry by clicking on „OK".
- The newly created template is now listed in addition to the already existing.
- Existing templates can also be edited; select the required and then click on the edit button.

Send encrypted Emails

An Email is like a postcard for everyone to read. To prevent this readability of sensitive data, Emails should be protected by encryption. An encryption programme is necessary to send encrypted data or to read encrypted data as a sender and receiver. One such free program is Gpg4win, which is already integrated into ***Accuvue***.

To receive encrypted Emails, each recipient must first create a key pair with the encryption software Gpg4win. One of these „public keys", a file encryption with public information, must be emailed to the sender. The sender will include this file information into file in ***AccuVue*** to ensure the transmission of encrypted Emails.

CAUTION

For each recipient of encrypted Emails a PublicKey must be requested. The recipient must have a a compatible Email programme (MS Outlook 2003, 2007 or freeware like Thunderbird with addon „Enigmail"). MS Outlook 2010 does not support encryption.

For the request of a PublicKey proceed as follows:

- First, load an image.
- Open the dialogue „Send Email" by clicking on the respective button.
- Open the address book by clicking on the button 

- If you want to create a new recipient, then click 

, otherwise edit an existing contact by clicking on 
- Enter the contact information.
- Select the encryption type PGP.

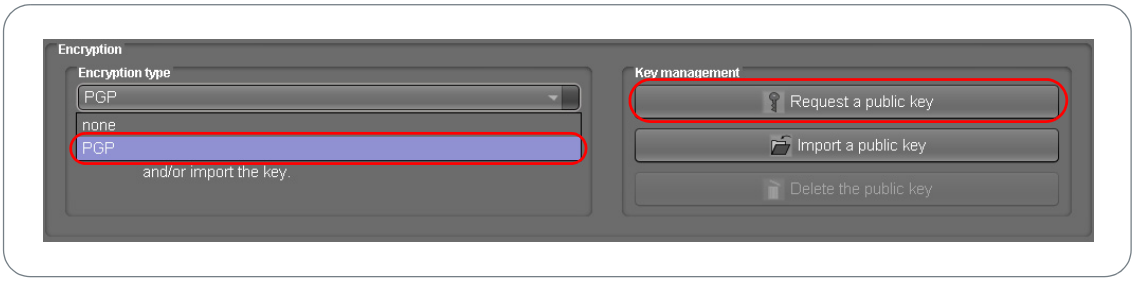


Figure 225. Select the encryption

- This activates two buttons on the right side in section Key management.
- Select „Request PublicKey".
- The following window opens:

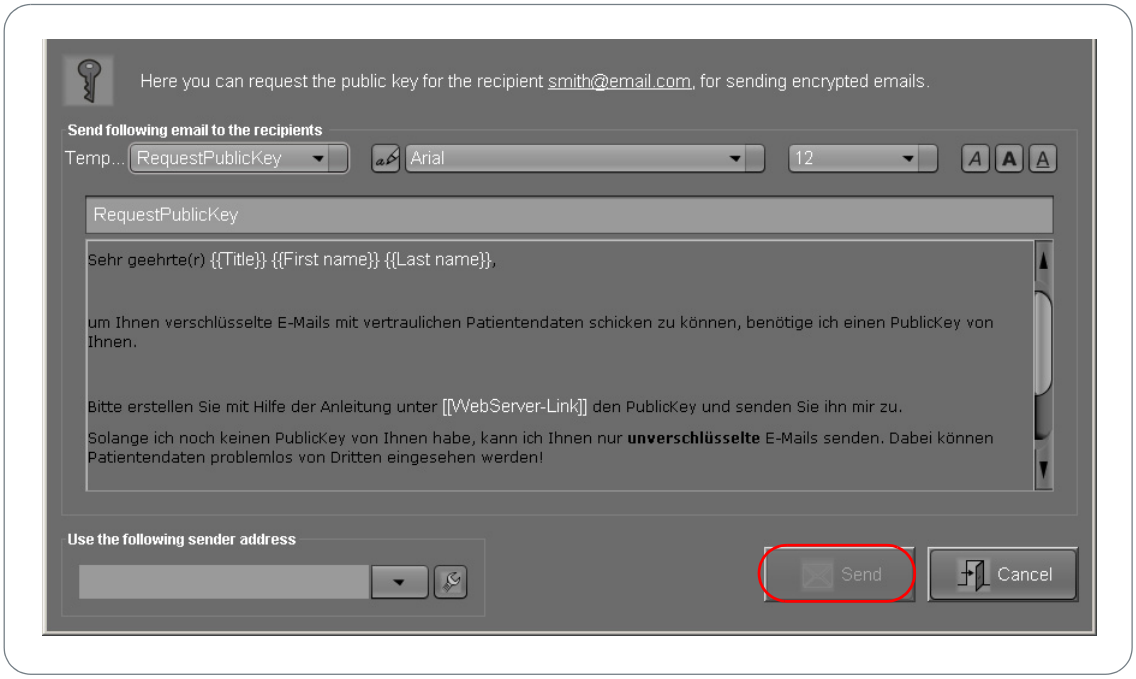


Figure 226. Sending the request of the public key

- The default template is selected. You can change the selection if already more templates have been created.
- You can make changes in the Email.
- Click on „Send".
- The recipient will receive an email with an instruction how to set up the encryption. Once this is done, you will receive an Email to the given sender address with an encryption file attached.
- Open your Email programme and save the file with the ending „.asc" on your computer.

- Open the address book.
- Select the edit button of the contact.
- Click on 

- Select the saved file and confirm the selection by clicking on „Import PublicKey“.
- In the address book, the following entry is shown:

- The encryption is active.
- Click on „Save“, to save the settings.

All further Emails to that recipient will be sent encrypted.

You can now delete the received and stored encryption file. An active encryption is shown in the address book with a key  . A recipient without an active encryption is indicated by a crossed key  . For safety reasons, a message pops up, indicating when no encryption is used.

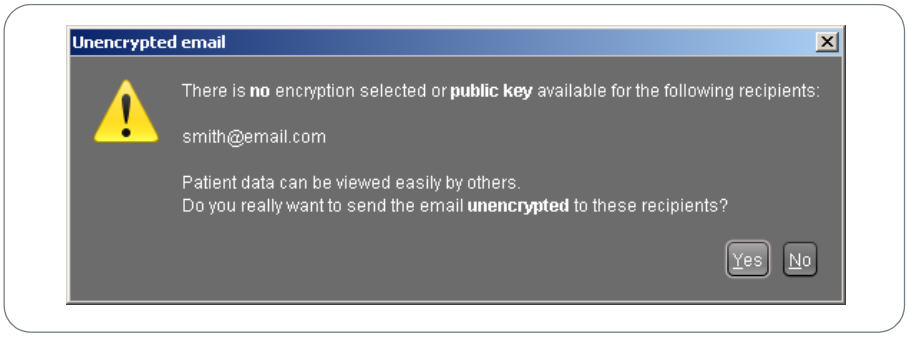


Figure 227. Warning message

3.8.12.2. Anonymize/customize DICOM data

Anonymising data is important for the privacy of patients when e.g. image data is passed on for scientific work.

DICOM data can be anonymised with only a few clicks with the following export functions:

- export images
- patient CD

- sending Emails

Anonymising of DICOM data can be selected in the dialogues in the section „Options“, if the images are exported in DICOM format.

AccuVue copies the DICOM files and replaces or removes all data fields that are required according to the configurable profiles and desired changes.

The checkbox „anonymize/customize DICOM data“ in the section „Options“ is only active when the DICOM image format is selected.

When the checkbox is selected, a new dialog opens after clicking on „Start“. It facilitates the process of anonymising DICOM data.

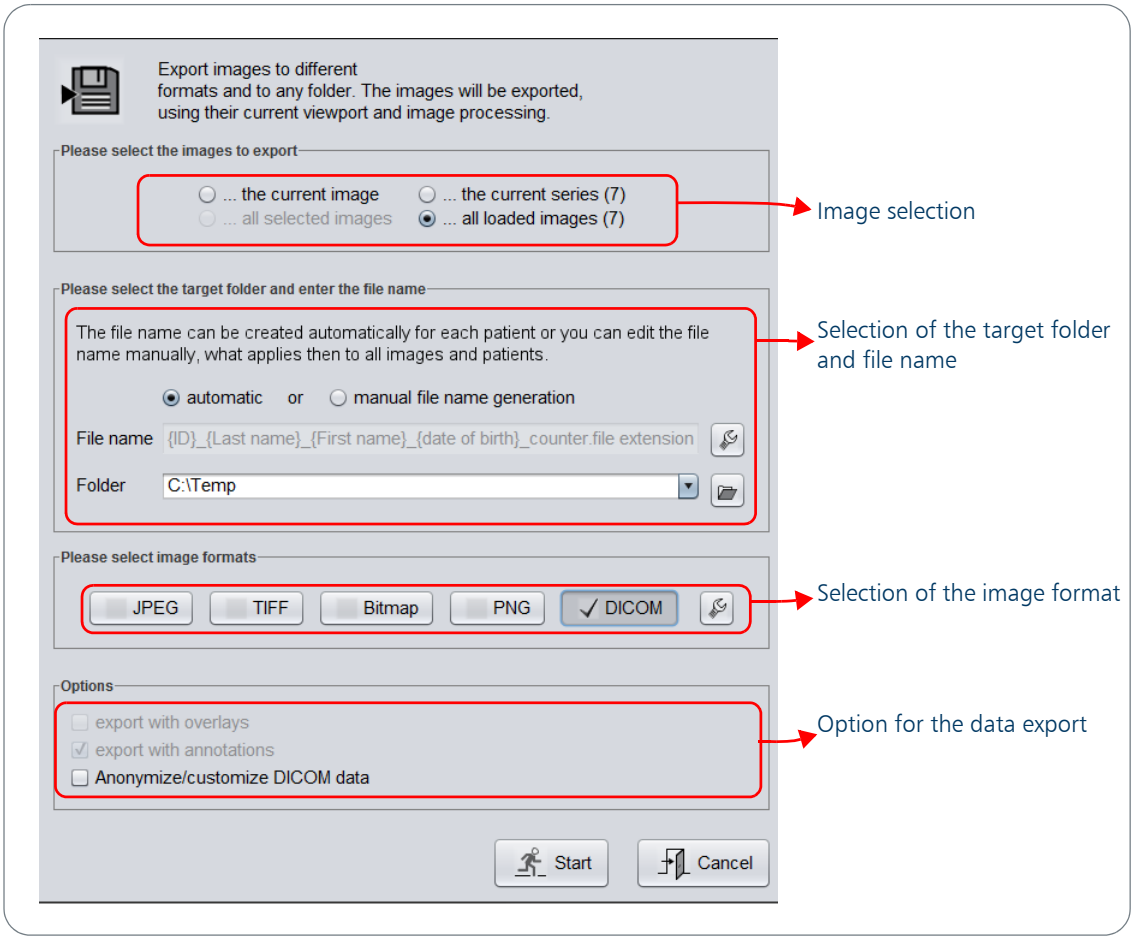


Figure 228. Configuration of file name and image formats

Generally three example profiles are loaded in the anonymising dialogue, with which data can be anonymised or customised

- Anonymous - only image specific information remain, e.g modality, size, etc.
- Delete personal information - all person specific information are deleted, e.g. names, birth of date, address, IDs, etc.

- Use random data - to alienate the data, random names, dates and IDs are used for random values

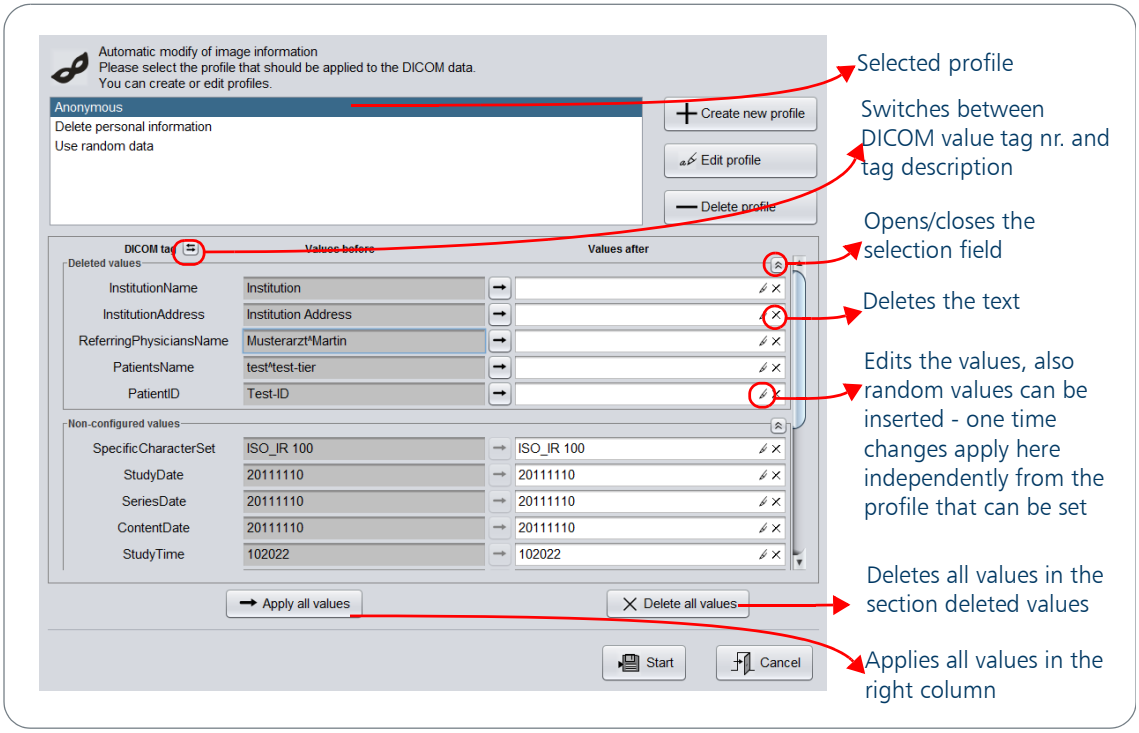


Figure 229. Anonymising profiles

NOTE

Please note that for all profiles only the tags apply that are available in the image.

To customise the profiles use either the button:

- „Create new profile“ or
- „Edit profile“

When clicking on “Create new profile“, the following dialogue appears, where the name of the profile and the corresponding tags can be defined.

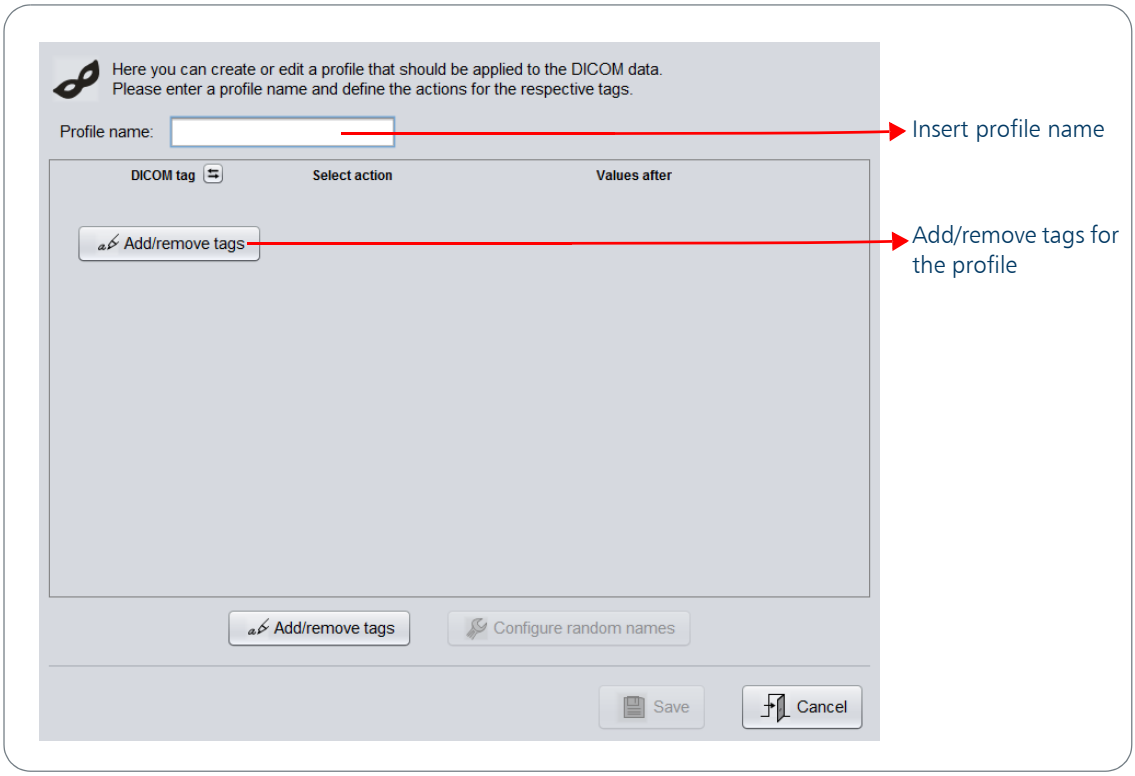


Figure 230. Create new profile

After saving the information, the newly defined profile is automatically added to the list of predefined profiles.

The selected profile that is highlighted in the profile list can be edited, when clicking on „Edit profile".

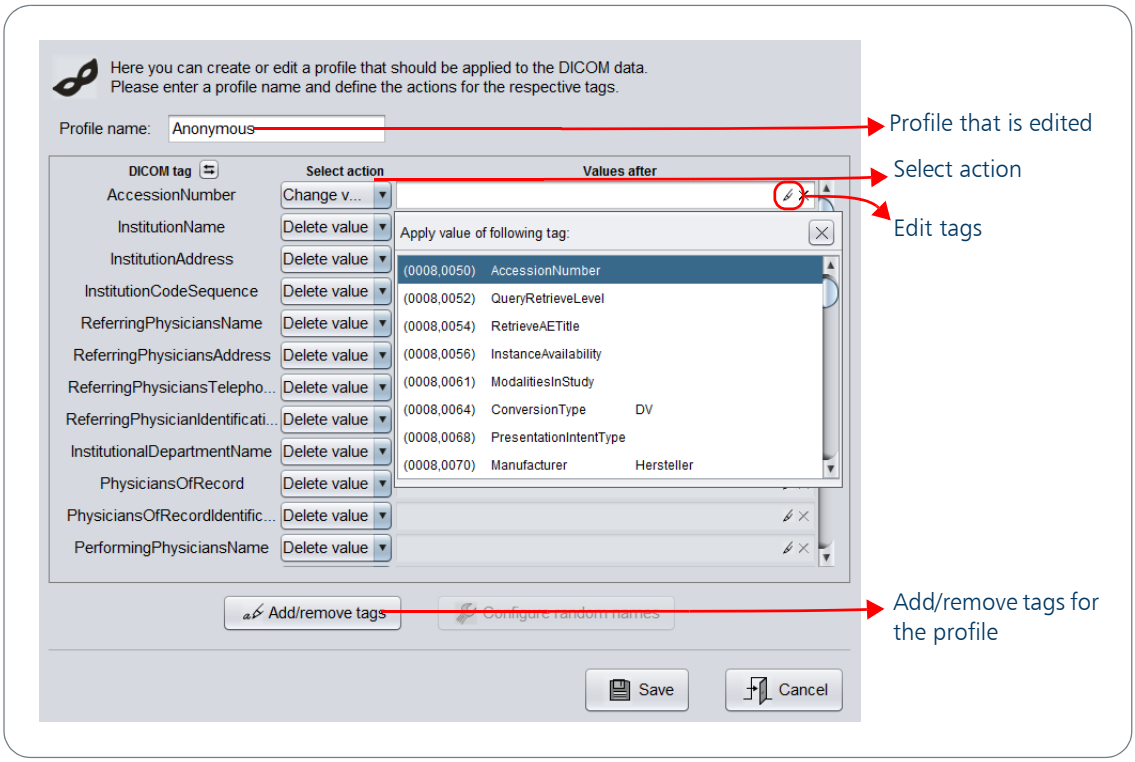


Figure 231. Edit profile

For anonymising data, the following options are available:

- DICOM tags can be deleted
- DICOM tags can manually be added or changed
- DICOM tag values can automatically be from other tags
- DICOM tag values (e.g. date, time, name) can be replaced by random values. If necessary, the random values for the names can also be configured.

Figure 232. Edit random names

Thus, according to DICOM standard, personal data of a patient, the practice or clinic will be anonymous.

However, ***AccuVue*** does not remove image-specific information, such as the resolution or greyscale.

NOTE

If patient information are burned into the pixel, they cannot be removed, like on ultrasound images that were captured by video signal.

The original images are copied the images to be anonymised are given new UIDs.

All data content within the image is presented in a clear table format, that gives a complete control and overview at all times about what data is used.

NOTE

All given profiles are just sample profiles. It is highly recommend to customise the profiles according to your needs.

Profiles can be deleted when they are highlighted in the profile list and when the button „Delete profile" is clicked.

NOTE

Any changes that are made in the profile that was set apply to all DICOM data when this profile is used.

One time tag changes, actioned by individualising the values in the right column, are not saved in the profile but are executed on the currently loaded DICOM data.

3.8.13. Stitching

In the configuration dialogue, the user may define keyboard shortcuts for accessing the different stitching steps. By means of the stitching function, separate X-ray images can be stitched together easily to produce an overall image. The images are uploaded, aligned correctly and can be joined horizontally or vertically to make one image. This function is ideally suited to create images of an entire leg or a complete spine. The user simply has to select the different images, cut at a marking point, align them and then save them as a new image. The patient data from the loaded X-ray images is automatically assimilated.

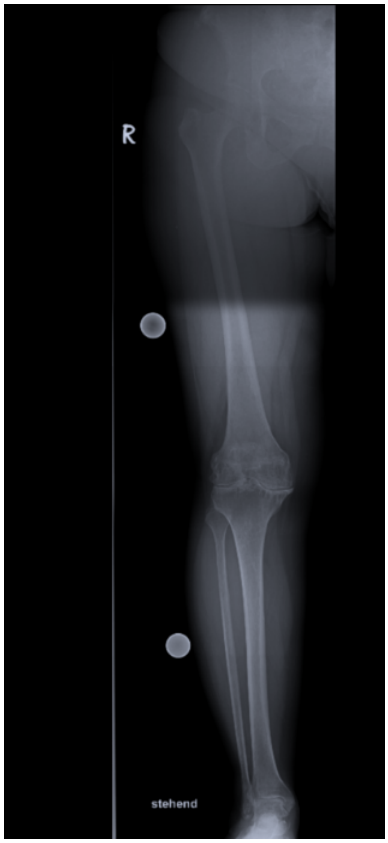


Figure 233. Stitching applied

CAUTION

The stitching tools have been developed exclusively for the stitching function and must only be applied with images created for that purpose.

To work with the stitching tool, first of all it is necessary to select the according images to be stitched by pressing the button „Create Stitching Image". A new dialogue box opens where all images of the study are displayed and can be selected.

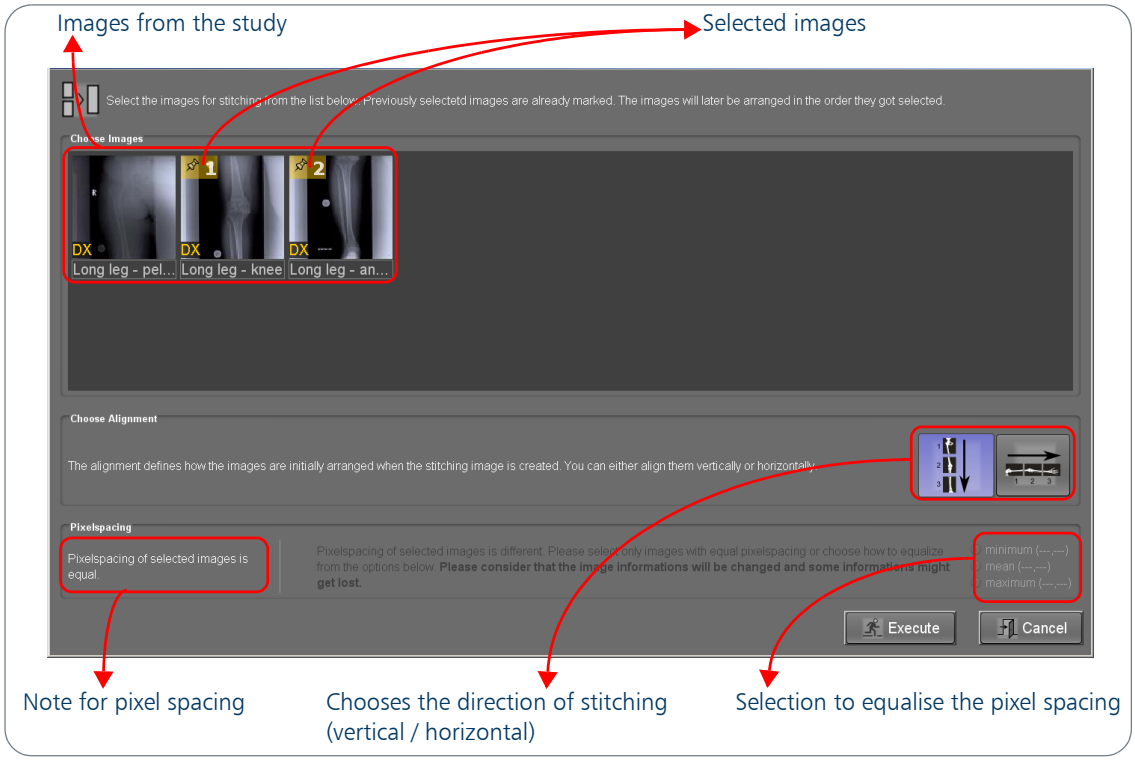


Figure 234. Image selection for stitching

The images can be selected in any order. The selection is indicated by numbers displayed in the preview images. Any number of images can be used for selection.

To select the direction of stitching, it is necessary to know that it can be chosen between a vertical or a horizontal direction. If there are conflicts between the images and their pixel spacing, a message will pop up and it is possible to equalise the images by choosing the required values. After clicking on the button „Execute" the images are displayed in the viewer in the set order and orientation. To get a good detail view zoom into the image by rotating the mouse wheel with the cursor pointing on the preview image on the right hand side. The images must then be cut at a marking point to put them together that they form a unified image. By holding down the left mouse button, the images can be moved easily. The overlapping boundaries of the sub-images can also be changed by holding down the left mouse button.

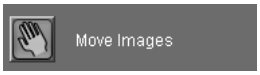
By clicking on finish stitching image a dialogue box opens with a preview of the final composite image. Selecting „Continue" allows to work on and to make further changes. By clicking on „Execute" the stitched image is added to the study. All original images that were used for the stitching, will remain. To cancel the procedure, the Cancel button has to be pressed after which the dialog box closes.

The selected images are displayed in the working area of the Viewer.

All remaining tools to perform the stitching process are located in a bar below the images to be stitched.

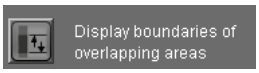
Figure 235. Export stitching

Figure 236. List with tools for the stitching process below the images to be stitched



The tool „Move Images" is activated by default. By using this tool, the images can be slid over each other to the correct cutting edge.

„Cut Images“ is a tool for cutting overlapped areas of the sub-images. The processed sub-image is highlighted by a neon green colour. In the process the areas will only be faded out and not cropped. The original image size can be restored at any time using this tool. With the yellow arrows on the right side of the stitched image it is also possible to cut the overlap.



The tool „Display boundaries of overlapping areas“ is also activated by default. This tool provides the display of the overlapped areas of the stitched images, which are marked by yellow arrows at the edge of the images.

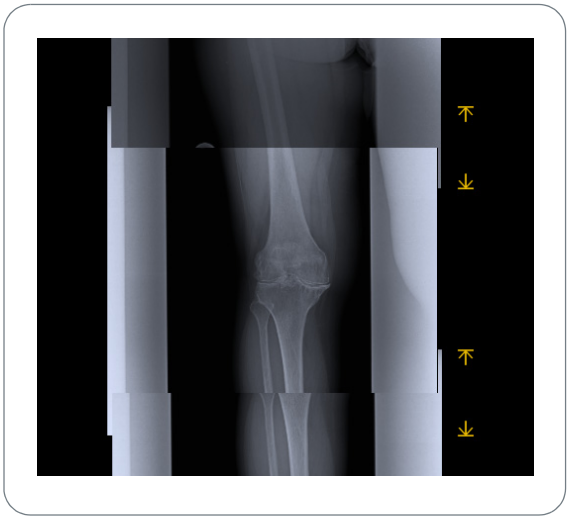


Figure 237. Display boundaries of overlapping areas

This tool offers the possibility to remove a subimage from stitching by a left-click on it, e.g. in case the user has selected too many subimages.

CAUTION

The functionality of „Delete Subimage“ is not reversible.

The tool „(de-)activate flickermode“ allows to compare the position of the images to each other. The overlapping areas are displayed like a flicker. The flicker mode can be configured to a rolling mode below the image. One image rolls above the other. The speed can be set for both options.

By using the „Back“ button, you can exit this mode and you have access to all tools for the stitching process again.

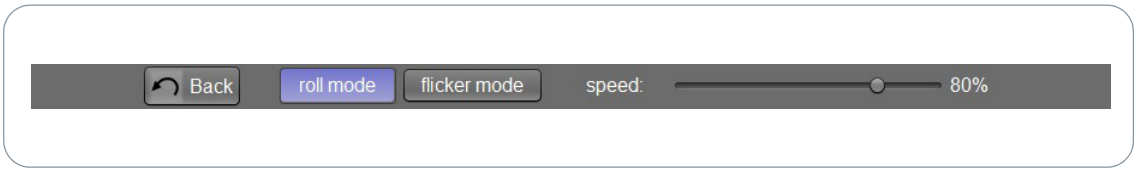


Figure 238. Activated flickermode

This tool allows to export the final image into a normal DICOM image which can be processed and edited. After pressing on the button „finish stitching image", the final image will be post-processed and afterwards a dialogue will appear presenting the image. It can then be decided whether the result fits the expectations. It is possible to export or cancel the operation to make additional changes to the image. The finished stitching image is added to the study and is listed in the navigation bar.

3.8.13.1. Auto-Stitching

Often motorized swivel arm systems have stitching programs integrated, working with fixed overlapping areas. The Auto-Stitching module offers an easy workflow and significantly reduces working time spent on the stitching process. The images that were taken for the examinations will automatically be arranged in to an editable Stitching- respectively overall image. Overlapping areas, which were defined once, can be set to align the images automatically in the correct order. The user must simply check the images, if they are set in the right order. A manual correction is usually not necessary.

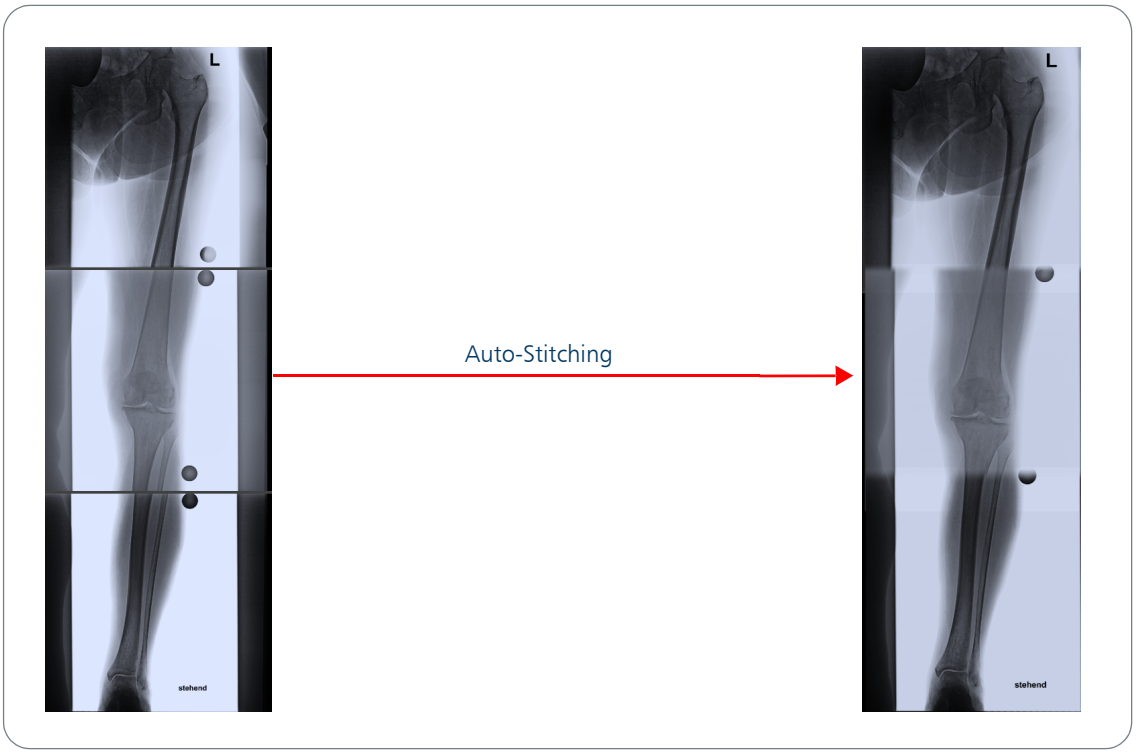


Figure 239. Three single images will be aligned to one overall image

Activating Auto-Stitching

To execute Auto-Stitching it is necessary to create a macro. (see “Configuration of examinations and macros” page 65). In this macro the images of the selected examinations are put together to one overall image. The example of a long leg image illustrates how the Auto-Stitching function influences the resulting image.

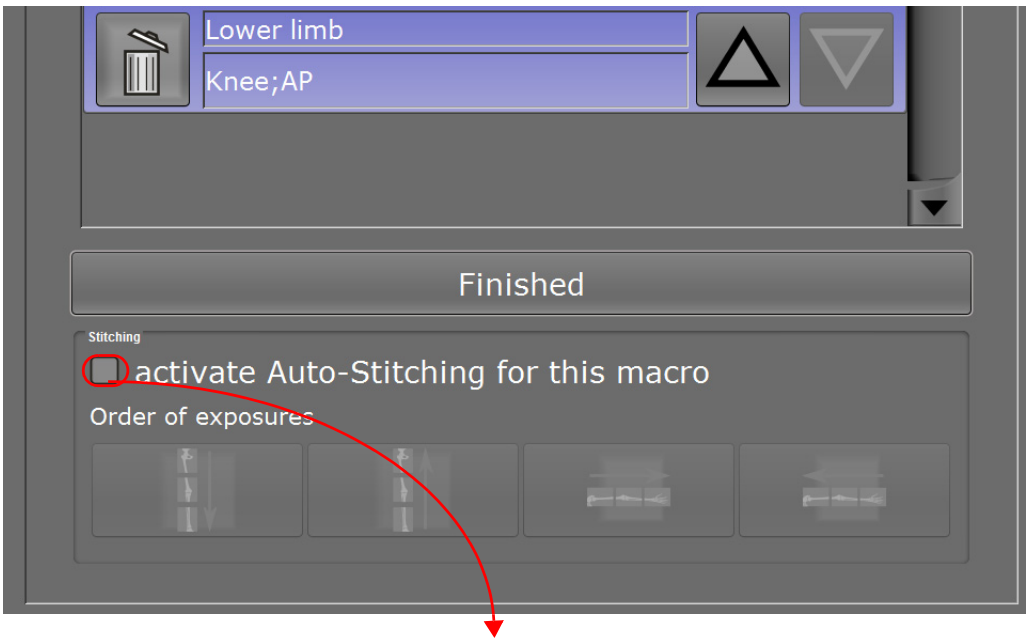


Figure 240. Activate the Auto-Stitching function for the selected macro

For the example, three examinations (thigh, knee and lower leg) were added to the macro. The option "activate Auto-Stitching for this macro" is located under the list of specified examinations for this macro.

If the option is activated, the user can select in which direction the images are arranged via buttons (“Order of exposure”). The second button (direction from the bottom upwards) is e.g. useful, if the first image is a foot, the second a knee and the third is a thigh.

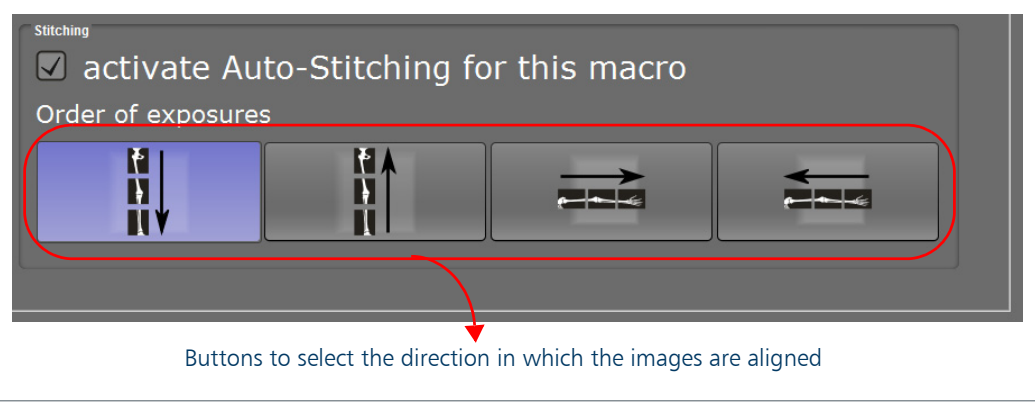


Figure 241. Order of exposures

The buttons below “Order of exposures” just change the direction (for example from the top to the bottom), but not the order of the images.

The order of the images is changed with the up and down button  next to the selected examination names.

Auto-Stitching is thus enabled and activated for this macro.

Creating the Auto-Stitching image

In the X-ray tab, the examinations, which are stored in the macro, have to be assigned to a patient. By selecting the macro with activated Auto-Stitching (in the example: "Long leg") the examinations are added and can be taken as usual.

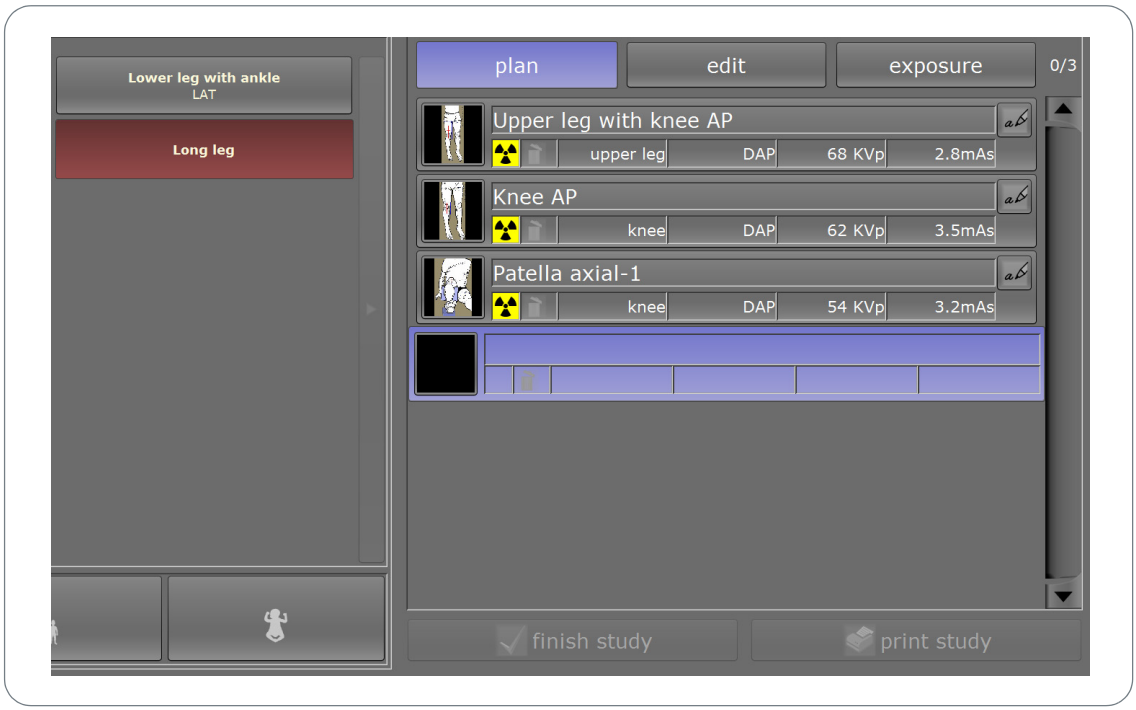


Figure 242. examination ready to expose the images

Once the images are taken, they can be displayed in the viewer by clicking the viewer button  .

Here the recorded images are stitched together and are displayed as an overall image.

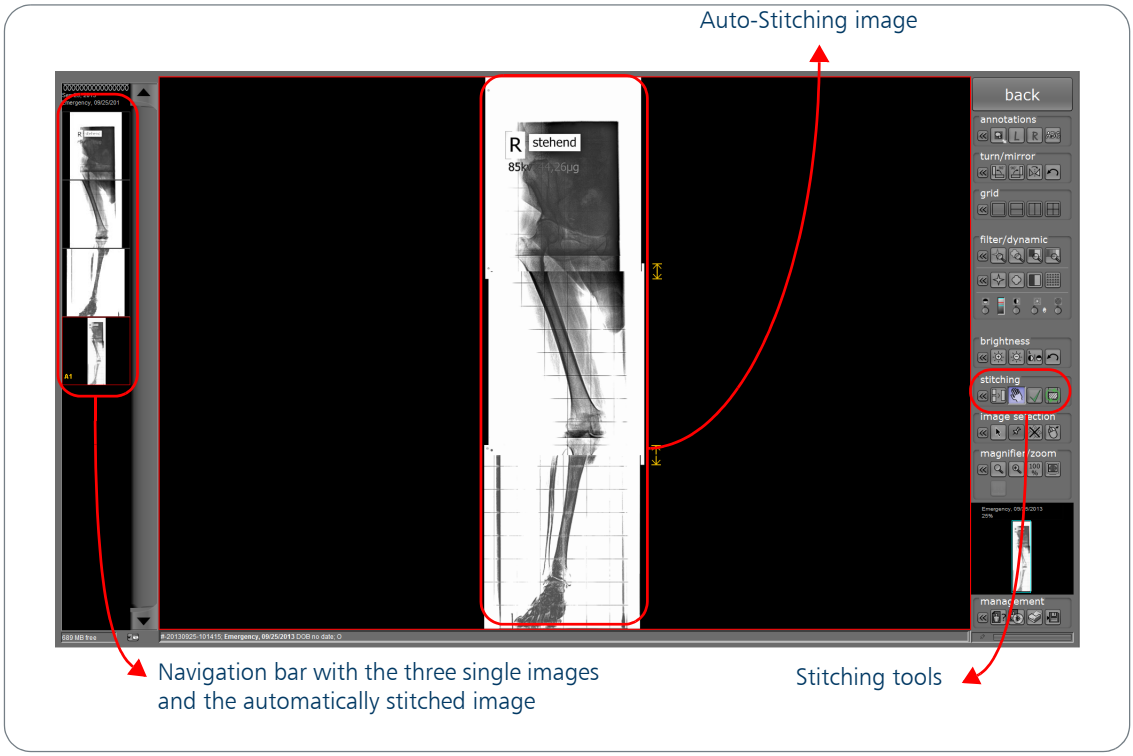


Figure 243. Viewer with three single images and one overall image in the navigation bar

As described in section “The working area” page 225 there are tools of the Stitching function available to use.

The tool "move images"  allows the positioning of the single images, so an overall image is created (for a description of the tools, see 3.10. “The working area” page 225). Once the images are positioned correctly, the user can finish the stitching process by using the „finish stitching image“ button  . A window opens, in which the position of the images can be saved (set checkmark), as well as the stitching process can be finished.

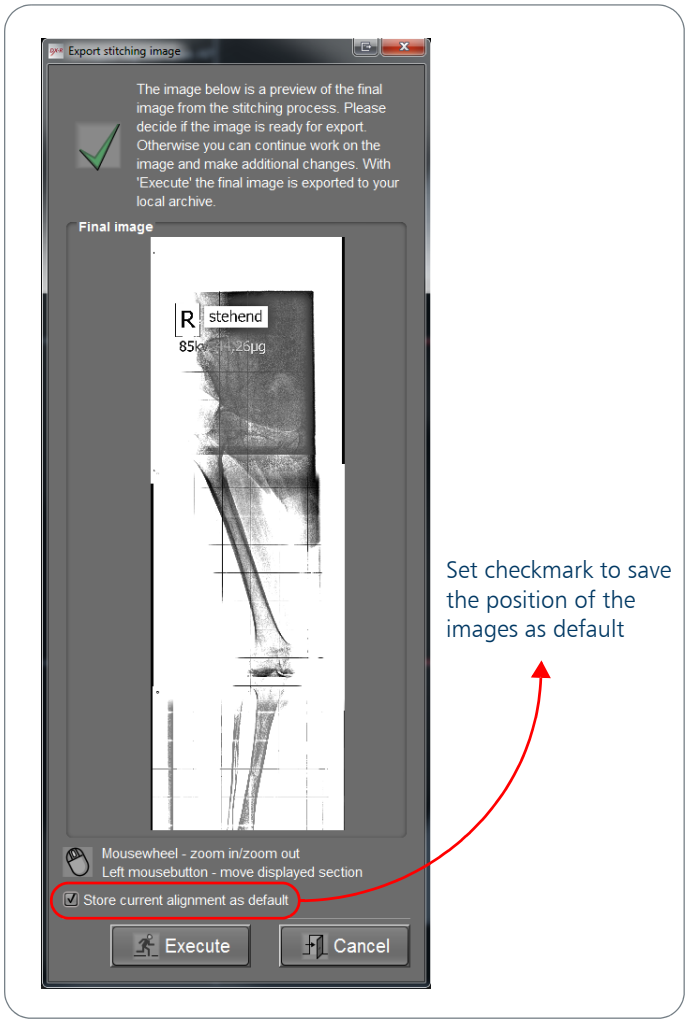
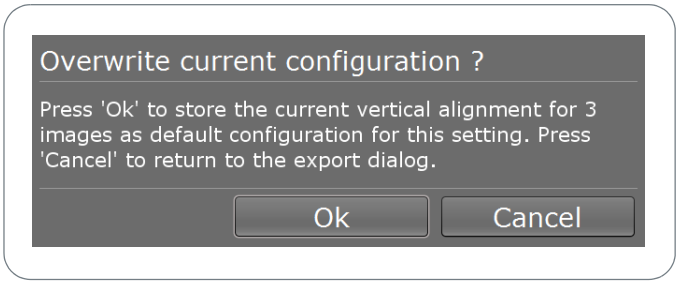


Figure 244. Execute stitching and store current alignment as default

If the checkbox is active, a click on the "Execute" button opens an additional dialog, in which the user must confirm the position values of the images to be saved.



With a click on the "Ok" button the stitched image will be created and the position values are stored as default values.

All further images that are taken with activated Auto-Stitching and have the same number of images and the same direction will be overlapped by the default values when displayed in the viewer.

Fine adjustment

It is possible to correct and adapt the numerical values of the overlapping areas. Therefore relevant is the dialog "Define Overlapping Areas". By using the tool "create stitching image"  the dialog "Input for stitching" opens (see 3.10. “The working area” page 225)

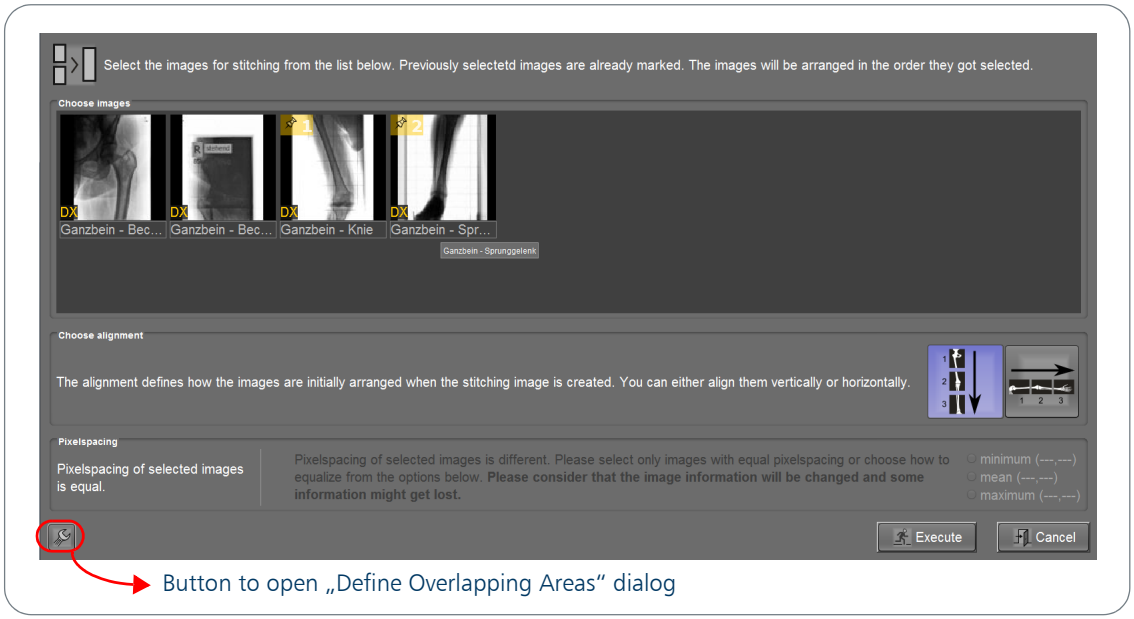


Figure 245. Input for stitching dialog

The wrench-button  , which opens the „Define Overlapping Areas“ dialog, is located in the bottom left corner.

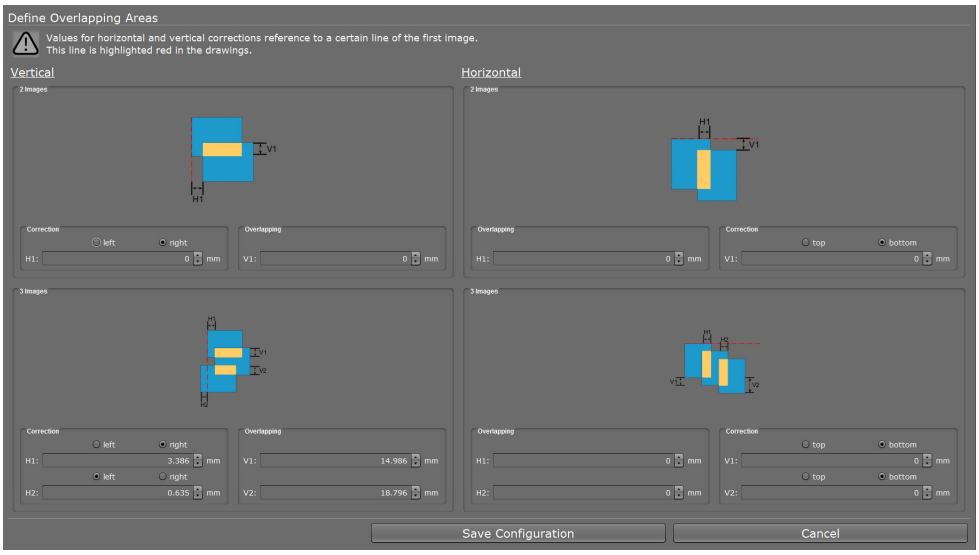


Figure 246. Define Overlapping Areas dialog

Here, the values of the horizontal and vertical position can be corrected.

For example, the following settings result in the adjacent image.

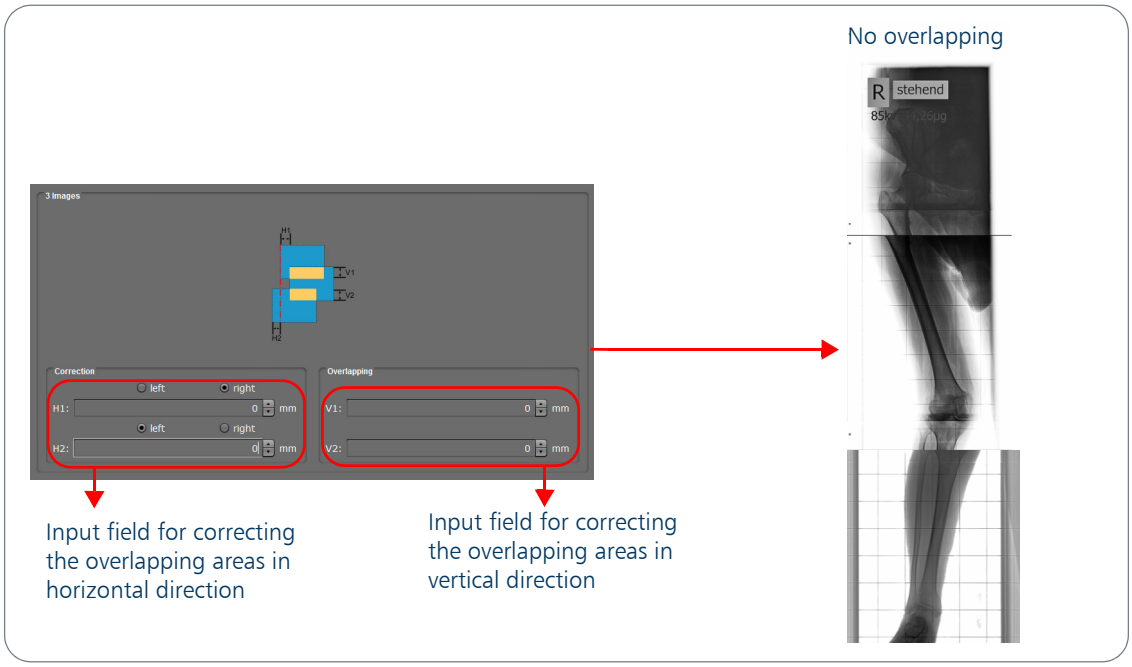


Figure 247. An example of a value of 0 results in no overlapping

It can be seen, that the images are aligned amongst each other, but they are not overlapping.

The following setting moves the middle image 50mm upwards (V1).

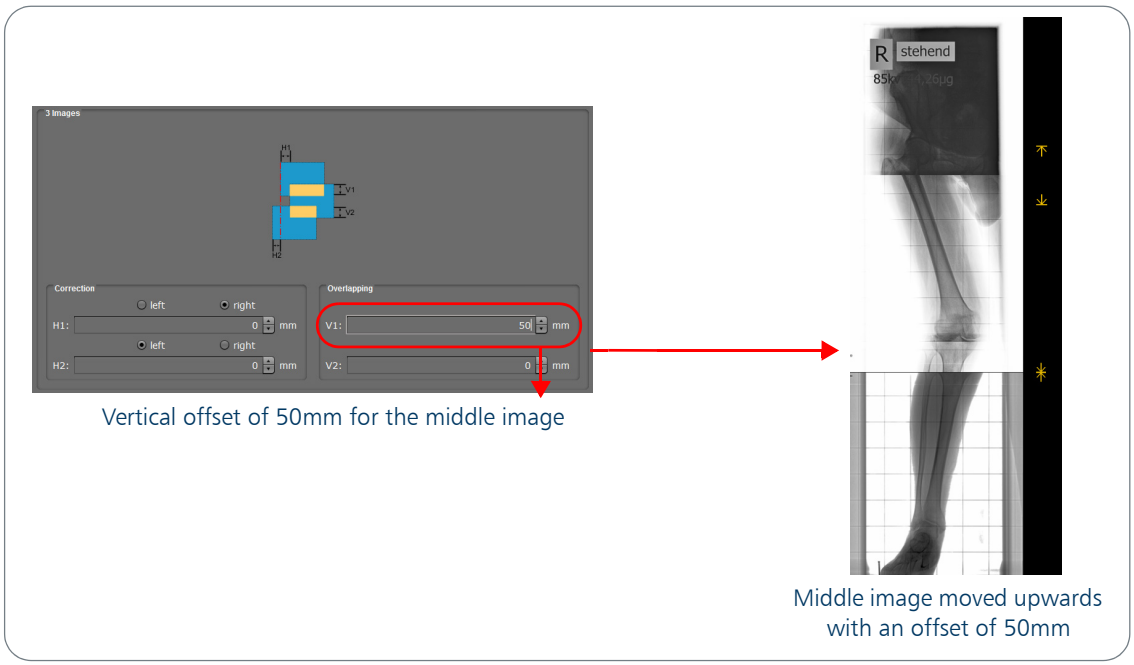


Figure 248. An example of a value of 50 for vertical position V1 results in a movement upwards

3.8.13.2. Configuration dialog of the management tools

The configuration dialogue appears by selecting the screw wrench icon and offers the settings for the specified tools.

The configuration of the tab „Daily visual check“ as well as „Databases“ can only be executed by OR Technology.

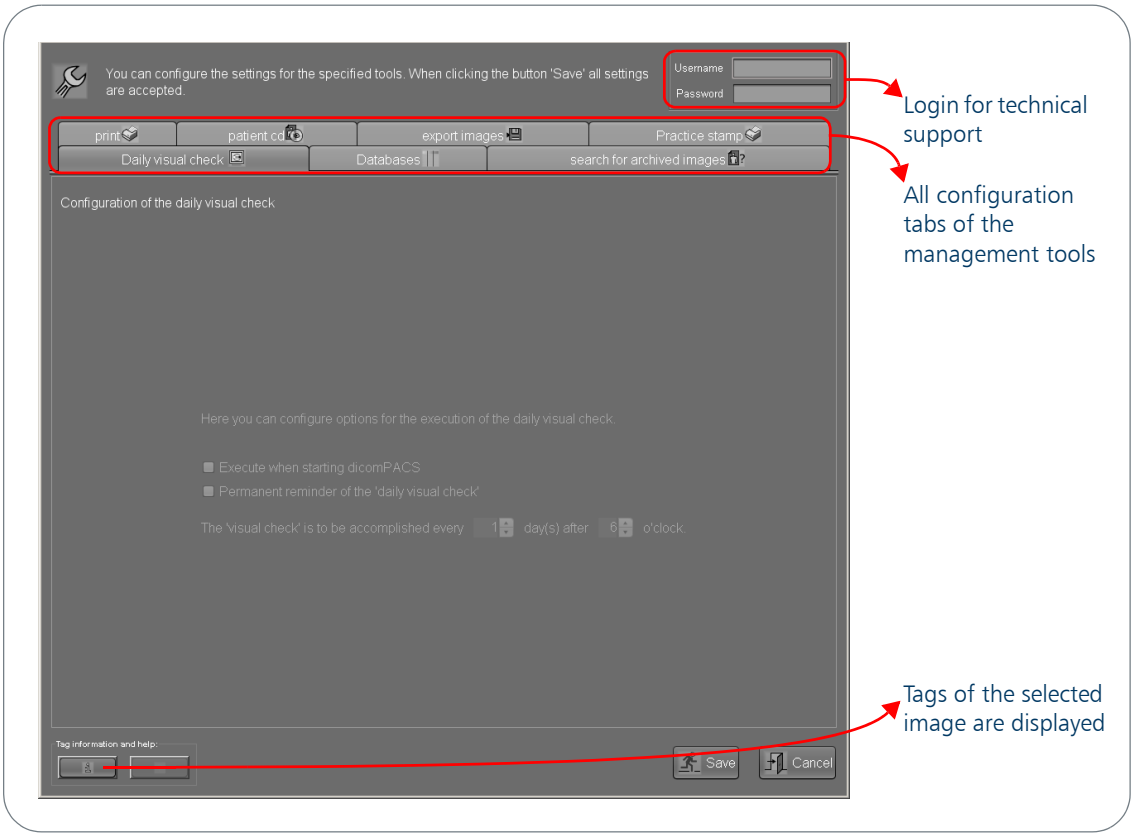


Figure 249. Configuration of the management tools

The tab search for archived images allows to configure the selected archive for the corresponding tool in the management toolbox.

NOTE

It is advisable that only your software dealer makes any changes to the configuration of the archive.

The different study search options allow to select how the user would like the Patient administration dialogue to be shown.

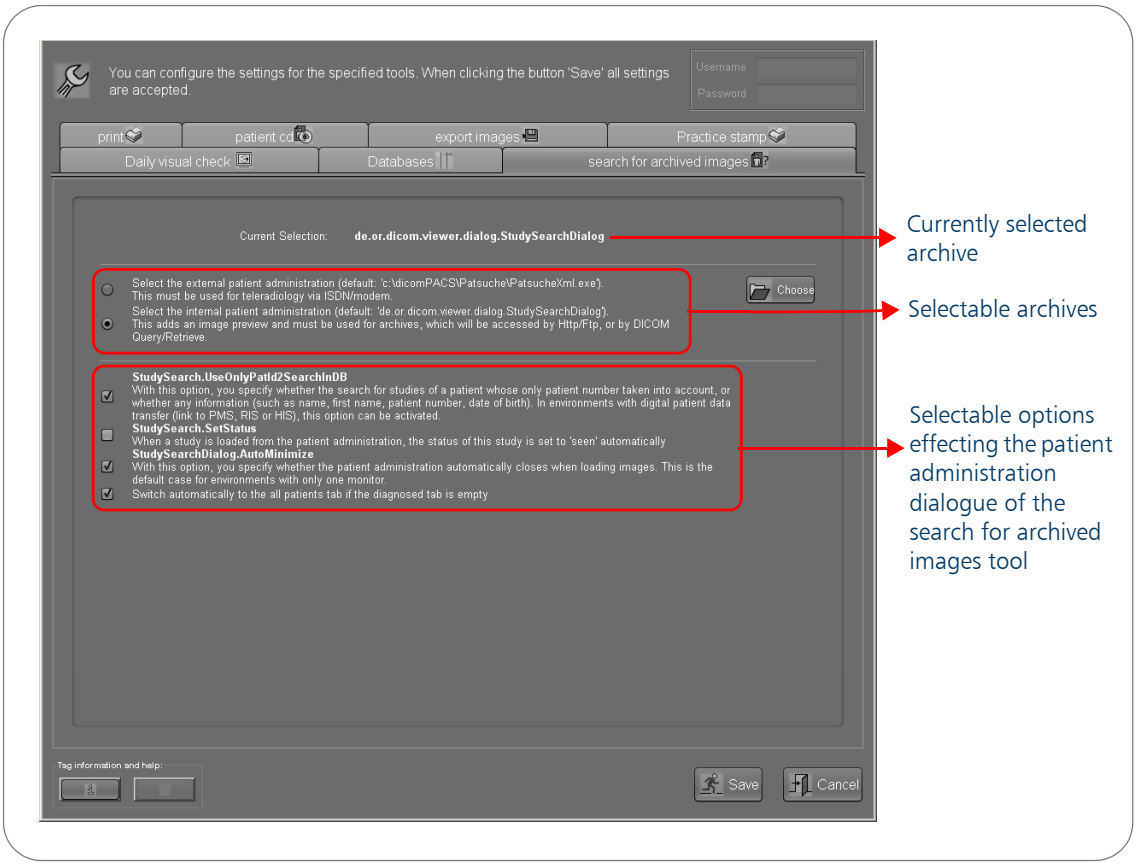


Figure 250. Search for archived images - configuration

In the tab print it is possible to configure new DICOM- and Windows printer or to delete existing ones. The user may also reject special configurations by resetting the entries.

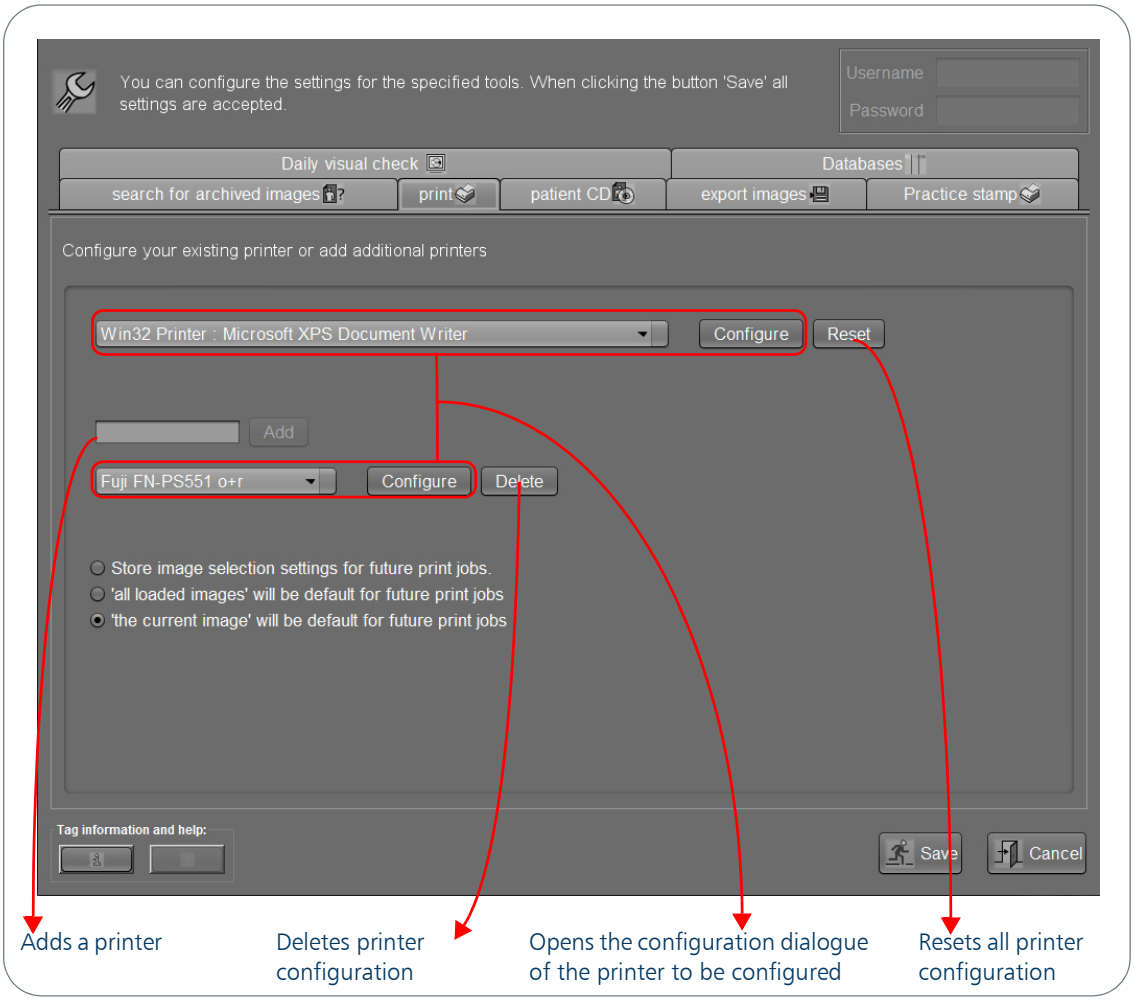


Figure 251. Print tool - configuration

The tab patient CD allows to configure the software to be used for burning CDs. The default setting using MakeCD offers the possibility to burn CDs without obtaining a third party license, like for Nero. The use of Nero may however be configured if the user has an active and compatible Nero version 6.6 until Nero version 8 installed on the PC, when it was used before an update.

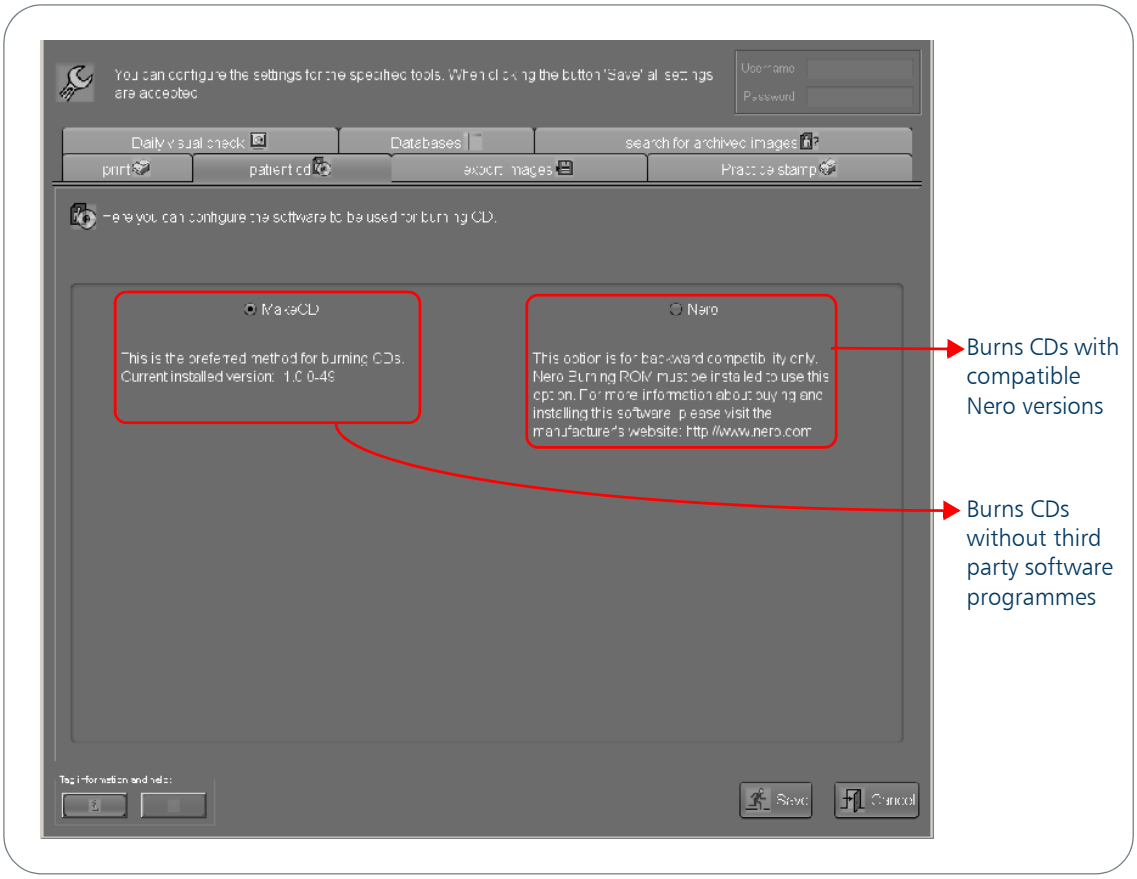


Figure 252. Patient CD - configuration

In the tab export images, the user may configure the preferred export formats and the export directory for the images.

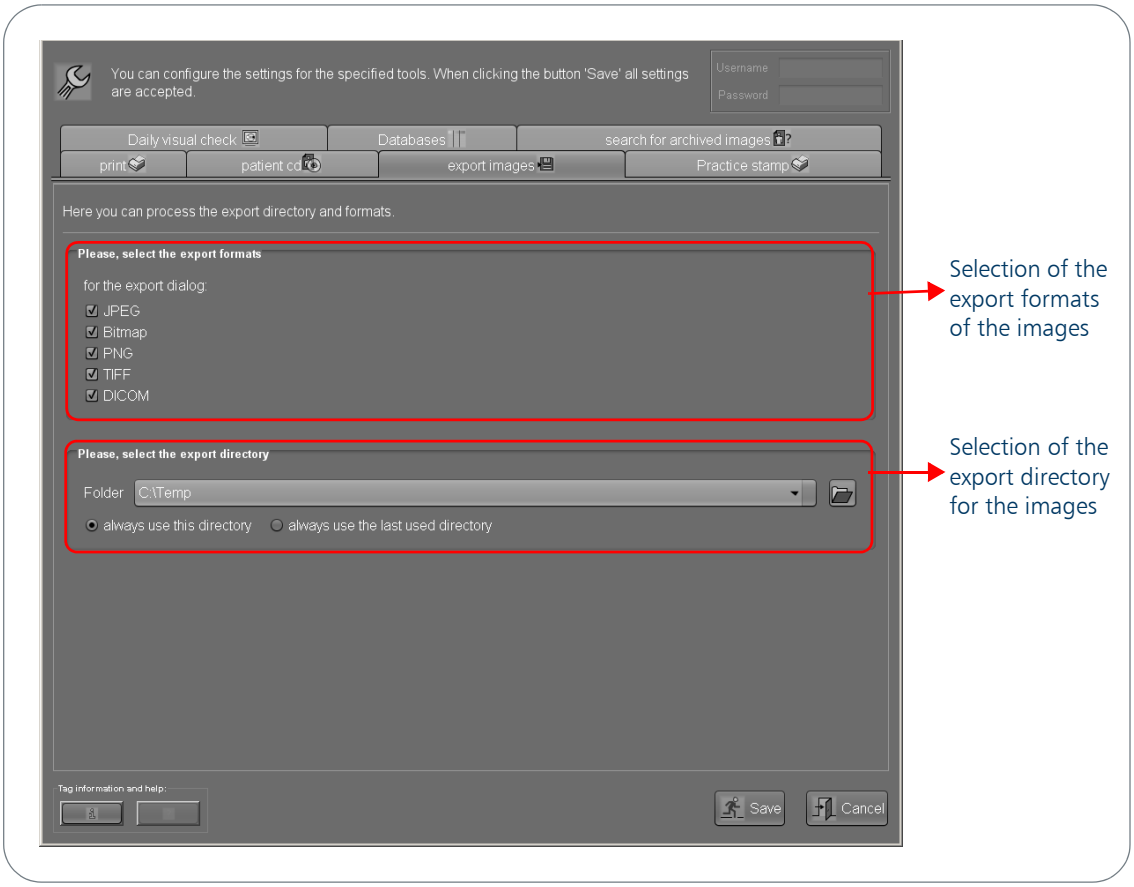


Figure 253. Export images - configuration

The tab Practice stamp offers the configuration of the practice data, which can be displayed e.g. at the top of the printout of images as well on the patient CD start screen.

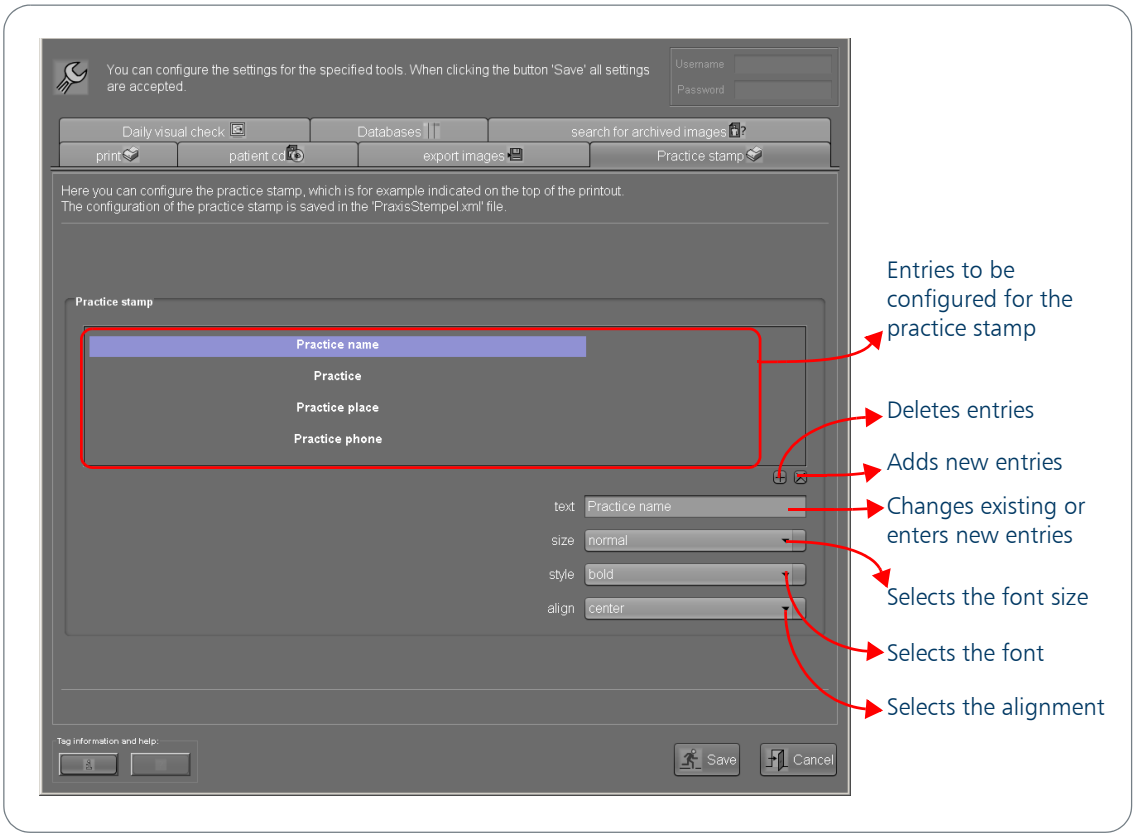


Figure 254. Practice stamp - configuration

Any changes that are applied to the practice data are immediately displayed in the list of entries.

3.9. Extended tools

CAUTION

To use extended tools, which are optional tools, together with a virtual keyboard it is necessary to connect a mouse to the PC to adjust the window leveling.

3.9.1. Tool area Filter / dynamic

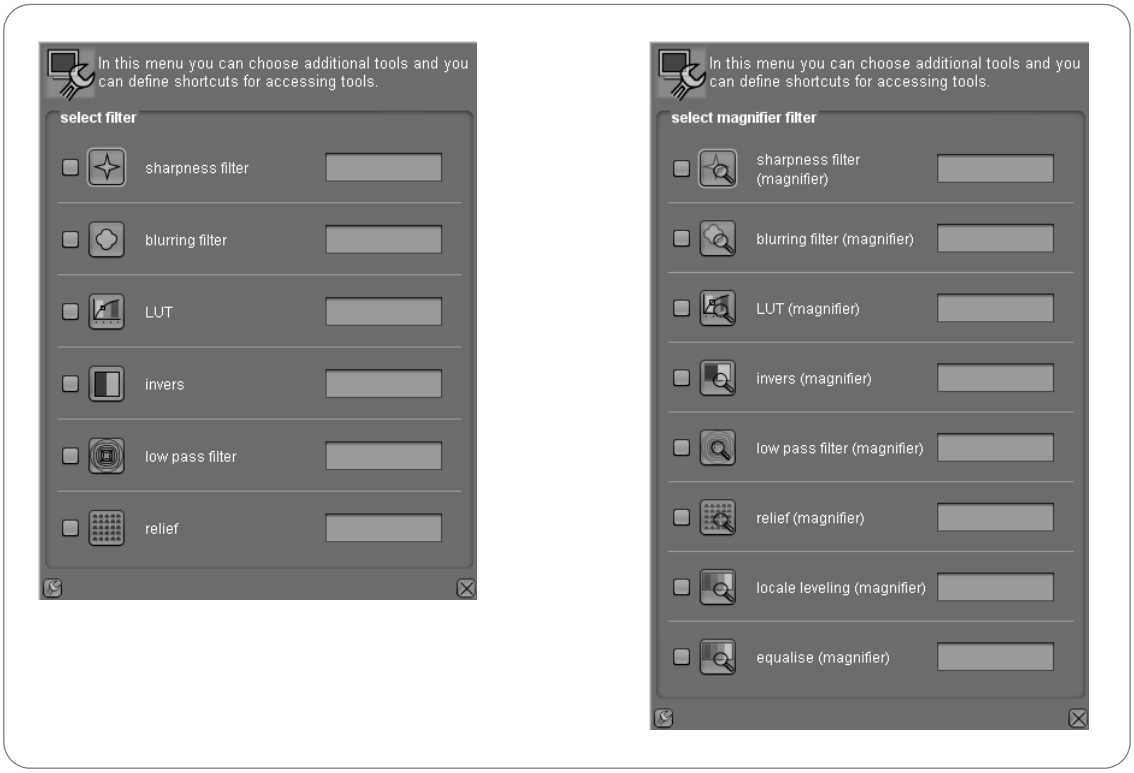


Figure 255. Filter / dynamic

In the configuration dialogue, the user may define keyboard shortcuts for accessing the filter/ dynamic tools.

The display of images can be adjusted with filters in order to see further or new details to support the diagnosis and findings process. The image data is processed by the filters (e.g. grey scales), which means that the image shown is not an exact reproduction of the original image data.

NOTE

The original data (raw data) of an image is never changed. Images that have been edited and are not displayed in their original state are marked with a warning symbol. The warning symbol is indicated with the following filters: sharpness filter, blurring filter, LUT (Look Up Table), relief filter and low pass filter.

3.9.1.1. Tools of filter/dynamic

Filter

There are two types of filter: the so called magnifying glass with filter and the standard filter.

The magnifying glass with filter is a combination of the magnifying glass and a filter. It combines the selected filter with the zoom factor set for the magnifying glass and can be moved across the image.

Figure 256. Magnifying glass with filter

The actual standard filter is always applied to the entire active image and may be switched on and off. A slide control is provided to adjust the strength of the filter.

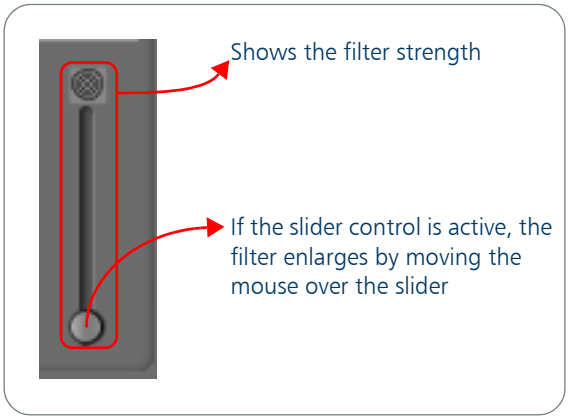


Figure 257. Slider

Icon	Functionality

	Sharpness filter
	Blurring filter
	Activates a LUT (Look Up Table)
	Relief filter
	Low pass filter
	Inverts the image
	Auto level inside the magnifying glass
	Histogram equalisation inside the magnifying glass

Table 5. Available types of filter

Dynamics

This area enables to change the grey scales of an image. The window width of the grey scale range and the position of the window (window centre) within the range of the grey scales contained in the image may be adjusted. The overall brightness of the image (gamma graph) can be changed as well.

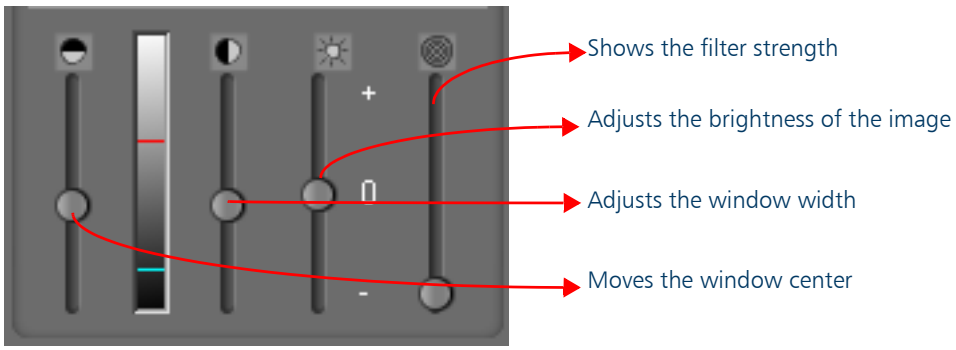


Figure 258. Dynamics

3.9.1.2. Configuration dialog of filter /dynamic

Select the screw wrench icon to display the configuration dialogue. The configuration dialogue of the filter and the filter inside the magnifying glass are identical but the magnifier tab is only available for the filter inside the magnifying glass.

NOTE

The configuration of the settings on the Colour LUT and the Monitor LUT tab may only be executed by your software dealer.

In this configuration dialogue it is possible to change existing, add new filters and to delete existing filters.

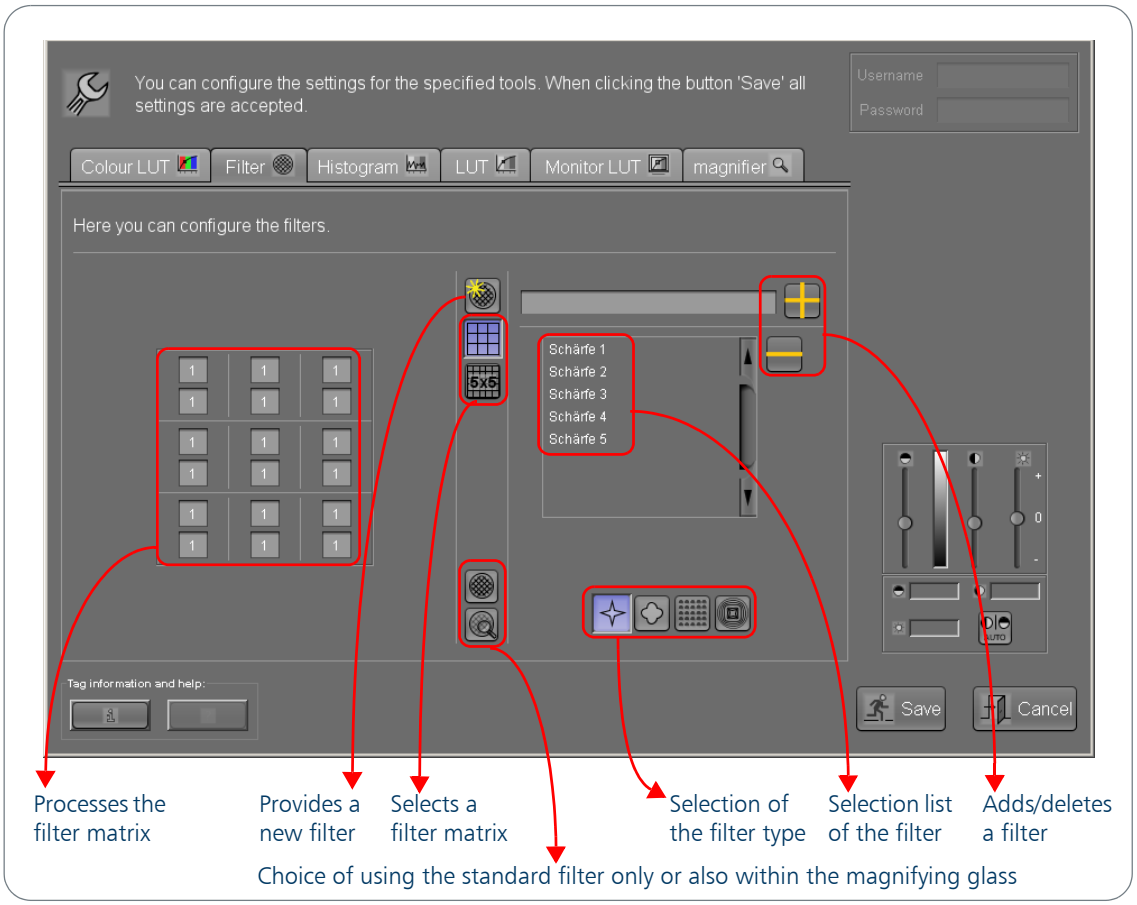


Figure 259. Filter configuration

To create a new filter, first select the „new filter" icon and select the type of the new filter. Then enter the name of the filter in the text field. The new filter can be added to the section list for filters by clicking on the „plus" button. A ticked entry is removed from the list of the filters by a click on the „minus" button. The selection list displays all available filter of the selected filter type. By a left mouse click on an entry, a filter can be selected and the appropriate filter matrix can be processed. For the filters, either a 3x3 or a 5x5 filter matrix can be used. The filter matrix of each filter can be adjusted as preferred by simply changing the matrix values.

In the dialogue below, a loaded image's histogram can be viewed.

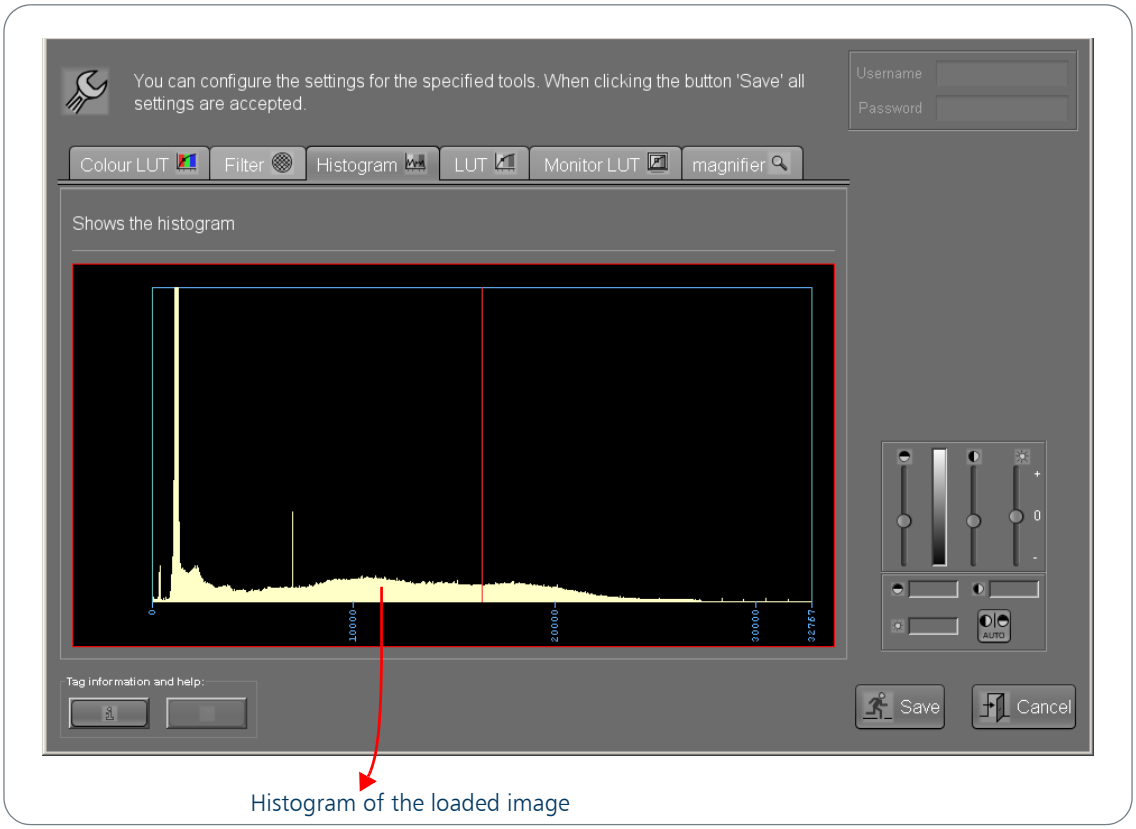


Figure 260. Image histogram configuration

To provide and add new LUTs and to revise or delete existings LUTs the below configuration dialogue is used.

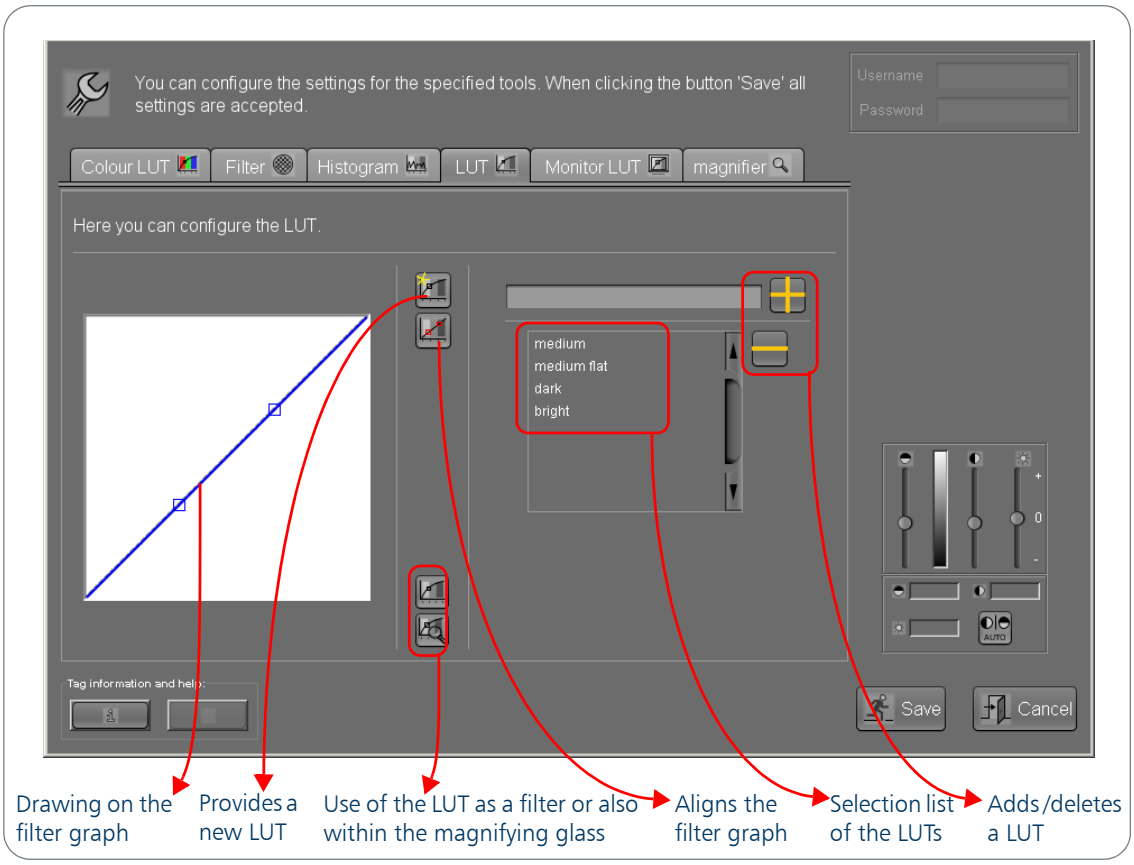


Figure 261. Configuration of the LUT

The below window is only displayed in the configuration dialogue of the filter inside the magnifying glass.

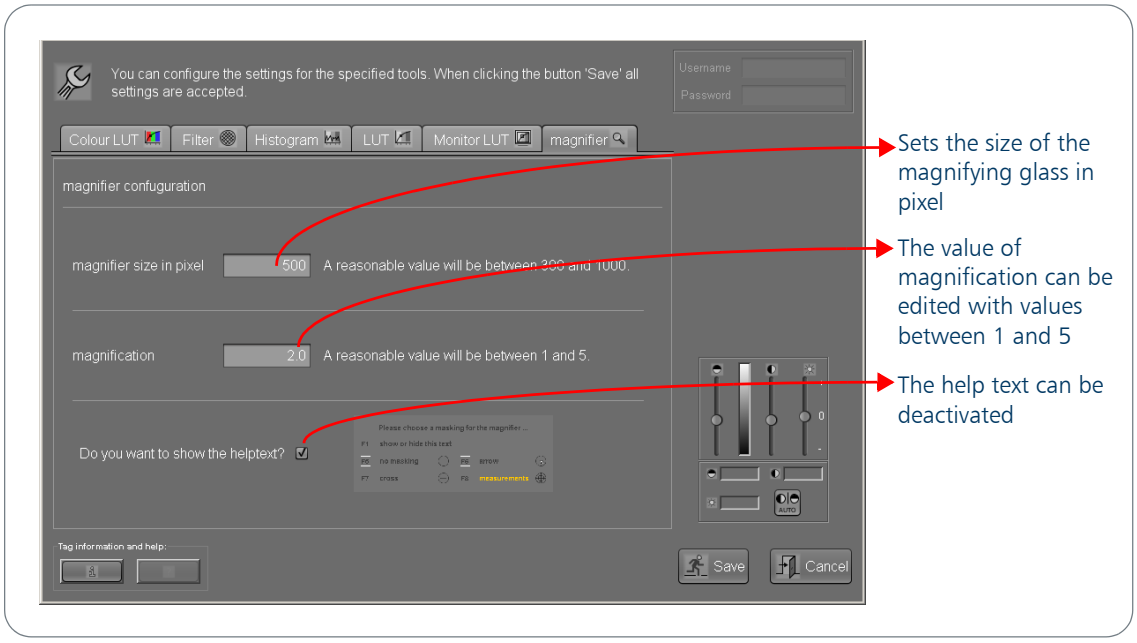


Figure 262. Configuration of the magnifier

3.10. The working area

The working area is used to display the loaded images. Additional information on the images, such as patient name, date of birth and examination details may be shown (see tool „annotations on/ off").

The tools and settings from the toolbar always apply to the currently active image. An image is activated by a mouse click on it or by positioning the mouse cursor over it and turning the mouse wheel. A red frame around the image confirms its active status.

A yellow number indicates a selected image and shows the image's position within all currently selected images.

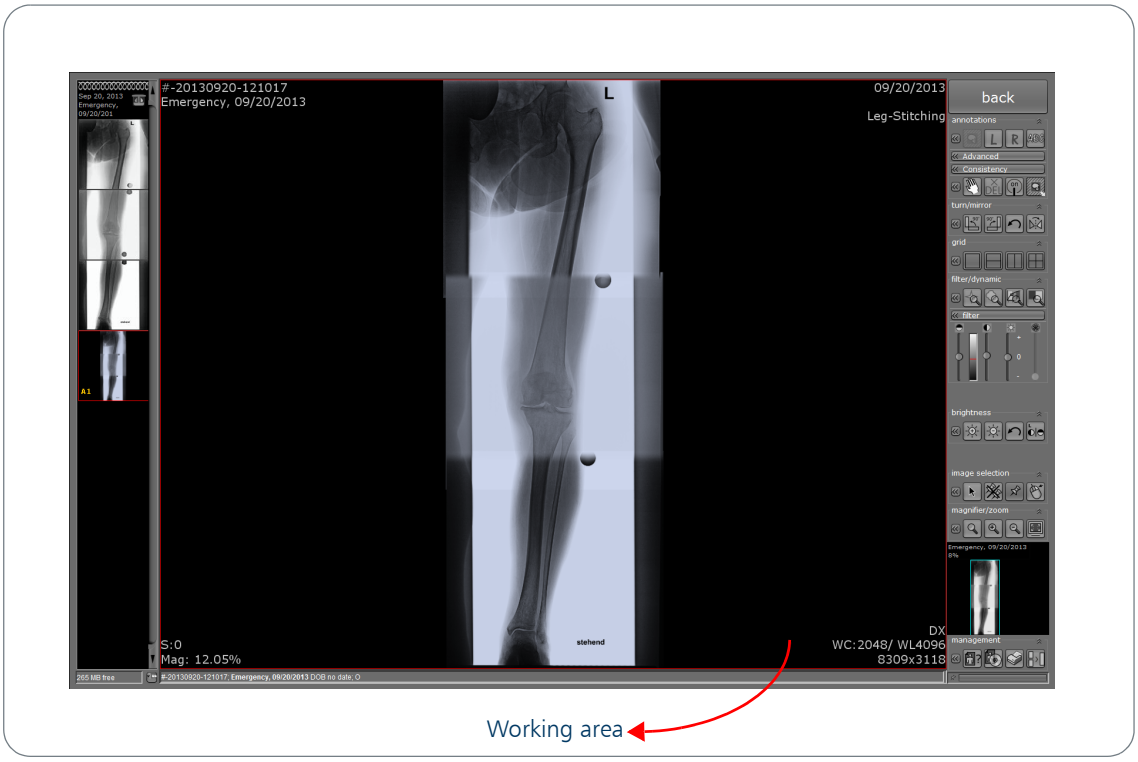


Figure 263. Working area of the viewer

3.10.1. Mouse button functions

Functions for the left mouse button:

- Moves image within its grid area (PAN tool) by holding down the mouse button
- Applies the tool selected from the tool bar (e.g. measurement, magnifying glass, annotation, etc.)

Functions for the right mouse button:

- Applies the tool allocated to the button (e.g. window level, magnifying glass, etc.)
- Zoom: press the right mouse button and turn the mouse wheel
- Functions for the mouse wheel:
- Zoom: press the Ctrl-key and turn the mouse wheel at the same time or press the right mouse button and turn the mouse wheel
- Quick access menu: this menu appears by pressing the mouse wheel.

3.10.2. Quick access menu

It is possible to set an individual favorites menu with the middle mouse wheel. The user can press the middle mouse button to open a menu that allows fast access to a freely configurable selection of tools.

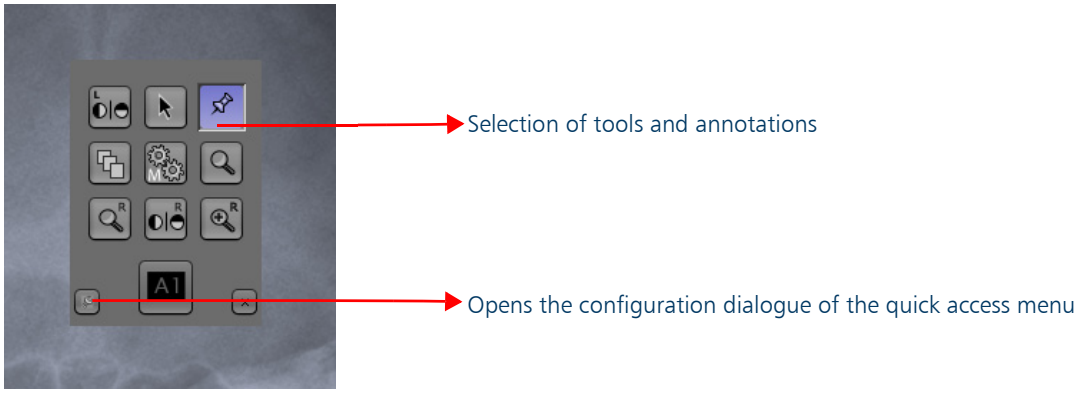


Figure 264. Quick access menu

If the use of the middle mouse button is not desired or not available, it is possible to uncheck the checkbox „open the quick access menu with the middle mouse button" in the configuration dialogue of the toolbox image selection in the viewer, see page 156.

NOTE

Please note that this tool is not available for touch screen operation.

By clicking on the screw wrench button on the left of the quick access menu the following configuration dialogue appears.

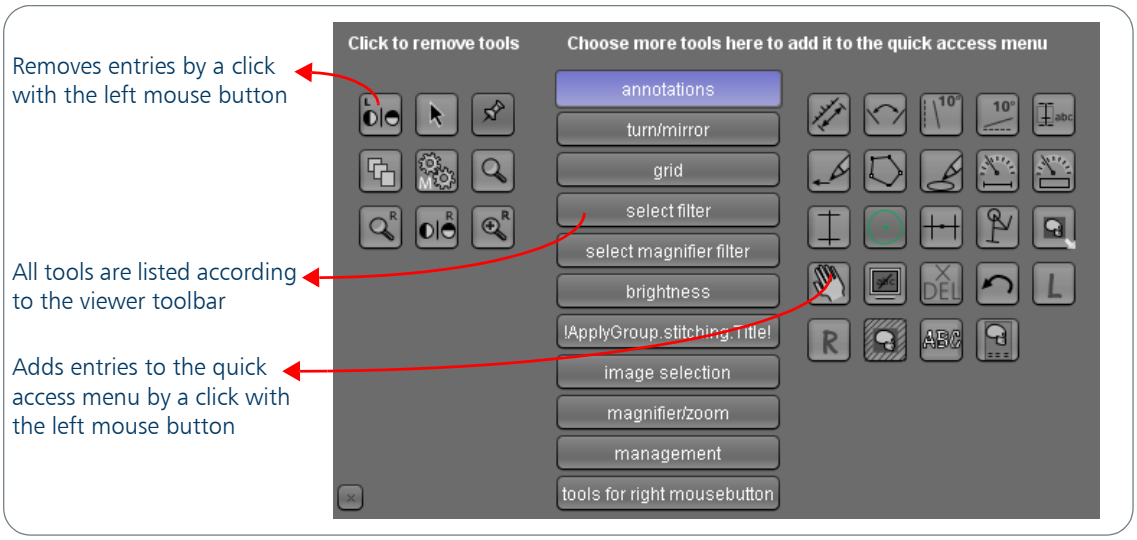


Figure 265. Configuration of the quick access menu

The favourites menu may also be assigned to the right mouse button via the tool „tool for the right mouse button“ in the toolbox image selection in the viewer, see page 156.

3.10.3. Full screen display

The full screen display is possible in the viewer. By using the key F11 on the keyboard, the user can make the preview bar visible or not. The key F12 makes the toolbar visible or invisible. The function is also located in the quick access menu, which appears by a click on the mouse wheel, see page 226.

Figure 266. Full screen mode

3.11. The navigation bar

In the navigation bar, all loaded images, series or documents are shown as preview images. With a mouse click on a preview image, the image is shown in the working area. If the working area is already divided by a grid, e.g. A1 – A4, the navigation bar will show a pop-up window when you right click, where the grid area can be selected in which the respective image should be displayed. Images can be arranged within the grid in the way the user wishes.

The option „Start relocating series into matrix from here" offers the opportunity to distribute the images automatically from the navigation bar into the grid area by the shown order. In case you have selected only a few images (with the pick up tool) in the navigation bar from a larger list of images and you want to distribute only the selected images select the option „Start relocating selected series into matrix".

When many images have been loaded, the visible part of the navigation bar may be moved using the scroll bar or the mouse wheel.

The activated pick-up tool can be used inside the working area and to the preview images of the navigation bar.

All marked images are available for further use, e.g. for printing, export, creation of a patient CD or similar.

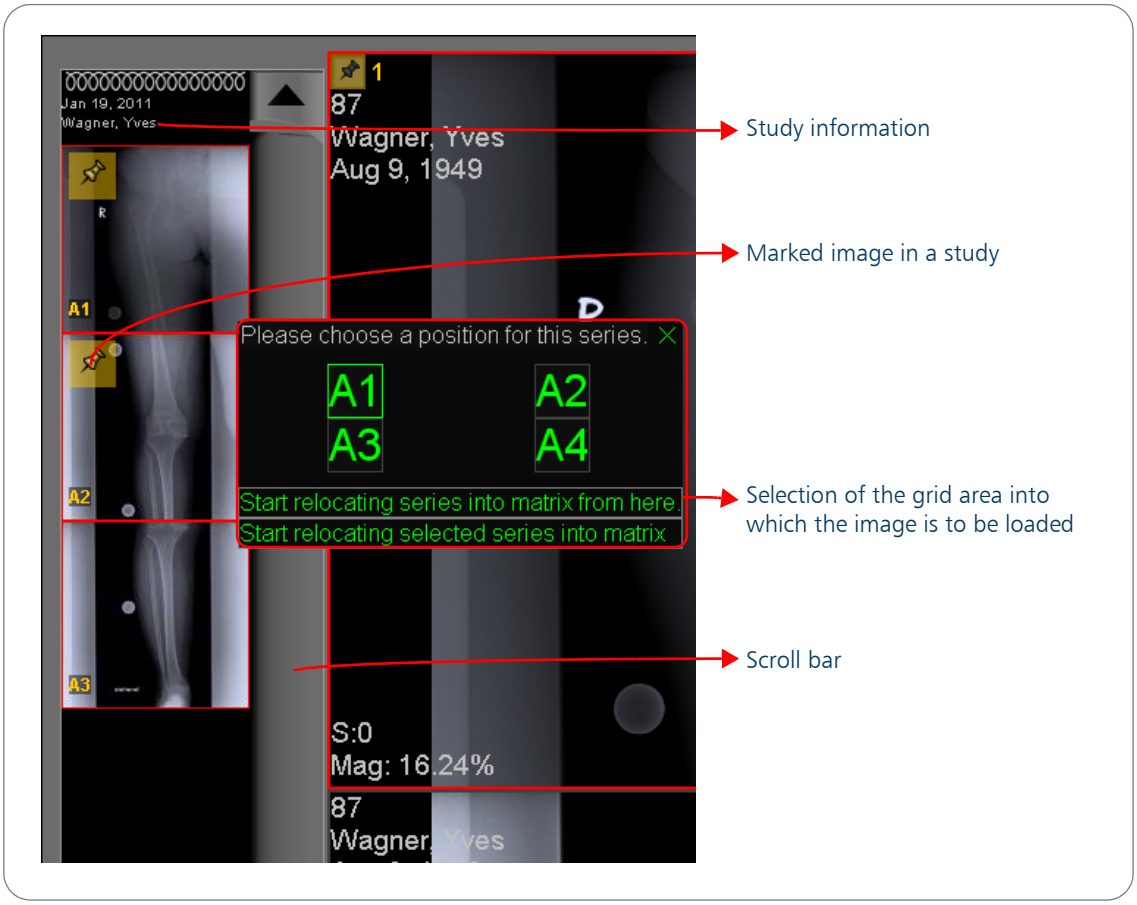


Figure 267. Navigation bar

3.12. The information bar

The information bar provides the patient data for the currently loaded images and the total size of all marked images. The total size can be found on the right of the information bar. This information is given in Mega Bytes and helps to estimate the amount of data to be exported to a CD or similar.

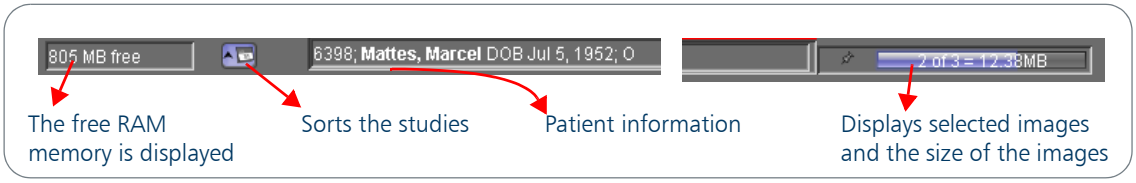


Figure 268. Information bar

The RAM state on the left of the information bar can be configured by your software dealer. A double click with the left mouse button reduces the RAM usage for a short time to load memory intensive images. It also gives an information when the memory capacity is low.

NOTE

The RAM status can be faded out in the support mode by a technician.

The small icon with the calendar and the arrow next to the RAM display, allows to sort more than one studies according to their time of exposure.

Chapter 4. Appendix

FDA relevant information

Summary of the Digital Panel Characteristics

Additional details are provided in the following documents:

- X-Ray FLAT PANEL IMAGER (FPI) OPERATION MANUAL OF TOSHIBA FDX4343R
- X-Ray FLAT PANEL IMAGER (FPI) STARTING OPERATION MANUAL OF TOSHIBA FDX3543RP
- DIRECT DIGITIZER Aero DR SYSTEM Operation Manual.

Sensitometric response characteristics typical of all three panels:

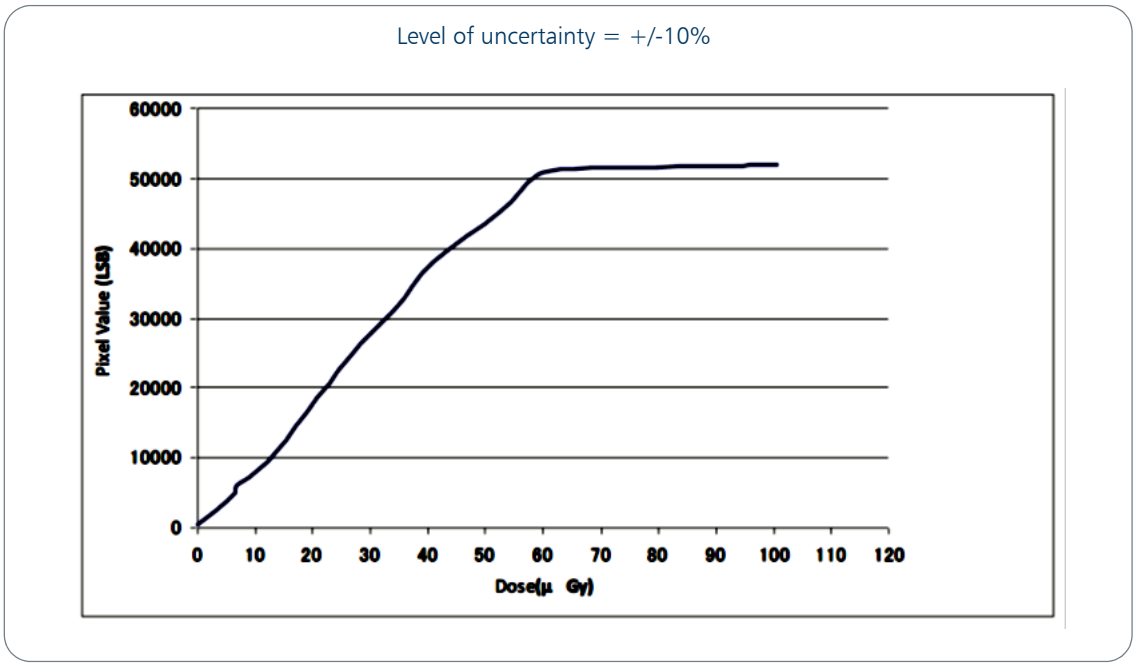


Figure 269. Response characteristics

FDX4343R	3.5 lp/mm
FDX3543RP	3.7 lp/mm
AERO DR	2.9 lp/mm

Table 6. Spatial resolution

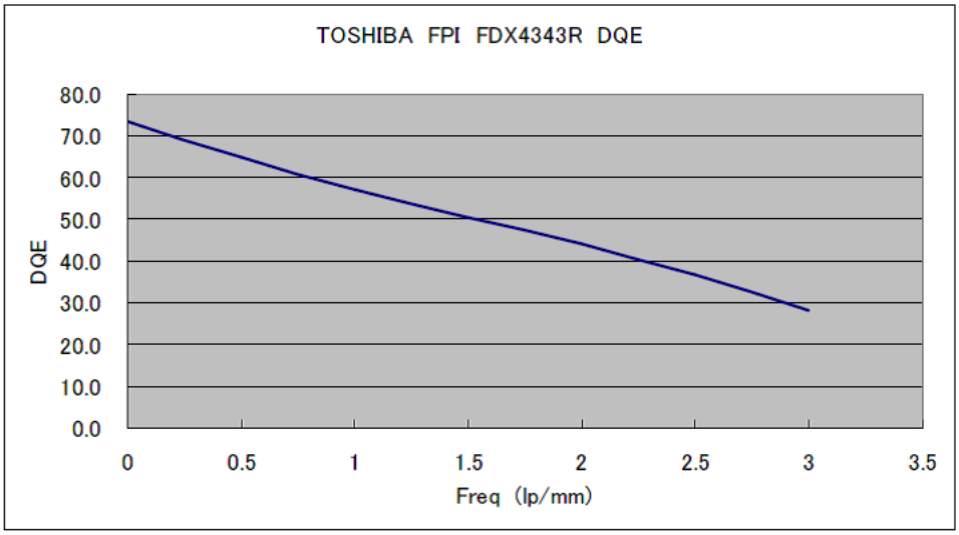


Figure 270. DQE Toshiba FDX4343R

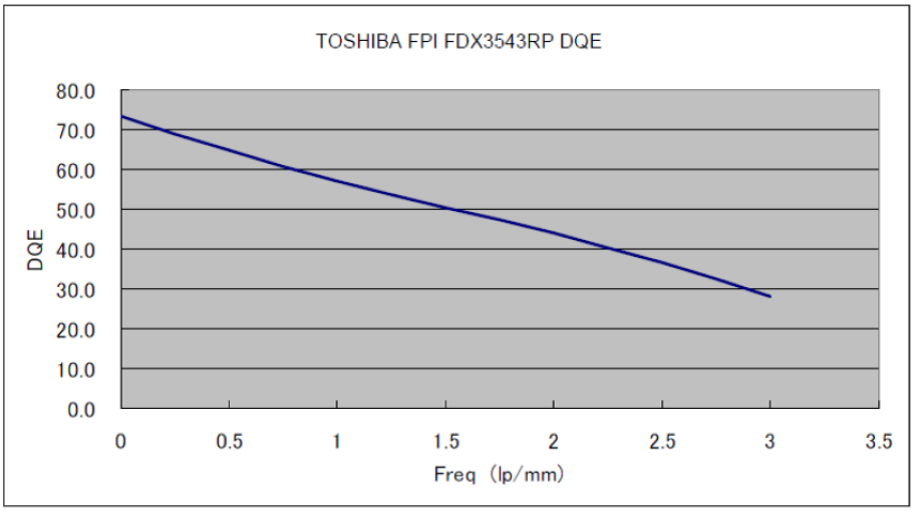


Figure 271. DQE Toshiba FDX4343RP

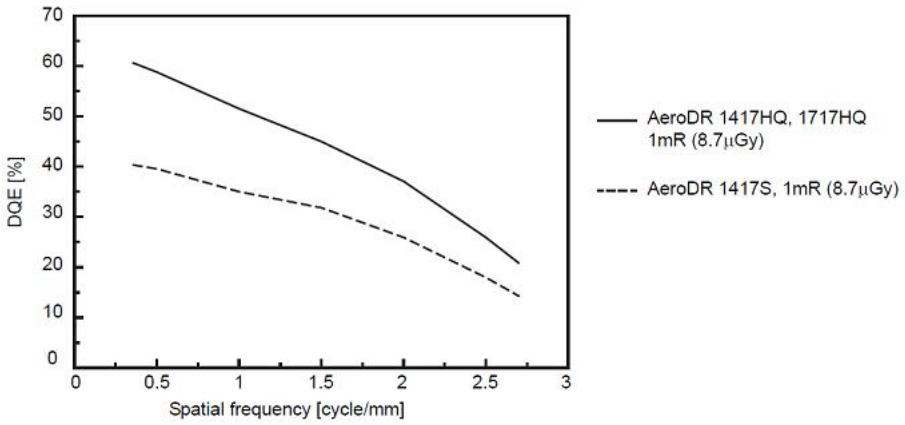


Figure 272. DQE Aero DR

FDX4343R	14 Bit
FDX3543RP	16 Bit
AERO DR	16 Bit

Table 7. Dynamic range

Display means utilised

For the diagnostic review of digital X-ray images, we recommend the highest LCD resolution available given your budgetary limitations. We can recommend diagnostic grade displays which have received FDA 510(k) clearance, with 5 mega pixel resolution (or more). Resolution can be computed by multiplying the maximum horizontal resolution by the maximum vertical resolution.

Results of image tests

A USA based board certified radiologist reviewed images from all three panels and found them to be of good quality, high resolution, and clinically acceptable. The review was conducted in accordance with the FDA guidance document on solid state X-ray imaging panels.

Typical patient doses

The table below gives typical dose reference level for adults (height: 175cm, weight: 75kg) and is valid for all three panels.

Examination	DAP * [dGycm^2]	Examination	DAP * [dGycm^2]
Skull ap/pa **	6.5	Thoracic spine ap	13
Skull lat***	6	Thoracic spine lat	17
Chest pa	1.6	Lumbar spine ap	23
Chest lat	5.5	Lumbar spine lat	42
Abdomen ap/pa	30	Pelvis ap	30

Table 8. Dose reference level

* DAP: dose area product

** ap: anterior-posterior pa: posterior- anterior

*** lat: lateral

List of pre-programmend examinations

Subpopulation Adult:

Clinical Application [Target]	Protocol Name	Thickness [cm]	kV_{min}	kV_{max}	$kV_{def.}$	mAs_{min}	mAs_{max}	$mAs_{def.}$	mAs_{AEC}	FFD [cm]	Grid	Filtration	AEC	S-Value
Spine	Cervical spine AP	13	66	77	70	8	12,5	10	63	115	yes	none	yes	250 - 400
Spine	Thoracic spine standing AP	22	70	85	77	12,5	20	16	100	115	yes	none	yes	250 - 400
Spine	Thoracic spine standing LAT	32	70	85	81	25	63	32	200	115	yes	none	yes	250 - 400
Spine	Lumbar spine AP	21	70	85	81	25	80	40	250	115	yes	none	yes	250 - 400
Spine	Lumbar spine LAT	31	85	95	90	40	125	80	320	115	yes	none	yes	250 - 400
Skull	Skull PA	19	70	85	77	16	32	20	125	115	yes	none	yes	250 - 400
Thorax	Chest PA	22	125	125	125	1,25	3,2	2,5	32	180	yes	none	yes	250 - 400
Thorax	Chest dex.-sin. LAT	32	125	125	125	3,2	8	6,3	63	180	yes	none	yes	250 - 400
Thorax	Hemithorax (Ribs) PA	20	60	75	70	12,5	20	16	160	115	yes	none	yes	250 - 400
Abdomen	Abdomen standing PA	21	80	100	81	10	40	16	160	115	yes	none	yes	250 - 400
Pelvis	Pelvis AP	19	75	90	77	8	63	16	200	115	yes	none	yes	250 - 400
Pelvis	Hip joint AP	19	70	80	77	8	32	16	100	115	yes	none	yes	250 - 400
Shoulder girdle	Shoulder neutral AP	12	60	75	66	8	16	12,5	50	115	yes	none	yes	250 - 400
Upper limb	Humerus AP	10	60	75	66	8	12,5	10	63	115	yes	none	yes	250 - 400
Upper limb	Elbow VD	6	50	60	55	2,5	6,3	4	25	105	no	none	no	250 - 400
Upper limb	Forearm VD	6	50	60	55	3,2	6,3	4	32	105	no	none	no	250 - 400
Hand	Hand DV	3	50	60	50	1,3	3,2	2	20	105	no	none	no	150 - 250
Lower limb	Upper leg with knee Hip	16	70	80	77	6,3	12,5	8	80	115	yes	none	yes	250 - 400
Lower limb	Knee LAT	11	60	70	60	2	12,5	4	50	115	no	none	no	250 - 400
Lower limb	Lower Leg AP	10	60	66	60	2,5	4	3,2	32	115	no	none	no	250 - 400
Foot	Ankle LAT	8	50	60	55	4	10	5	32	105	no	none	no	150 - 250

kV_{min}, kV_{max}, $kV_{def.}$: Range of voltage adjustment and the default votage for the x-ray examinations (same for AEC and manual technique)
mAs_{min}, mAs_{max}, $mAs_{def.}$: Range of mAs product adjustments and the default mAs product for the x-ray examinitions (manual technique)
mAs_{AEC} : The default mAs-Product for the x-ray examinitions (AEC technique)
Thickness: Estimated thickness of the body part to be examined
Filtration: Additional filtration of the X-ray beam corresponding to the other values in the table
S-Value: The targeted S-Value for the examinations (same for AEC and manual technique)
FFD: film-focus distance **AEC:** automatic exposure control

List of pre-programmend examinations

Subpopulation Child:

Clinical Application [Target]	Protocol Name	Thickness [cm]	kV_{min}	kV_{max}	$kV_{def.}$	mAs_{min}	mAs_{max}	$mAs_{def.}$	mAs_{AEC}	FFD [cm]	Grid	Filtration	AEC	S-Value
Spine	Whole spine AP	16	70	77	70	6,4	10	8	50	115	yes	yes (+ 0,1mm Cu)	yes	500 - 700
Thorax	Chest standing up to 6 years PA	10	60	80	70	3,2	5	3,2	16	150	none	yes (+ 0,1mm Cu)	yes	500 - 700
Thorax	Chest standing PA	15	100	120	109	1,25	2	1,6	10	150	yes	yes (+ 0,1mm Cu)	yes	500 - 700
Skull	Skull pa	15	66	73	70	8	12,5	10	40	115	yes	yes (+ 0,1mm Cu)	yes	500 - 700
Pelvis	Pelvis supine AP	16	70	77	73	5	8	6,4	50	115	yes	yes (+ 0,1mm Cu)	yes	500 - 700
Shoulder girdle	Clavicle supine AP	8	60	66	63	3,2	6,4	4	32	115	none	yes (+ 0,1mm Cu)	yes	500 - 700
Upper Limb	Humerus 2 joints	7	60	66	63	2,5	5	3,2	32	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Upper limb	Forearm both joints AP	5	52	60	55	1,25	3,2	2	16	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Hand	Hand DV	2	50	52	50	1,25	2,5	1,6	8	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Lower limb	Upper leg 2 joints AP	10	70	73	70	4	6,3	5	32	115	none	yes (+ 0,1mm Cu)	yes	500 - 700
Lower limb	Knee AP	7	60	66	63	2	4	2,5	20	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Lower limb	Lower leg 2 joints	7	60	66	63	2	4	2,5	20	105	none	yes (+ 0,1mm Cu)	no	501 - 700
Foot	Ankle LAT	5	52	57	55	1,6	4	2,5	16	105	none	yes (+ 0,1mm Cu)	no	250 - 400

Subpopulation Infant:

Clinical Application [Target]	Protocol Name	Thickness [cm]	kV_{min}	kV_{max}	$kV_{def.}$	mAs_{min}	mAs_{max}	$mAs_{def.}$	mAs_{AEC}	FFD [cm]	Grid	Filtration	AEC	S-Value
Abdomen	Abdomen <1kg	5	60	60	60	0,8	1,25	1	-	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Chest	Chest <1kg	5	60	60	60	0,8	1,25	1	-	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Abdomen	Abdomen 1-2kg	7	60	60	60	1	1,6	1,25	-	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Chest	Chest 1-2kg	6	60	60	60	0,8	1,25	1	-	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Abdomen	Abdomen 2-3kg	8	63	63	63	1	1,6	1,25	-	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Chest	Chest 2-3kg	8	63	63	63	1	1,6	1,25	-	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Abdomen	Abdomen 3-4kg	10	66	66	66	1,25	2	1,6	-	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Chest	Chest 3-4kg	9	66	66	66	1,25	2	1,6	-	105	none	yes (+ 0,1mm Cu)	no	250 - 400
Abdomen	Abdomen >4kg	11	66	66	66	1,6	2,5	2	-	105	none	yes (+ 0,1mm Cu)	no	500 - 700
Chest	Chest >4kg	10	66	66	66	1,6	2,5	2	-	105	none	yes (+ 0,1mm Cu)	no	250 - 400

kV_{min}, kV_{max}, $kV_{def.}$: Range of voltage adjustment and the default votage for the x-ray examinations (same for AEC and manual technique)
mAs_{min}, mAs_{max}, $mAs_{def.}$: Range of mAs product adjustments and the default mAs product for the x-ray examinitions (manual technique)
mAs_{AEC} : The default mAs-Product for the x-ray examinitions (AEC technique)
Thickness: Estimated thickness of the body part to be examined
Filtration: Additional filtration of the X-ray beam corresponding to the other values in the table
S-Value: The targeted S-Value for the examinations (same for AEC and manual technique)
FFD: film-focus distance AEC: automatic exposure control

Guidelines for pediatric subjects

CAUTION

Children are more radiosensitive than adults. Exposure settings designed for adults may result in excessive radiation exposure if used on smaller patients. "As Low As Reasonably Achievable" (ALARA) principles should always be followed when choosing equipment settings to minimize radiation exposure to the pediatric patient.

As a general rule, the following recommendations shall be observed in pediatrics:

- Use short exposure times and ensure necessary immobilization of the child (by device or parent).
- Set a correct field size (not too large, not too small, set it by hand).
- Apply necessary shielding, particularly to gonads and thyroid.
- Whenever possible, use high kVp techniques.
- If possible, add more filtration.
- Do not use anti scatter grid below body part thicknesses of 12 cm to apply lower doses.
- Check whether AEC technique is useful, if in doubt preferably use a manual technique.

Positioning the pediatric patient

Pediatric patients mostly do not understand the need to remain still during the procedure. So the use of immobilizing devices such as bean bags and restraint systems (foam wedges, adhesive tapes, etc.) to avoid the need of repeating exposures due to the movement of the pediatric patients is strongly recommended. Therefore it makes sense to provide your staff with aids to maintain a stable positioning.

Protective shielding

Extra shielding of radiosensitive organs or tissues such as eyes, gonads and thyroid glands is strongly recommended. Applying a correct collimation will also help to protect the patient against excessive radiation.

Please review the following scientific literature regarding pediatric radiosensitivity:

GROSSMAN, Herman. “Radiation Protection in Diagnostic Radiography of Children”. Pediatric Radiology, Vol. 51, (No. 1): 141- 144, January, 1973 http://pediatrics.aappublications.org/cgi/reprint/51/1/141.

Field size

Limiting the X-ray beam by setting an appropriate field size is very important in pediatric radiography. A field size set too small obviously degrades the respective image, but even a field size which is set too large will degrade the image quality. A field set too large will impair image contrast and resolution by increasing the amount of scattered radiation but also - most importantly - result in unnecessary irradiation of the body outside the area of interest.

Technique factors

You should take steps to reduce technique factors to the lowest possible levels consistent with good image acquisition. Whenever possible use techniques based on the lowest exposure times to reduce the influence of a moving pediatric patient on the image quality. Please review the following link and reduce pediatric technique factors accordingly: http://www.pedrad.org/associations/5364/ig

Further references:

- FDA approach to pediatric X-ray imaging at: http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm298899.htm
- Claire-Louise Chapple at 12th Congress of the International Radiation Protection Association "Optimisation of protection in pediatric radiology" at: http://www.irpa12.org.ar/PDF/RC/RC-14_fullpaper.pdf

Summary:

- Image only when there is a clear medical benefit.
- Image only the indicated area.
- Use the lowest amount of radiation for adequate imaging based on size of the child.
- Try to use always short exposure times, large SID values, high kVp techniques and immobilizing devices.
- Avoid multiple scans and use alternative diagnostic studies (such as ultrasound or MRI) when possible.

Chapter 5. Notes

Space for notes