DXR CompACS®
X-ray Acquisition Software

User manual (EN)

Professional acquisition software for X-ray images from flat panel or CR systems

OR Technology

CE 0482

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Chapter 1. Introduction

Thank you very much for choosing *dicomPACS®DX-R* - our X-ray acquisition software for DR (direct radiography/flat panels) and CR (computed radiography) systems.

The *dicomPACS®DX-R* 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 *dicomPACS®DX-R* 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 of OR Technology 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 unauthorised changes have been made to the delivered software and hardware components, the warranty by OR Technology becomes void. OR Technology 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 *dicomPACS®DX-R* system. Our support team will be glad to help you if you have any queries.

Enjoy reading the manual as well as working with *dicomPACS®DX-R*.

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Copyright

1.1 Intended purpose and important software information

The *dicomPACS®DX-R* 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. *dicomPACS®DX-R* 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 *dicomPACS®DX-R* 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, *dicomPACS®DX-R* 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.

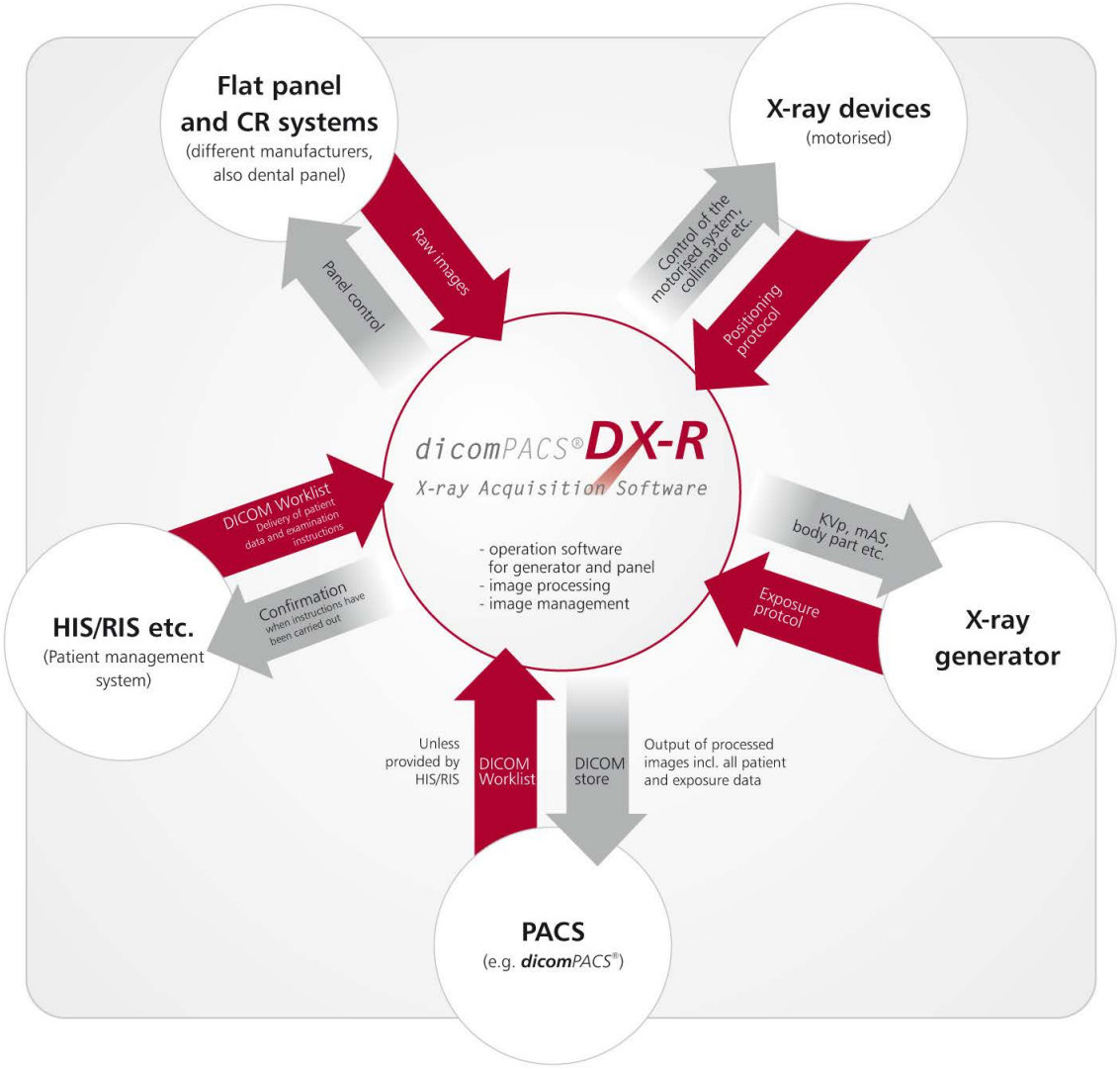

Figure 1. Functional principles of *dicomPACS® DX-R*

Measuring

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

CAUTION/ATTENTION!

EN: 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.

FR: Les mesures peuvent être prises au niveau des lignes (en millimètres) et des angles (en °, degrés). La longueur d'une ligne peut être donnée seulement en millimètres si l'image DICOM contient l'échelle de référence des pixels de la longueur qui en résulte.

Compatibility

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

Monitor quality

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

CAUTION/ATTENTION!

EN: 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 215. In particular, the 5% and 95% greyscale areas must be clearly discernible.

FR: Pour tester la cohérence de ces paramètres pendant le fonctionnement, les tests de cohérence de l'écran doivent être effectués à intervalles réguliers. La régularité de ces tests figure dans le protocole d'acceptation. En règle générale, un contrôle visuel quotidien doit être effectué. Ce contrôle est décrit à la page 215. En particulier, les zones en niveaux de gris à 5 % et 95 % doivent être clairement visibles.

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 *dicomPACS®DX-R* viewer.

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.

1.2 Intended use

dicomPACS®DX-R is intended for human X-ray image acquisition.

dicomPACS®DX-R is able to provide technique parameters for X-ray generators. The software is not intended to start the exposure. It can read post exposure from the generator if provided by the device and assign them to the examination.

dicomPACS®DX-R creates DICOM conform images. These images will be transferred to a PACS system for storage and examination. *dicomPACS®DX-R* can query patient data from a DICOM worklist server. It is able to send DICOM MPPS messages to a server. Data from RIS systems can be adopted.

dicomPACS®DX-R includes a database with predefined radiological examinations and *dicomPACS®DX-R* Viewer functions for image analysis.

Intended user profile and usage environment

dicomPACS®DX-R is intended to be used in clinical environment as well as homecare service.*dicomPACS®DX-R* is intended to be used by qualified medical personnel as well as trained staff in hospital, surgeries and homecare.

Patient population and body parts

All ages and genders of humans and appropriate examinations for all body parts with X-ray and processing parameters are supported by *dicomPACS®DX-R*

Indication

dicomPACS®DX-R is intended to be used as acquisition workstation.

dicomPACS®DX-R in combination with DR detectors or CR readers is intended for use in acquiring radiographic images of human anatomy. The software is intended to replace film/screen systems in all general purpose diagnostic procedures.

Regarding radiation safety requirements *dicomPACS®DX-R* provides X-ray helper for patient positioning and predefined X-ray parameters for exposure.

Contraindication

dicomPACS®DX-R is intended to be used as acquisition workstation and not as primary diagnostic workstation. It is contraindicated if the medical staff uses excessive dose parameters (over- or underexposure) for the X-ray image acquisition. This results in unnecessary radiation exposure of the patient.

dicomPACS®DX-R is not intended for breast tomosynthesis and interventional radiology. *dicomPACS®DX-R* is intended to be used in combination with integrated components listed in document: "*dicomPACS®DX-R* - Overview of integrated devices". The document is available for download on the OR Technology homepage.

It is contraindicated if the software is used with non-validated components.

Residual risk

The most detected risk for patients is a repeated examination due to failed image acquisition or wrong generator parameter settings and unwanted X-ray exposure. Therefore *dicomPACS®DX-R* islimited to 150kV for X-ray exposure. Further *dicomPACS®DX-R* handles generator and detector interface communication in synchronized mode.

Obligation to notify the authorities

The user or patient must report any serious incident according to EU 2017-745 relating to this product to the manufacturer and the responsible authority of the Member state in which the user or patient is established.

1.3 System requirements

1.3.1 Hardware

CPU:	Intel Core i5/i7, quad-core or comparable processor
Memory:	16 GB RAM
Hard drive:	at least 500 GB: 80 GB of free disk space on C:\ for software and operating system 420 GB for the image archive
Network:	100 MBit (1 GBit recommended)
Graphics hardware:	Colour monitor with resolution of minimum 1,280 x 1,024 pixel, using the true-colour mode, higher resolution recommended (DVI connection recommended)
Flat panel detectors:	Please note the requirements for the different flat panel detectors and generators, e.g. additional network cards or serial ports!

Table 1. Operating requirements

CAUTION/ATTENTION!

EN: *dicomPACS®DX-R* is **exclusively** designed for colour monitors!

FR: *dicomPACS®DX-R* est exclusivement conçu pour les écrans en couleur!

Monitor requirements

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

A viewing monitor should satisfy the following requirements:

1. DVI connection (no VGA)
2. Resolution of at least 1,920 x 1,080 pixels
3. TFT-colour from 1" 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
3. Special b/w monitors from 18,1" TFT with high luminance and contrast
4. High fidelity of grey tones
5. Preset DICOM monitor LUT on colour monitors

1.3.2 Software

Operating system	Windows 10 Windows 11	64-bit
SQL Server	2019 Version	

Software installation

Please run the included setup "*_setup.exe". The setup creates the latest version of the *dicomPACS®DX-R* software on the C:\ drive of your PC.

After the installation, a *dicomPACS®DX-R* icon is displayed on the desktop.

dicomPACS®DX-R 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.

Chapter 2. Warnings and advisory symbols

To ensure the safety of patients, staff and other persons, any changes to the software and hardware delivered by Oehm und Rehbein GmbH (OR Technology) 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 *dicomPACS®DX-R*.

The warning signs "Danger" and "Caution" used throughout this manual are written in English and French. The following symbols will be used throughout this manual:

DANGER!

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

FR: L'icône «Danger» informe des conditions ou des situations qui, si elles ne sont pas prises en compte ou évitées, causeront un sérieux défaut de fonctionnement au logiciel. La fonctionnalité du logiciel peut être détruite en cas d'utilisation incorrecte.
Si des changements non autorisés ont été effectués sur les composants du logiciel et du matériel livrés, la garantie d'OR Technology s'éteint. OR Technology n'acceptera aucune responsabilité pour le fonctionnement correct du produit dans un tel cas.

CAUTION/ATTENTION!

EN: The "Caution" icon points out areas that require special attention to ensure the accurate function of the product. The functionality of the software can be limited in the case of incorrect use.

FR: L'icône «Attention» indique les zones qui requièrent une attention spéciale pour assurer le bon fonctionnement du produit. La fonctionnalité du logiciel peut être limitée en cas d'utilisation incorrecte.

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 3. Working with dicomPACS®DX-R

First of all, start the *dicomPACS®DX-R* application by a double click on the icon *dicomPACS®DX-R*, which is located on the desktop or by using the "*start menu -> programme -> dicomPACS -> dicomPACS DX-R*". If the demo mode of the software starts, a message will be displayed that the programme uses a temporary license. Please confirm this message by clicking on "OK".

3.1 Programme start and login

Once the programme has been started, the user will be asked to login. Depending on the login level, the programme components "support mode" and/or "configuration" can be called up. The support mode is only accessible for users having administration rights.

Figure 2. Login screen

The software *dicomPACS®DX-R* 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.

There are different login levels. Depending on the login, the user has the following rights after registration:

- admin rights (access to the support mode)
- rights to change patient data
- rights to change the configuration of macros and examinations

The buttons for accessing the "support mode" and "configuration" are enabled by default. However the login level determines whether a user has access to these settings or not. If the access is denied, the user is prompted to log in with an account that has the appropriate rights. The process must be repeated if a function that requires higher rights shall be used.

Figure 3. Login with an other account

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.

3.1.1 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.

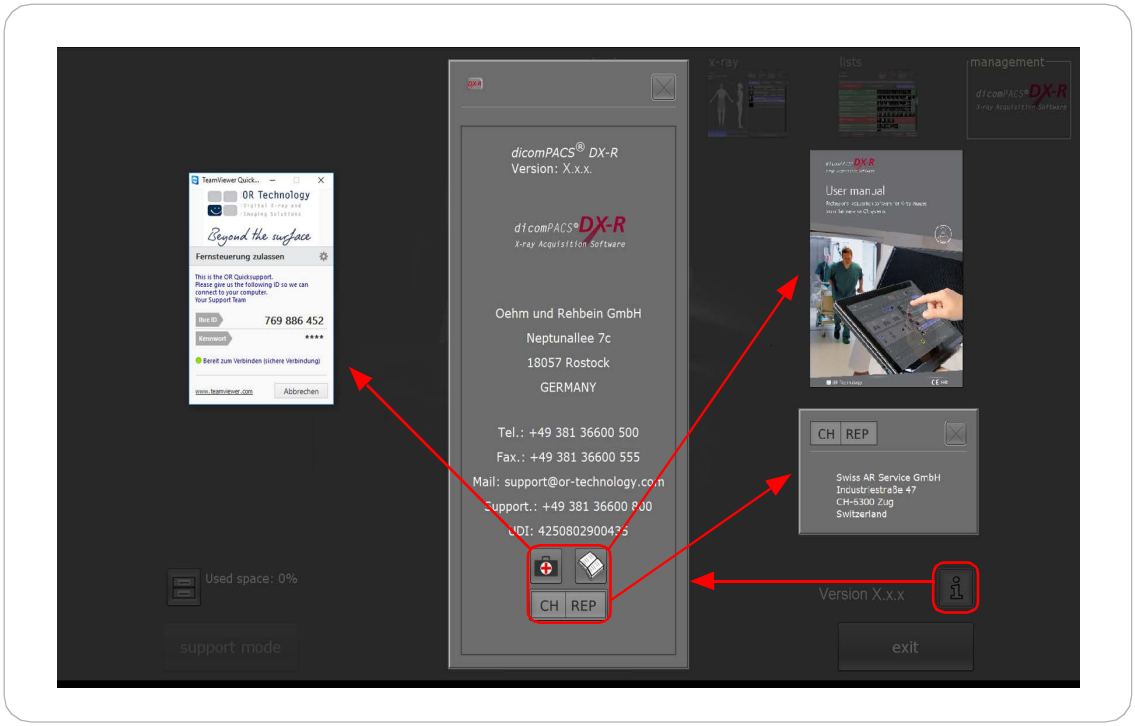


Figure 4. Programme information

3.1.2 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.

Virtual keyboard for the Worklist-View

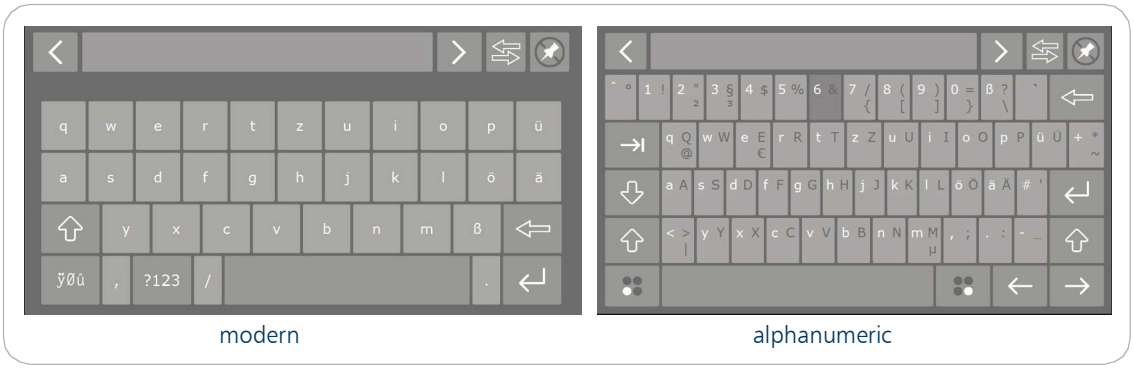


Figure 5. Virtual keyboard of the Worklist-View

By default, the first letter is capitalized when text is entered. This makes the data input easier when the virtual keyboard is enabled.

The virtual keyboard adapts to the needs of the input field. For example for the date of birth, only numbers are displayed.

The virtual keyboard can be undocked and moved to another position using the button. With the virtual keyboard can be embedded again.

By means of the orientation of the virtual keyboard can be changed to the opposite side.

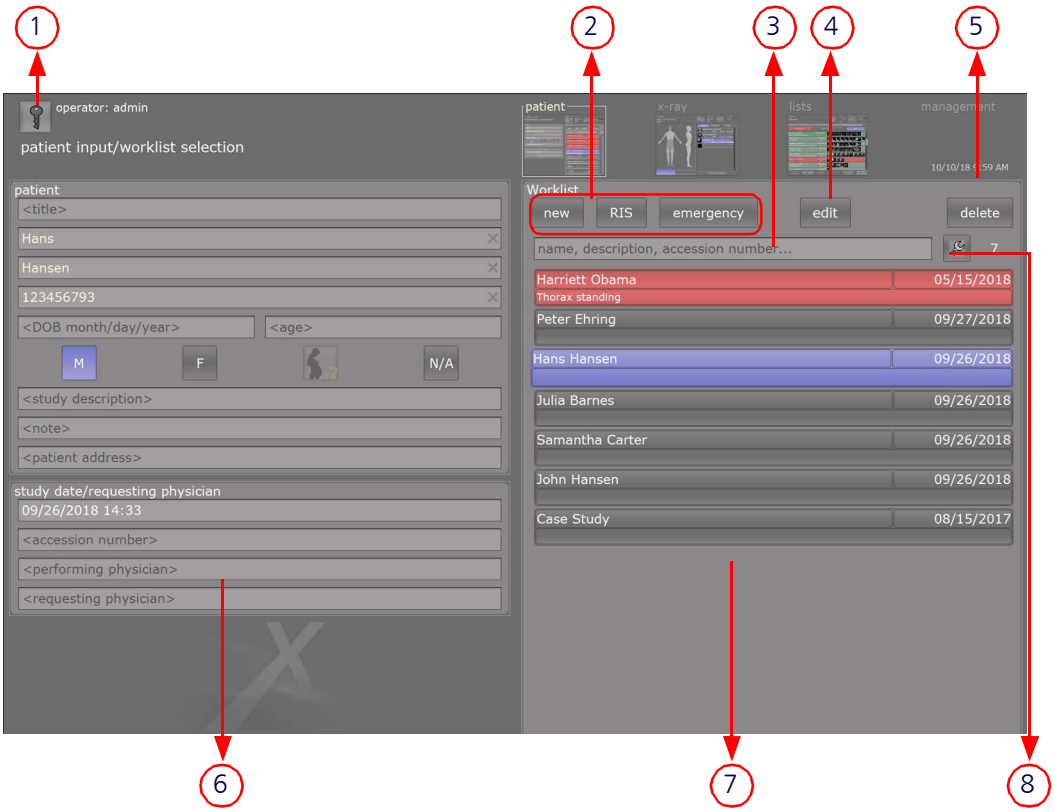
For the Worklist-View the design of the virtual keyboard can be adjusted to the needs of the user. Changes can be made by users with admin rights or by a service technician in the support mode.

Besides the choice of the design the behaviour of the virtual keyboard can be adjusted for all text input fields:

- normal manual input
- capitalize first letter on manual input
- always upper case

3.2 Patient view

After the login to *dicomPACS® DX-R*, 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.

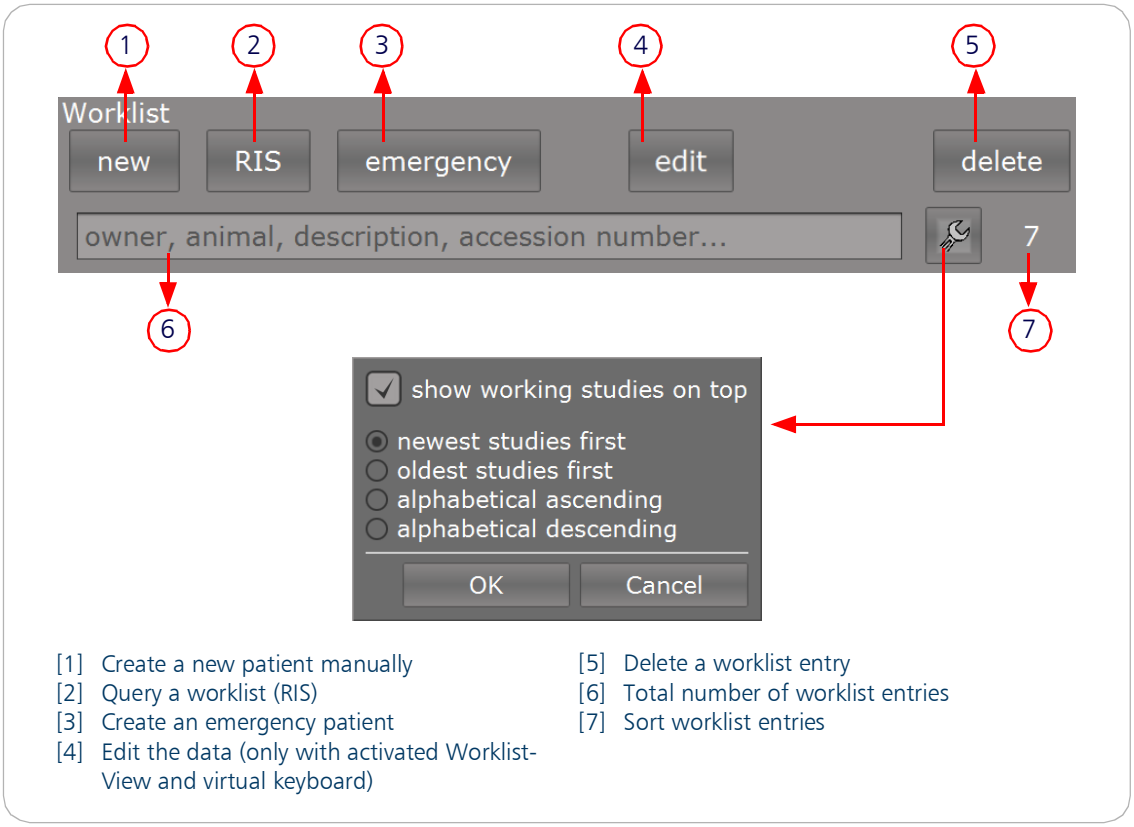


[1] Logout and display of current user
[2] Captures patients and work assignments
[3] Search for X-ray assignments in the worklist
[4] Edit the data (only with activated Worklist-View and virtual keyboard)
[5] Delete jobs
[6] Area for entering / changing patient data
[7] Worklist
[8] Sort worklist entries

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:

1. Manual entry of new patients
2. Query a DICOM worklist
3. Creating an emergency patient



[1] Create a new patient manually
[2] Query a worklist (RIS)
[3] Create an emergency patient
[4] Edit the data (only with activated Worklist-View and virtual keyboard)
[5] Delete a worklist entry
[6] Total number of worklist entries
[7] Sort worklist entries

Figure 7. Worklist

The worklist section offers the possibility to sort worklist entries alphabetically or by time of creation. Interrupted entries (marked in red) can be placed at the beginning of the list.

3.2.1 Create a new patient

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 marked in red are compulsory fields. The buttons "F", "M" and "N/A" denote the gender of the patient.

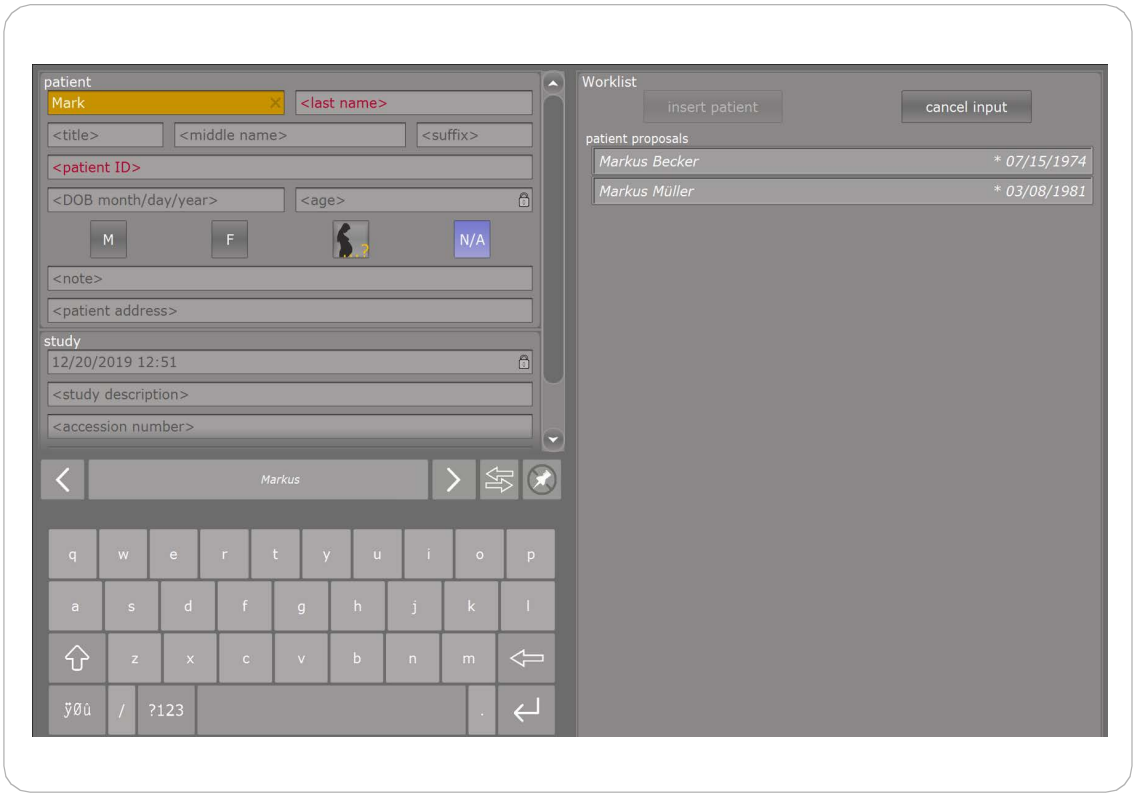


Figure 8. Create a new patient manually

If mandatory fields such as the patient ID are not filled in during patient entry, the entry cannot be created. When switching to the X-ray view, a dialogue opens in which the user is prompted to complete the patient entry, select a valid patient from the worklist or create an emergency patient.

If an emergency patient is created, previously made entries are lost.

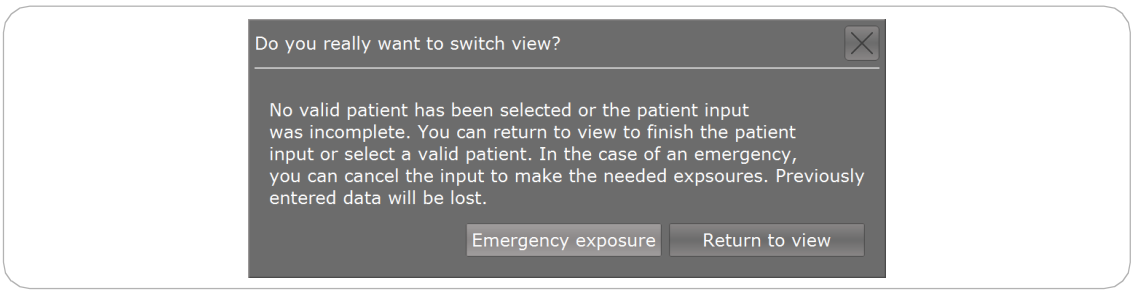


Figure 9. Dialogue for uncompleted entry

By default, the first letter is capitalized during the input of text.

In the support mode the behaviour can be adjusted for all text input fields:

- normal manual input
- capitalize first letter on manual input
- always upper case

Patient ID

By default the patient ID is a mandatory field.

If required, the patient ID can be generated automatically. The automatically generated patient ID is not editable. When creating worklist entries, the number of the patient ID is simply incremented. In addition, it is possible to hide the automatically generated patient ID in the patient input. A service technician or a user with admin rights can adjust these settings in the support mode.

Birth date

When entering the date of birth, the dot can be omitted. The software recognizes the date automatically. The date of birth must be entered in the format MMDDYYYY:

12052005 → 12/05/2005

Pregnancy status

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.

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.

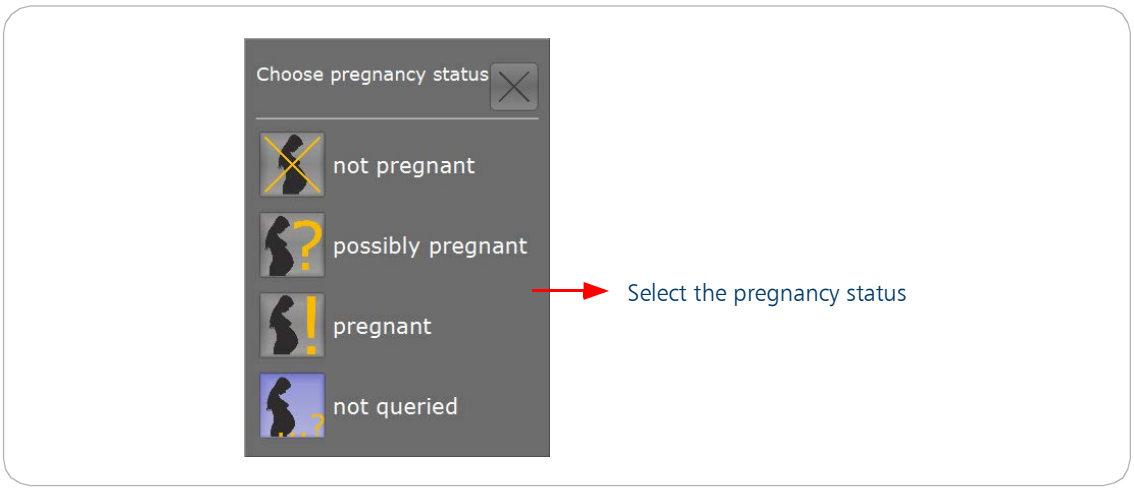


Figure 10. Pregnancy status

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.

Patient address

By default this input field is hidden in the patient view. The patient address can be added as an input field. To do this, the corresponding settings in the support mode have to be adjusted.

Proposal lists

When the virtual keyboard is disabled, proposal data are displayed above the input field.

If the virtual keyboard is active, proposal lists are displayed on the right side of the screen. In addition, the patient data is deleted when emergency patients are edited. The new data can be entered immediately.

A proposal list is created from existing entries. When filling in the corresponding input field, the software displays a proposal list from which you can select an entry.

By clicking on the desired entry the data is transferred to the input mask. Then you don't need to enter the data manually.

If you select data from the proposal list when during the patient input, the system switches to the patient view by default. Then, the software automatically creates a new worklist entry. Settings for the proposal lists are done in the support mode. Here the proposal lists can be enabled or disabled. In addition, it is possible to adjust the workflow. After selecting an entry from the proposal list:

- the patient input should remain open
- a new worklist request is to be created automatically
- DX-R switches directly to the X-ray view

By default, the proposal data is enabled as soon as the Worklist View is active. Otherwise, the settings has to be changed in the support mode.

3.2.2 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.

3.2.3 Create an emergency patient

emergency

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 52). The correct patient data can be insert in the patient view and the study can be closed and send to the archive again.

3.2.4 Delete a patient

delete

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.

3.2.5 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 " name", "last name", "accession number" and/or "study description" where the letter "A" is included.

3.2.6 Worklist entries

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

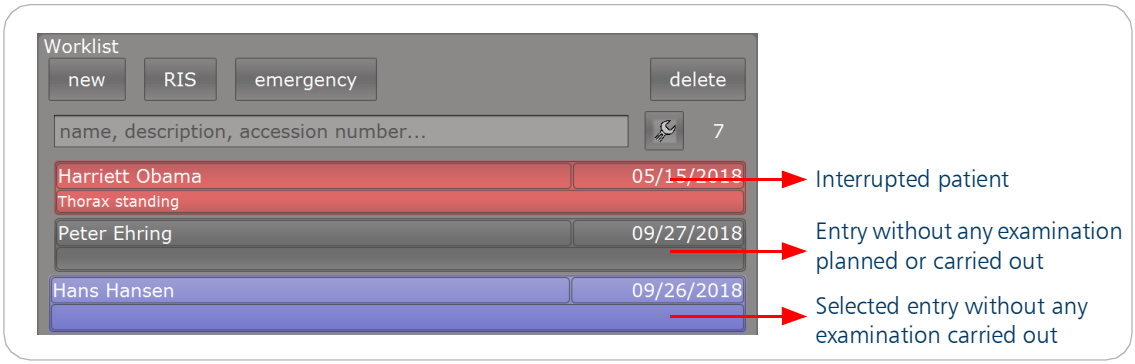


Figure 12. Worklist entries

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.

By default, new worklist entries are located below the interrupted worklist entries and are also sorted by time.

3.3 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

CAUTION/ATTENTION!

If the generator is switched off and on again as long as you are in the planning, editing or acquisition mode of the X-ray view, the generator values must be checked for correctness.

Otherwise, standard values are used for the exposure which may result in an overexposure of the patient.

3.3.1 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.

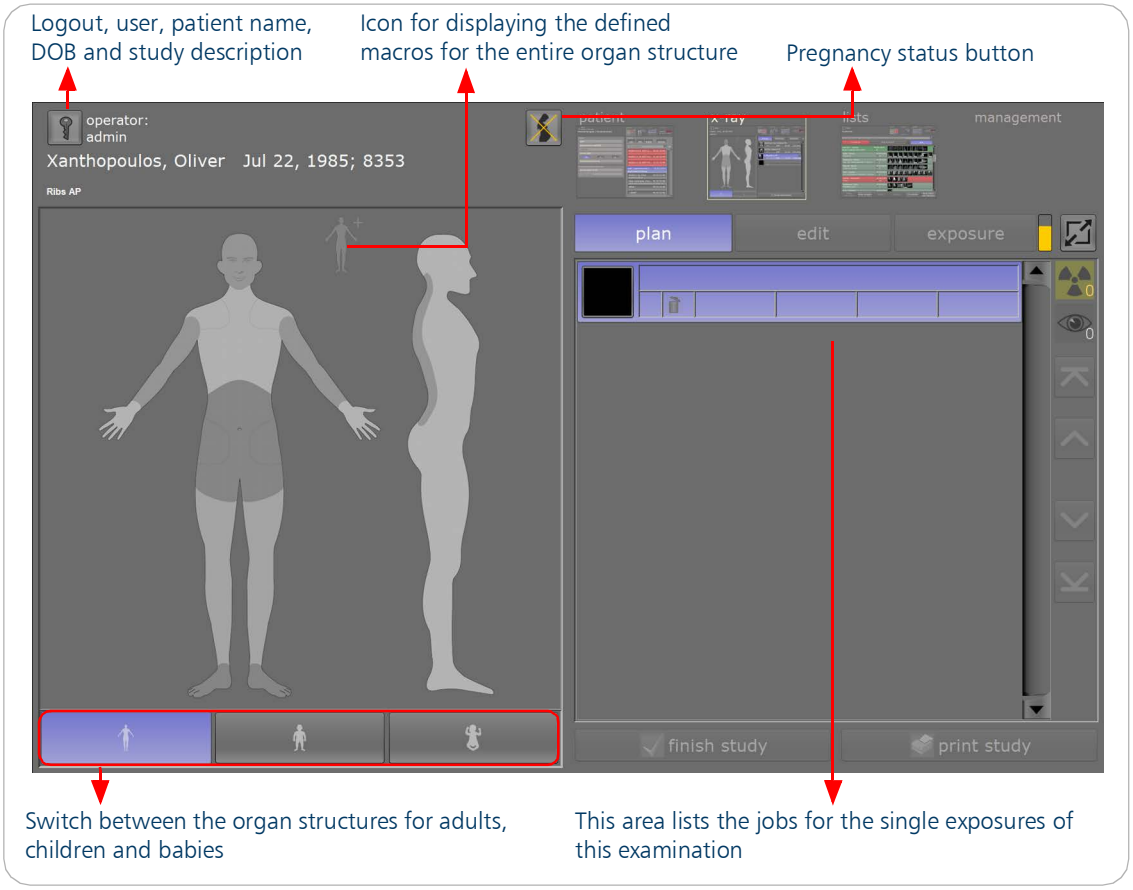


Figure 14. Planning mode of the X-ray view

On the right side some more symbols offer additional information to the plannings.

 Switch to full screen view. Allows the user to view an acquired image in full screen.

 Displays the number of scheduled plannings for a study.

 Displays the number of acquired images for a study.

It is possible to automatically switch to the full screen mode after the image acquisition. Therefore this function must be enabled in the support mode.

The 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 partwill 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.

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

Note

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

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.

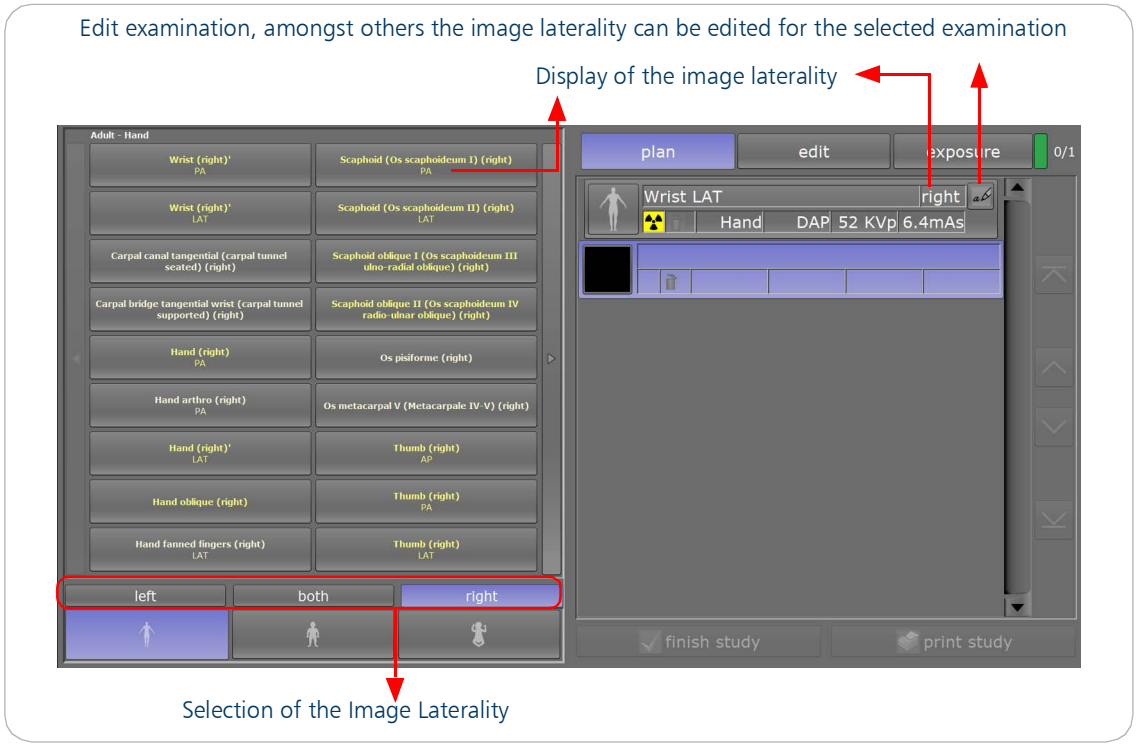


Figure 15. Image laterality

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 37. 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 81.

Planning mode

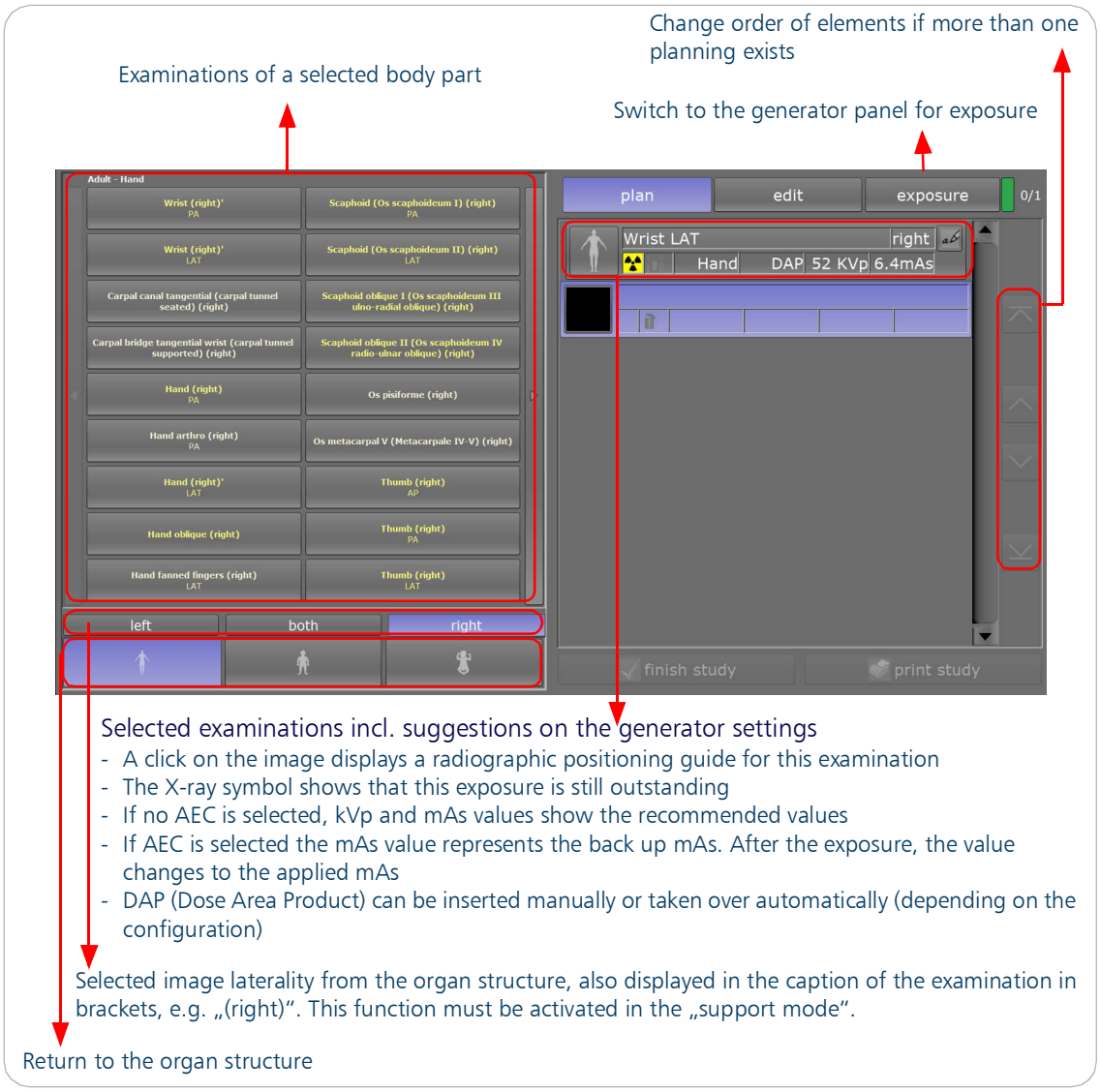


Figure 16. Planning mode of the X-ray view

New plannings can be added in between already scheduled plannings. The desired position has to be selected and a new planning can be scheduled. The new examination is always inserted below the selected, existing planning. The order of plannings in the X-ray view can be changed. A highlighted planning can be moved up and down in single steps (). Additionally it can be moved to the top or bottom ().

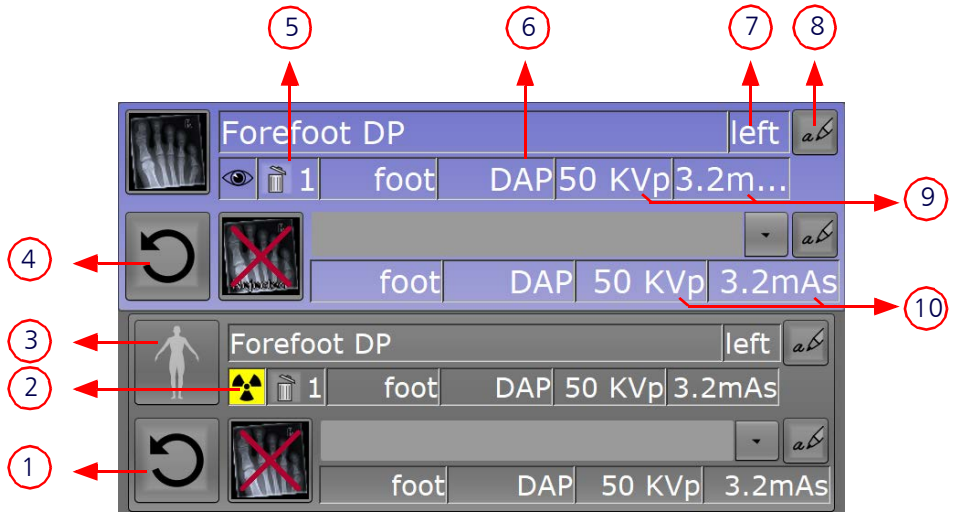
Note

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.

Hinweis

The yellow font colour of some buttons indicates that these are frequently used basic settings. This colour is freely configurable for each examination (see "Configuration of examinations and macros" on page 81).

The whole list of examinations can be customised manually by using the configuration mode. For more information, please refer to "Configuration of examinations and macros" on page 81.



[1] Restores the examination
[2] Indicates that this exposure is pending
[3] Opens the radiographic positioning guide
[4] Creates new examination from rejected image
[5] Indicates the number of rejected exposures
[6] Dose Area Product
[7] Assigned image laterality
[8] Edits the examination: image laterality can be changed, image comment can be added, post exposure values can be corrected
[9] Suggested values
[10] Post exposure values

Figure 17. Planned examination

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.

Note

The insertion of new plannings is not possible before one or between two 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 69.

Figure 18. Radiographic positioning guide

3.3.2 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.

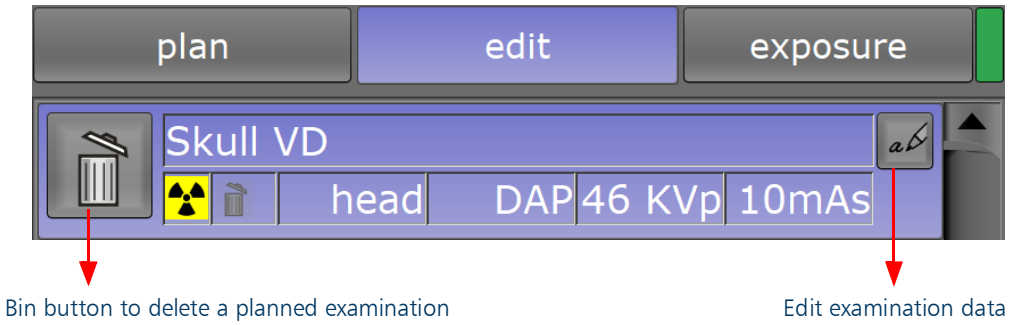


Figure 19. Edit a planned exposure

Note

For a system with generator control (Module SW1001), it is only possible to edit the parameters "DAP", kVp" and „mAs" after the exposure, because the suggested values are overwritten by the exposure values.

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

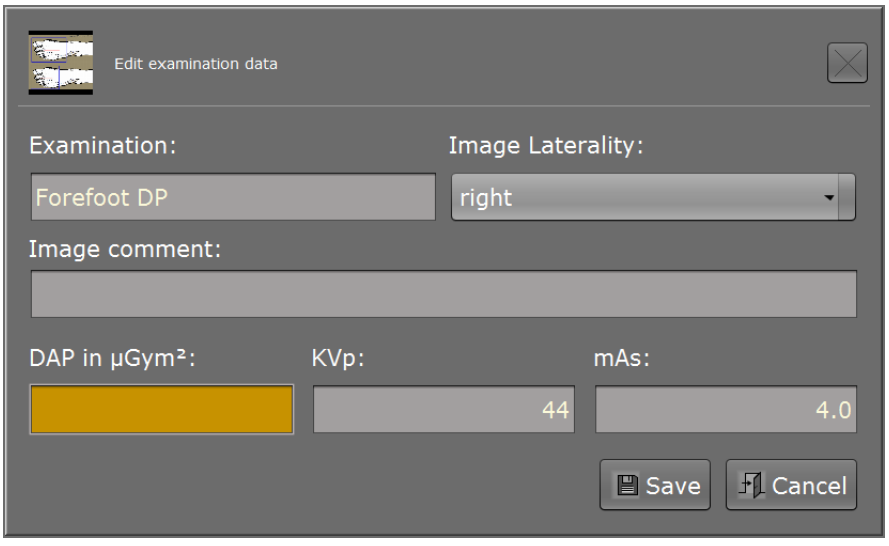


Figure 20. Edit examination data

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 41 for more information.

Note

The image comment is stored inside the DICOM image.

CAUTION/ATTENTION!

EN: 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.

FR: Quand les valeurs kVp et mAs sont modifiées via le masque de saisie, elles ne seront pas synchronisées avec le générateur. Ces valeurs servent uniquement à des fins de documentation.

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.

3.3.3 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.

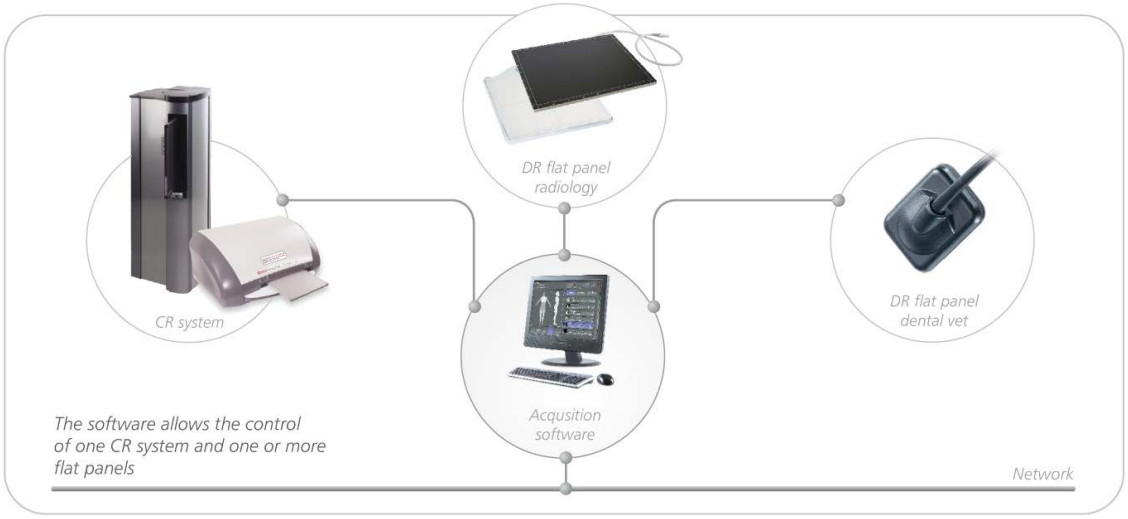


Figure 21. Image acquisition options

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.

3.3.3.1 CR system

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

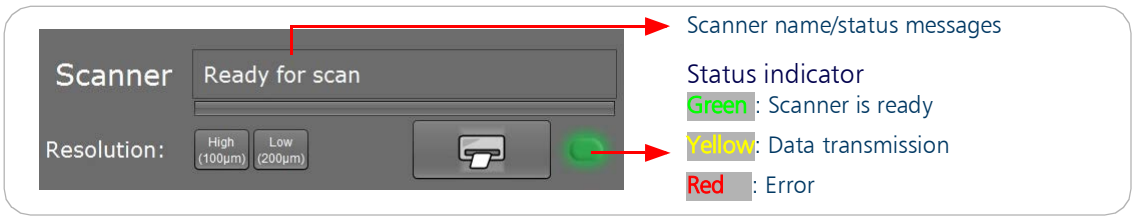


Figure 22. X-ray view with a CR system (no integrated generator panel installed)

When the status LED is green, the scanner is ready to read the image.
If the generator integration is used all the default values and settings (kVp, mAs, focus, etc.) are displayed as recommendations (guidelines) and can be adjusted in the support mode.

3.3.3.2 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 23. X-ray view without generator panel with a DR system

After all parameters were configured for the generator control, the data is sent automatically to the generator. When all data has been sent and checked and the panel is ready and the status LED is green, the X-ray technician triggers the actual X-ray machine.

Directly after the X-ray image was taken, the image is processed and optimized according to the image processing set for this examination, and is displayed as a preview immediately in place of the generator panel. Under the X-ray image, a toolbar is displayed.

3.3.3.3 Integrated components

An overview of integrated flat panel detectors, CCD systems, X-ray generators and CR systems is available for download on the OR Technology homepage.

3.3.4 Exposure

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

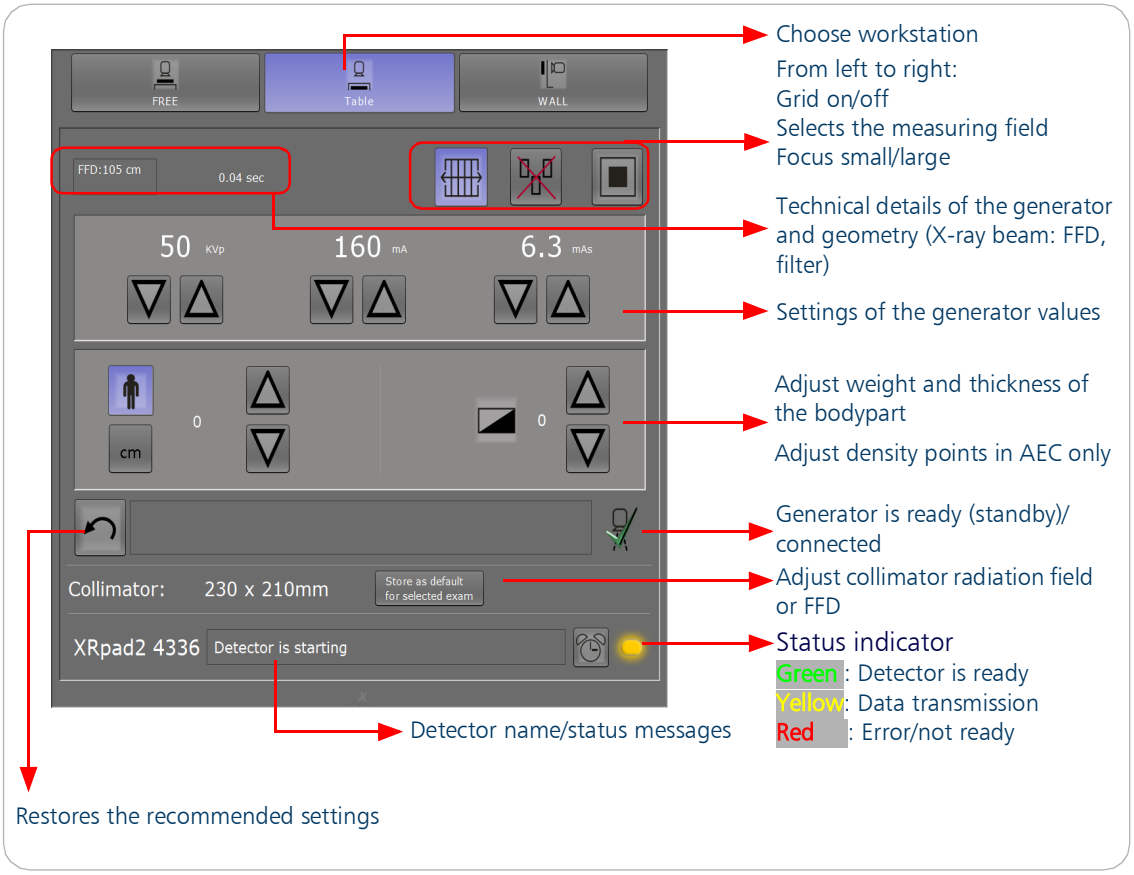


Figure 24. Generator panel

In case more than one workstation 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.

PRACTICAL HINT

It is possible to automatically switch to the next entered planning after exposure. The waiting time until the next shot can be set by a user with admin rights or a technician in the support 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 

and  button). The required values of kVp and mAs will be adjusted automatically.

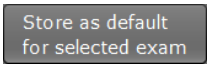
This function is not available for a system with an EMD generator.

Collimator settings (only for CX225)

If activated in the support mode, it is possible to set the radiation field of the collimator and the focal-film-distance (FFD) for each examination. This applies exclusively to the collimator model CX225.

For each examination, the size of the radiation field and the FFD are already stored in *dicomPACS®DX-R*. For newly created examinations, the values can be set subsequently. To do this, an examination must be selected in the X-ray view. By default the radiation field has a predefined size. Then, the following collimator settings can be adjusted manually in the exposure tab:

- Radiation field size
- FFD

To make adjustments change the radiation field on the collimator or the FFD manually. The actual values then are applied and shown in the control panel of the "exposure" tab. Save the values by clicking on 

.

Note

This applies only for the collimator model CX225.

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.

Enable background sounds

It is possible to enable background sounds for various status events of the detector and generator. By default, the sounds are disabled. The software provides a number of standard settings which can be adjusted to your own requirements. For example, a sound can be played to signal that the detector or the generator is ready for the next image acquisition. A technician or a user with admin rights can change the settings in the support mode.

Pregnancy status

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

DANGER!

EN: 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 actually applied values 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.

FR: Les valeurs affichées sur le panneau de commande du générateur (kVp, mAs, mA, etc.) sont uniquement des recommandations (indications) et doivent toujours être vérifiées avant d'effectuer une radiographie. Ces valeurs peuvent être ajustées dans le tableau de valeurs pour un générateur particulier. En cas de questions, veuillez vous adresser à votre ingénieur de maintenance pour les générateurs. Si aucune valeur de générateur n'est envoyé au générateur automatiquement, il est recommandé d'ajouter de toute urgence les valeurs définies manuellement pour chaque exposition, et ce également sur la console du générateur. L'avantage est que les valeurs véritablement appliquées sont classées avec l'image correspondante (dans l'en-tête DICOM) et peuvent être enregistrées dans un registre radiographique. C'est important pour la documentation correcte de chaque exposition individuelle.

CAUTION/ATTENTION!

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

FR: Chaque détecteur connecté doit être calibré par un ingénieur de maintenance autorisé. Le cycle de maintenance est donné par le fabricant du détecteur.

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 37.

Exposure

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

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

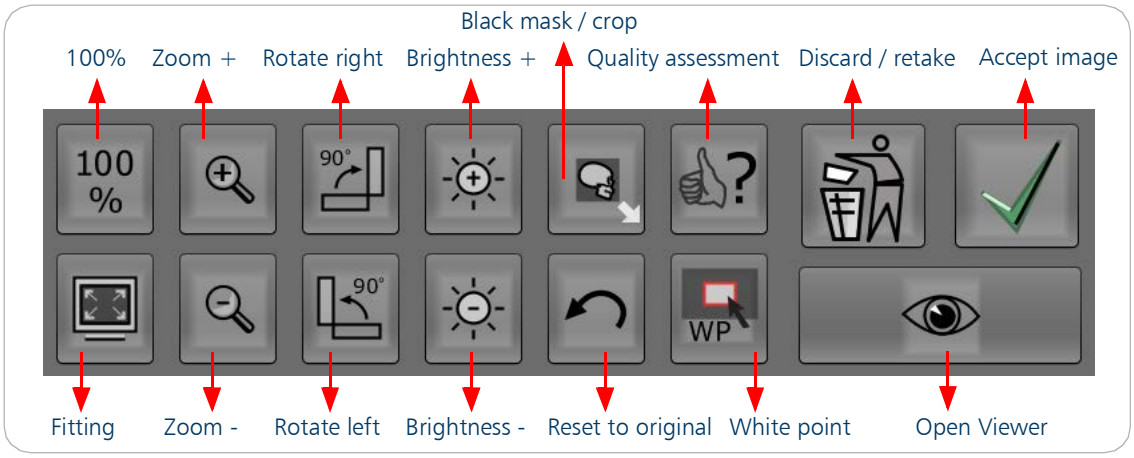


Figure 25. Toolbar

The following tools are included in the toolbar:

	Displays the image pixel per pixel (full resolution)
	Shows the complete image
	Enlarges the image
	Shrinks 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 mask around the image
	Restores the original condition of the image
	Rejects a failed 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

Quick preview image

This option has to be enabled in the support mode.
dicomPACS®DX-R displays a processed preview image that helps the user to get a faster impression of the final image. This preview image is reduced in resolution but largely corresponds to the final

image. It is possible to continue working immediately. The final image processing then runs in the background and you do not have to wait for it. The progress bar displays the progress of the image processing.

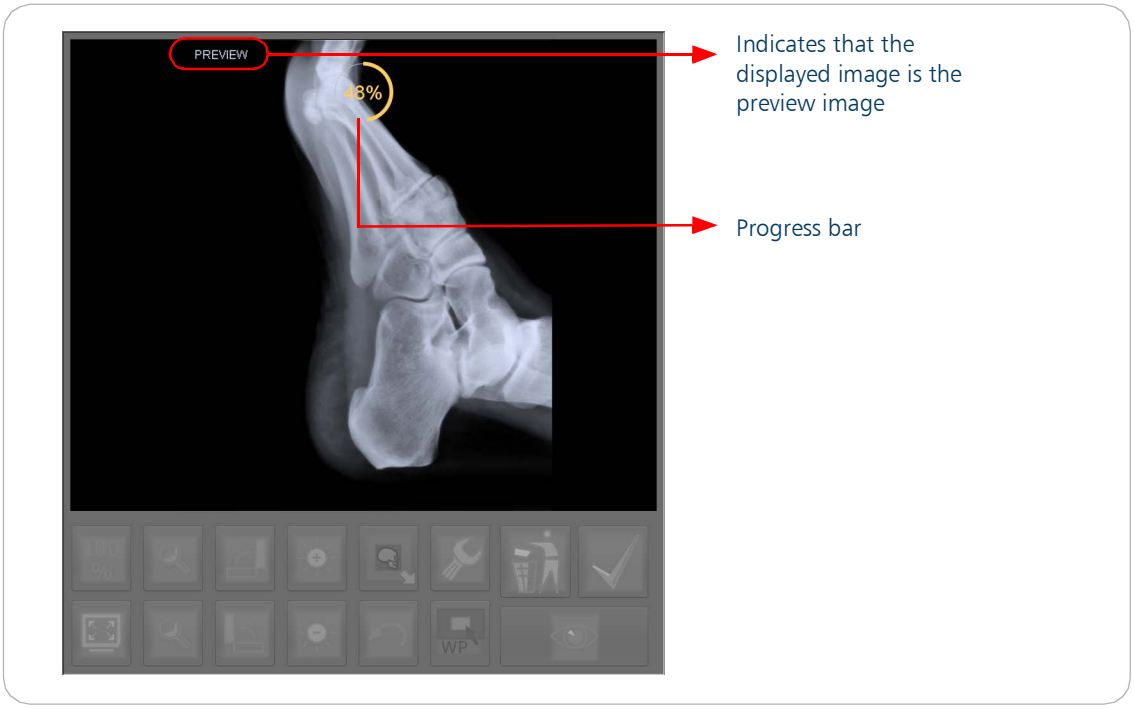


Figure 26. Preview image

Full screen mode

This function must be enabled in the support mode.

If several plannings are entered in the X-ray view, the full screen mode always shows the last shot taken. The full screen is displayed with a coloured border. Depending on the status of the workstation, this border is orange or green.

After the image acquisition, an orange frame will always be displayed first. It indicates that the workstation is not yet ready for the next acquisition. In the background the software switches to the next entered planning and the colour changes from orange to green. With the settings shown above (time to switch to next open exposure = 0 seconds) an automatic shift to the next scheduled planning takes place immediately. As soon as the detector is ready again, the colour of the frame changes to green until the next exposure.

This makes it easy to progress the list of plannings without leaving the full screen mode. After an image has been acquired for the last scheduled planning, the frame remains orange to indicate that no further plannings are pending.

If you leave the full screen mode and manually restart it, you will always see an orange frame.

The full screen mode shows the patient data and the most important status displays. These include:

- the ready indication of the detector

- the Wi-Fi connection status detector - workstation
- the battery status of the detector
- patient (name, DOB, ID)
- name of the image
- exposure index / S-value

The status display disappears after a few seconds if the mouse is not moved. A new movement of the mouse shows the status display again.

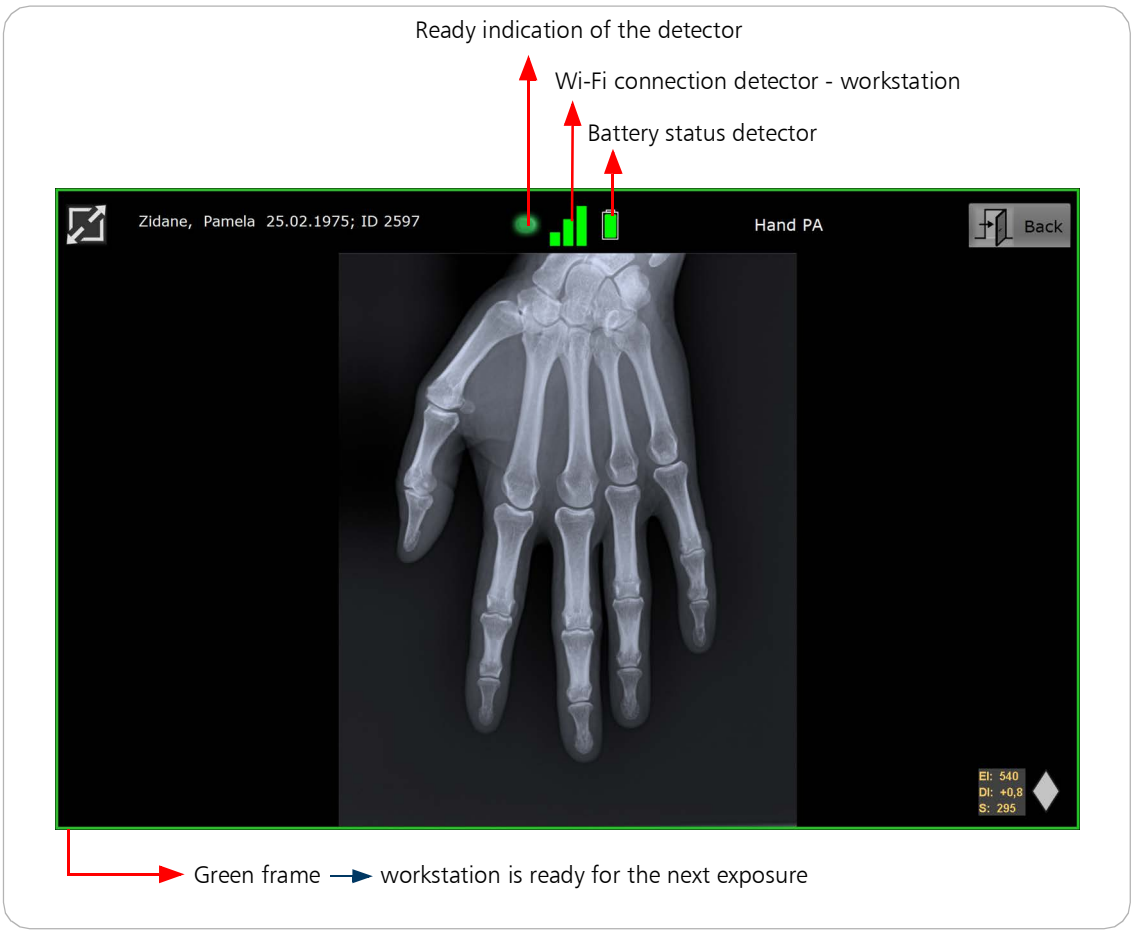


Figure 27. Full screen mode

3.3.5 Exposure index

Basics

In digital radiography, there is no direct relationship between the image receptor dose and the brightness (by analogy with optical density) of the processed image. Incorrect exposures can be compensated by the image processing in a wide range so that there is always a constant brightness and contrast effect. Therefore in digital radiography it is not possible to determine the actual image receptor dose based exclusively on the brightness impression of the final image, unlike analogue images, which represent this value.

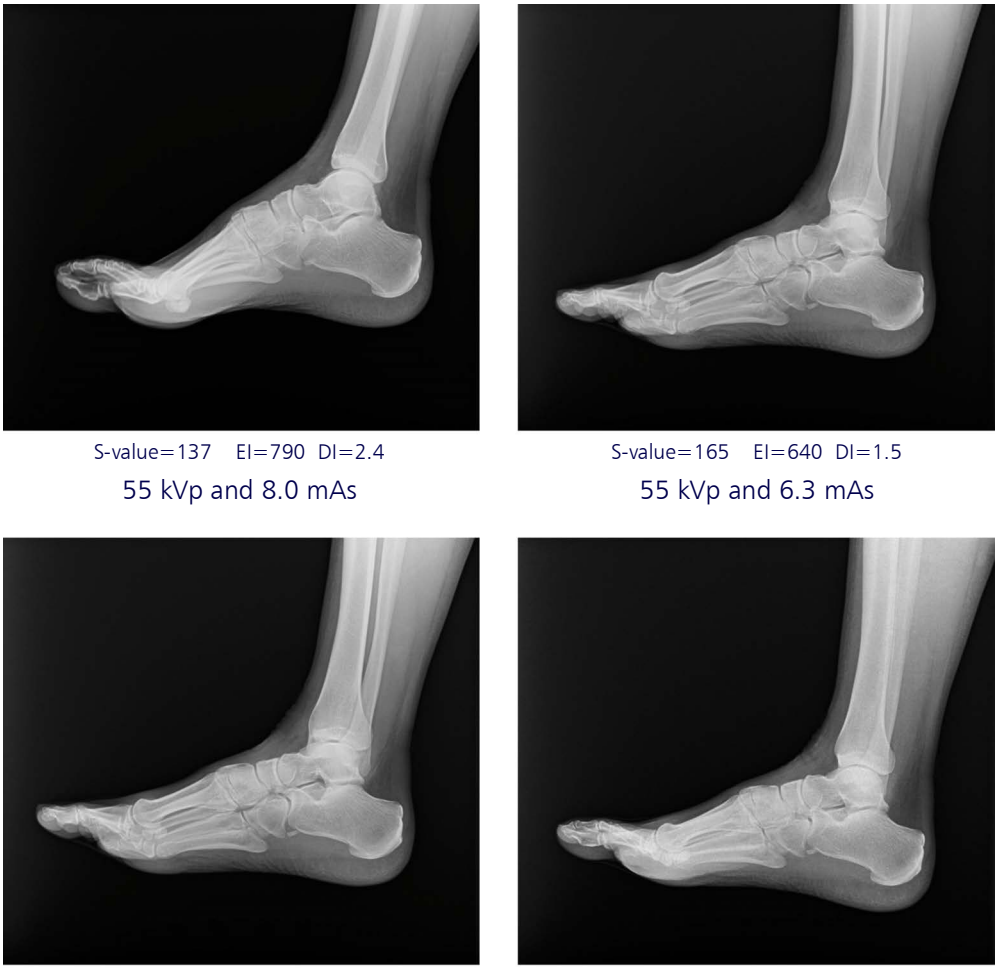


Figure 28. Examinations acquired under the same conditions with different mAs values, target exposure index is set to 450

Certainly, with digital radiography, underexposed images have a higher noise level and less detail, but this typically is compensated by the image processing, too. Overexposed images increase the radiation of the patient and partially the staff. If the final images are observed without any additional information, the decision whether the exposure of an image is correct or not is a nearly impossible task.

Digital radiography uses exposure indices to solve this dilemma. Therefore in most of the countries it is regulated that the manufacturer of digital radiography systems must use an exposure index (dose indicator, dose index) in order to give the user the possibility to estimate the exposure level of an image and therefore accomplish the task of acquiring correctly exposed images.

Historically, there were different standards for exposure indices. E. g. until May 2013 in Germany this was regulated by DIN 6868-58. Early standards only demanded a numerical value for the exposure index, which correlates with the image receptor dose under the same recording conditions. This is why different manufacturer-specific exposure indices can be found in digital radiography.

With *dicomPACS®DX-R* you can use two different exposure index types, the S-value that is oriented towards the sensitivity classes of film-screen-systems (Speed Class) and the exposure index according to the international standard IEC 62494-1.

The following table will give you a comparing overview of both exposure index types:

Description	Speed Class	S-value	EI (IEC 62494-1)	Dose required
High definition	100	100	1000	10.0 µGy
Universal film	200	200	500	5.0 µGy
High gain	400	400	250	2.5 µGy
Highest gain	800	800	125	1.25 µGy

Table 3. Comparison of exposure indices and speed class system

Additionally, for all exposure indices it has to be considered that an exposure index is not a measuring device like a dose meter. Any exposure index is a computed value referring to a region of interest found in the image. Thus, merely the exposure level can be estimated with exposure indices.

3.3.5.1 Exposure Index according to IEC 62494-1

The Exposure Index according to IEC 62494-1 is displayed by default after installation.

The IEC 62494-1 standard introduces three indices belonging together. The exposure index (EI), the target exposure index (TEI) and the deviation index (DI). The values of these three indices are stored in the DICOM header of the processed images and can be found in the following DICOM tags:

- (0018, 1411) Exposure Index
- (0018, 1412) Target Exposure Index
- (0018, 1413) Deviation Index

The exposure index (EI) is the presentation of the average dose which was detected on the sensor in the relevant image area (region of interest). The relevant image area is the examination-specific subarea in the image that contains the information relevant for the diagnosis. The exposure parameters are usually optimised for this area.

According to IEC 62494-1, the value of the EI is defined as the numerical value of the calculated dose D_r in µGy multiplied by 100.

Examples:

$D_r = 2.5 \mu Gy \rightarrow EI = 2.5 \times 100 = 250$

$D_r = 10.0 \mu Gy \rightarrow EI = 10.0 \times 100 = 1000$

The calculation of the dose is performed on the basis of a given value from the relevant image area. This value is determined using an average value method and the relevant image area is determined using a histogram-based method.

The target exposure index (TEI) is the expected exposure index (EI) for a correct exposure of a specific examination. For each examination a default TEI is defined in the software which can be adapted individually. For more information about the configuration of examinations/macros see "Tab Exposure Index" on page 92.

The deviation index (DI) is a value that represents the difference between exposure index and target exposure index. It shows quantitatively how much the EI deviates from the TEI.

Examples:

Situation	DI	EI	Relative dose	Relative dose increase
four times the dose	6.0	EI=4xTEI	400%	+300%
appr. three times the dose	5.0	EI=3.15xTEI	315%	+215%
two and a half times the dose	4.0	EI=2.5xTEI	250%	+150%
double the dose	3.0	EI=2xTEI	200%	+100%
appr. eight fifth of the dose	2.0	EI=1.58xTEI	158%	+58%
five quarters of the dose	1.0	EI=1.25xTEI	125%	+25%
dose for a correct exposure	0.0	EI=TEI	100%	+0%
four fifth of the dose	-1.0	EI=0.8xTEI	80%	-20%
appr. three fifth of the dose	-2.0	EI=0.62xTEI	63%	-37%
half the dose	-3.0	EI=0.5xTEI	50%	-50%
four tenth of the dose	-4.0	EI=0.4xTEI	40%	-60%
appr. one third of the dose	-5.0	EI=0.31xTEI	32%	-68%
a quarter of the dose	-6.0	EI=0.25xTEI	25%	-75%

Table 4. Examples for the dose deviation index

Because of the logarithmic scaling of the DI, working with the DI is like working with the well known exposure point system. That means that a value of +1 corresponds to an exposure with one exposure point too much dose, a value of -6 corresponds to a six exposure points too little dose and an image that is underexposed about four times.

PRACTICAL HINT

EI and DI can be shown instead of or additional to the S-value. The TEI can also be displayed.

Exposure level indicators

There are five symbols which are used as indicators for the current exposure level of an image and represent the ranges of the actual deviation index. The default configuration for the symbols is explained in the table below.

Symbol	Situation	Default DI configuration
	strong overexposure, not acceptable	> +5.0
	overexposure, acceptable in exceptional cases	from +5.0 to +2.0
	(almost) correct exposure	from +2.0 to -2.0
	underexposure, acceptable in exceptional cases	from -2.0 to -5.0
	strong underexposure, not acceptable	< -5.0

Table 5. Exposure level indicators

PRACTICAL HINT

The default configuration for the exposure level symbols can be adjusted in the support mode.

In practice

According to IEC 92494-1 the deviation index (EI) and the deviation index (DI) must be displayed. After acquisition, the values are displayed in the lower right area of the image. Depending on the configuration the target exposure index (TEI), the symbols for the exposure value and the S-value can be displayed together with the EI and DI.

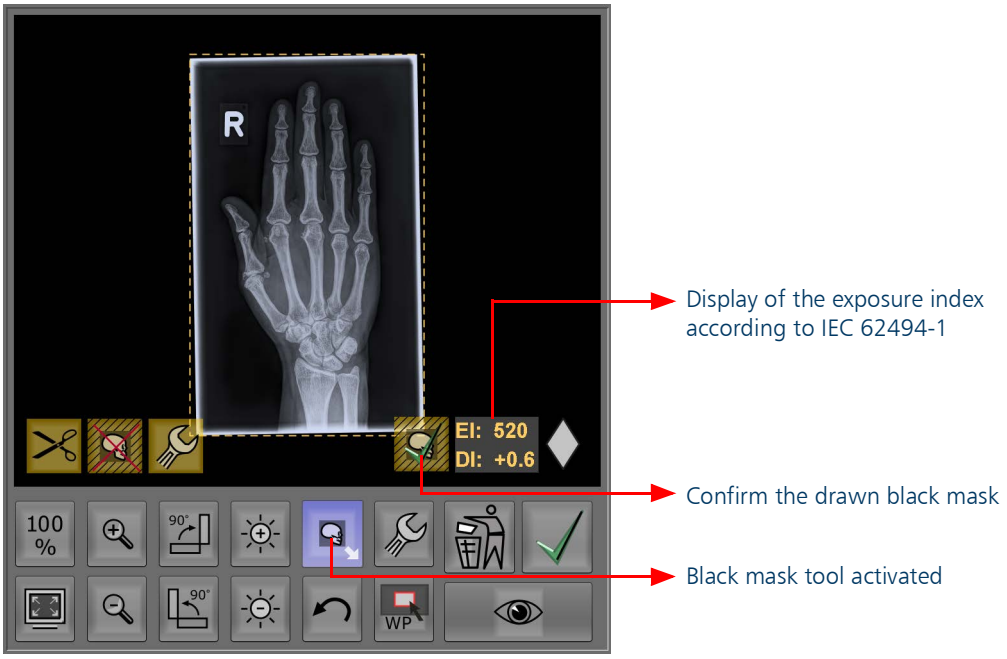


Figure 29. Display of the exposure index according to IEC 62494-1

If the automatic calculation of the exposure index fails (e.g. if the automatic region finder fails), a recalculation can be started by the user. The relevant image area for calculating the exposure index depends on the black mask (automatic shutter) that is automatically found by the software. Therefore, to get the recalculation started, the user has to check and correct the black mask by using the black mask tool. The recalculation is triggered by the button for confirming the black mask. For details how to use the black mask tool see “Black mask / cropping” on page 57.

To determine an EI or TEI suitable for the purpose of the examination and to manage regular occurrence of overexposure or underexposure with appropriate DI values are tasks which should be considered and solved coherently. When evaluating EI/TEI and DI values, the X-ray technique (e. g. kVp, mAs, grid/filter usage and source-image distance) and dosage measurement values (such as DAP) should always be checked for plausibility.

In addition and as explained previously, the exposure index is not a measuring device. In daily work, the calculated EI and DI values vary according to the dose actually applied, the kVp-range used, the organ examined and considering the calculation of the DI values the configured TEI for the examination.

It is therefore advisable, to first check the magnitude of the exposure index in routine operation to determine an average normal value for each system with its individual configuration and the individual operating principles of the staff. This investigation must, of course, be carried out separately for each examination type/organ. Therefore defining an EI/TEI for a correct exposure is, strictly speaking, an application-specific task. In order to support the user in this task, the software provides statistics on the already calculated EI values for each examination. Please see “Tab Exposure Index” on page 92 in the user manual for further information on the configuration of examinations/ macros.

Nevertheless, for orientation and to illustrate this, common target exposure indices can be given for selected applications in typical working environment, please see table below:

	adult, stationary DD CsI[1]	adult, stationary GOS[2]	child, stationary DD CsI[1]	child, stationary GOS[2]
EI/TEI extremities	450	560	250	360
EI/TEI trunk/torso	280	360	125-200	160-250

Table 6. Common (target) exposure indices in human application

[1]: direct deposit caesium iodide flat-panel detector

[2]: gadolinum oxide flat-panel detector

Once a TEI has been specified and configured for each examination, DI calculation and therefore statements for each image with respect to exposure level can be made, i.e. under, over or correct exposure dependent on the configuration of the exposure level indicator.

3.3.5.2 S-value

The S-value as exposure index in *dicomPACS®DX-R* is oriented towards the speed class system of film-sheet systems (as shown in Table 7 "S-value / radiation dose relation" on page 53). The S-value is a manufacturer-specific exposure index and represents the average dose in the region of interest of the acquired images. The S-value can be used in all COP processings.

The valid value range of the S-value ranges from 5 to 20000. The relationship between S-value and radiation dose is linear and inversely proportional. For the work with the S-value this means:

- high S-value ⟶ small dose (underexposure)
- small S-value ⟶ high dose (overexposure)
- double dose ⟶ half S-value
- half dose ⟶ double S-value

S-value	1600	800	400	200	100	50
Mean Radiation dose [μGy]	0.63	1.25	2.5	5	10	20
Mean radiation dose [mR]	0.07	0.14	0.29	0.57	1.14	2.28

Table 7. S-value / radiation dose relation

The calculated S-value is stored in the DICOM header of the processed image. The value can be found on the following DICOM tags:

- (0018,6000) Sensitivity
- (0018; 1405) Relative X-ray exposure

In practice

The S-value is displayed at the bottom right corner of the image after the image acquisition.

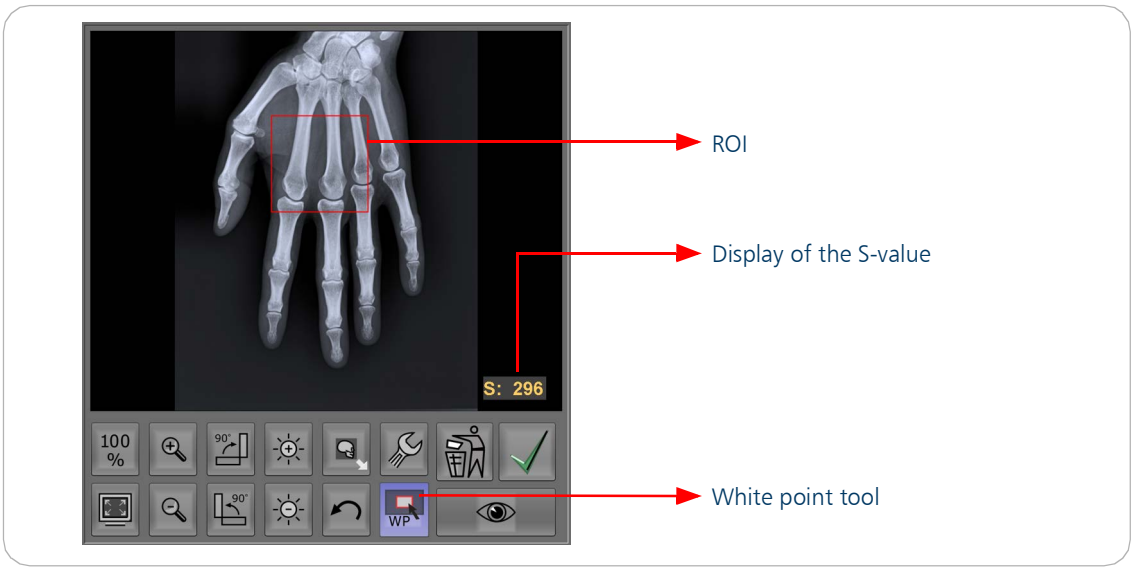


Figure 30. S-value

If the automatic calculation of the S-value fails (e. g. if the automatic region finder fails), a recalculation can be started by the user. The calculation of the S-value uses a region of interest. The white point tool has to display and control this region of interest. Afterwards, the white point tool can be used to correct the region of interest and start a S-value recalculation.

As explained previously, the S-value being an exposure index is not a measuring device. In daily work, the S-values displayed vary according to the dose actually applied, the kV-range used and the organ examined.

It is therefore advisable, to first check the magnitude of the S-Value in routine operation to determine an average normal value for each system with its individual configuration and the individual operating principles of the staff. This investigation must, of course, be carried out separately for each examination type/organ. Thus defining S-values for a correct exposure is, strictly speaking, an examination-specific task.

Nevertheless, for orientation and to illustrate this, common S-values can be given for selected applications in typical working environment, please see the next table:

	adult, stationary DD CsI[1]	adult, stationary GOS[2]	child, stationary DD CsI[1]	child, stationary GOS[2]
S-value extremities	250	160	400	280
S-value trunk/ torso	360	280	500-800	400-800

Table 8. Common S-values in human application

[1]: direct deposit caesium iodide flat-panel detector

[2]: gadolinum oxide flat-panel detector

Once a S-value has been specified for a correct exposure, statements for each image with respect to exposure level can be made, i. e. under, over or correct exposure. The following example illustrates this:

For the correct exposure of a trunk image, the S-value 360 is set. Overexposure as double-dose exposure and underexposure is defined as half-dose exposure. Exposures with triple or- one-third of the dose are considered to be significantly over- or underexposed.

	strong underexposure	underexposure	correct exposure	overexposure	strong overexposure
S-value	1080	720	360	180	120

Table 9. Example - how to work with the S-value

3.3.5.3 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.

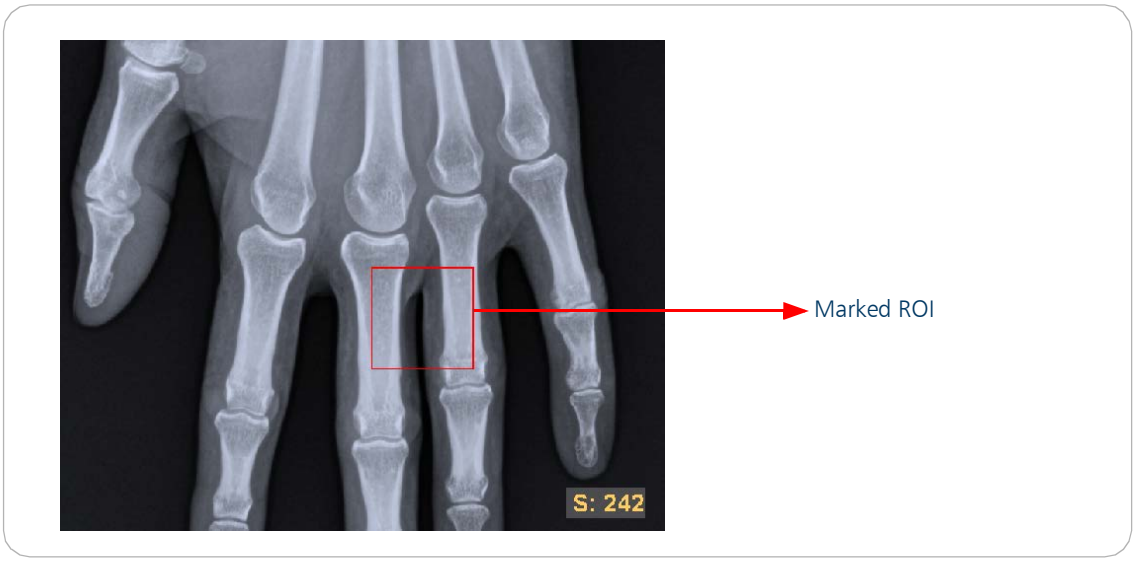


Figure 31. White point

3.3.5.4 Quality assessment of images

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

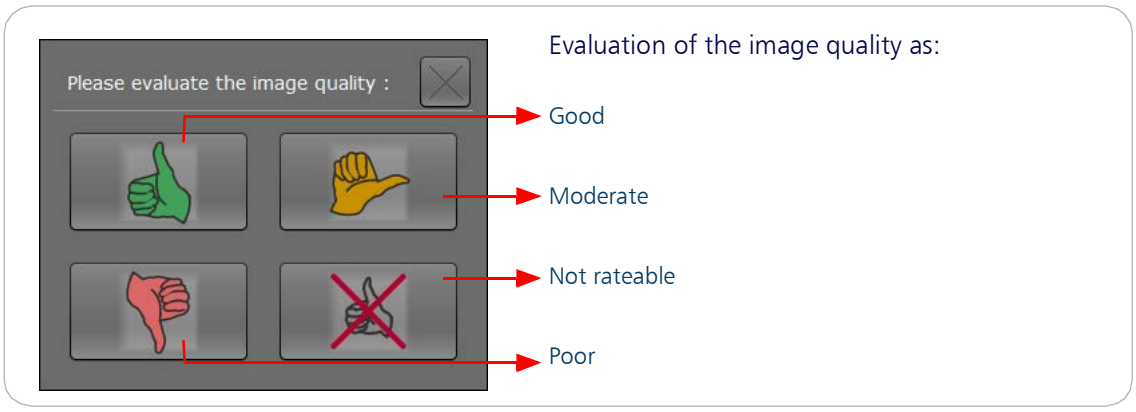


Figure 32. Quality assessment for images

3.3.5.5 Black mask / cropping

Using the black mask tool it is possible to darken light image parts and to eliminate unwanted sources of illumination. The X-ray image can so be limited to the relevant image part.

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

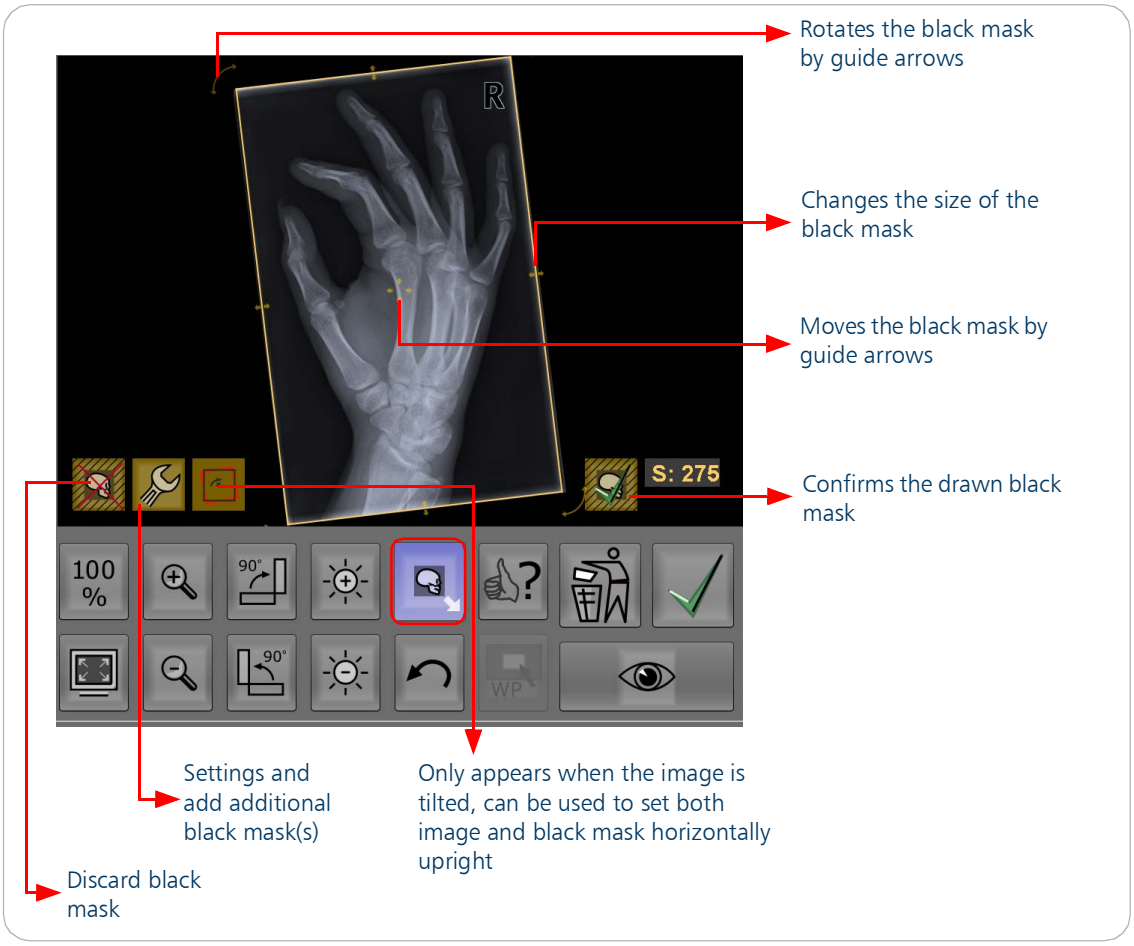


Figure 33. Black mask with normal edit helper annotations in the preview image

The tool "Create / Edit black mask" in the image preview is optimized for touch operation.

Pressing the "Esc" key stops drawing the black mask, e.g. to cancel an erroneous selection of the tool or incorrect handling. The status before applying the black mask is restored after pressing the "Esc" key.
If the "Esc" key is pressed after the black mask is complete, the programme will automatically switch to the edit mode. The helper lines disappear and the image can be moved.

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 dialogue opens, in which the shadowing can be adjusted from 70-100% (100% represents black) and in which you can add another black mask by clicking on the button „Add another ROI".

 Draw rotated black mask and set image (including black mask) upright by clicking this icon (if available)

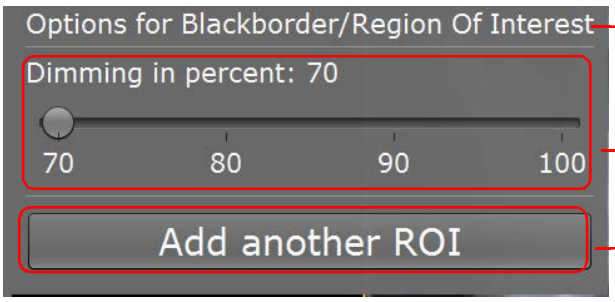


Figure 34. Black mask with small edit helper annotations in the preview image

 Draw the black mask

If a study with a drawn black mask is finished, the cropping functionality can also be applied automatically in case it is set up in the support mode.

Figure 35. Results of the black mask and cropping

CAUTION/ATTENTION!

EN: Before the cropping function can be used, a technician has to activate the tool in the support mode.

FR: Avant de pouvoir utiliser la fonction de recadrage, un technicien doit activer l'outil dans le mode support.

3.3.6 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. For each rejected image you can add a reason for the rejection. There are pre-configured rejection reasons available in the drop-down list, accessible by clicking on the small triangle next to the edit button. The list of rejection reasons can be adjusted to the individual requirements with the help of a technician in the support mode.

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.

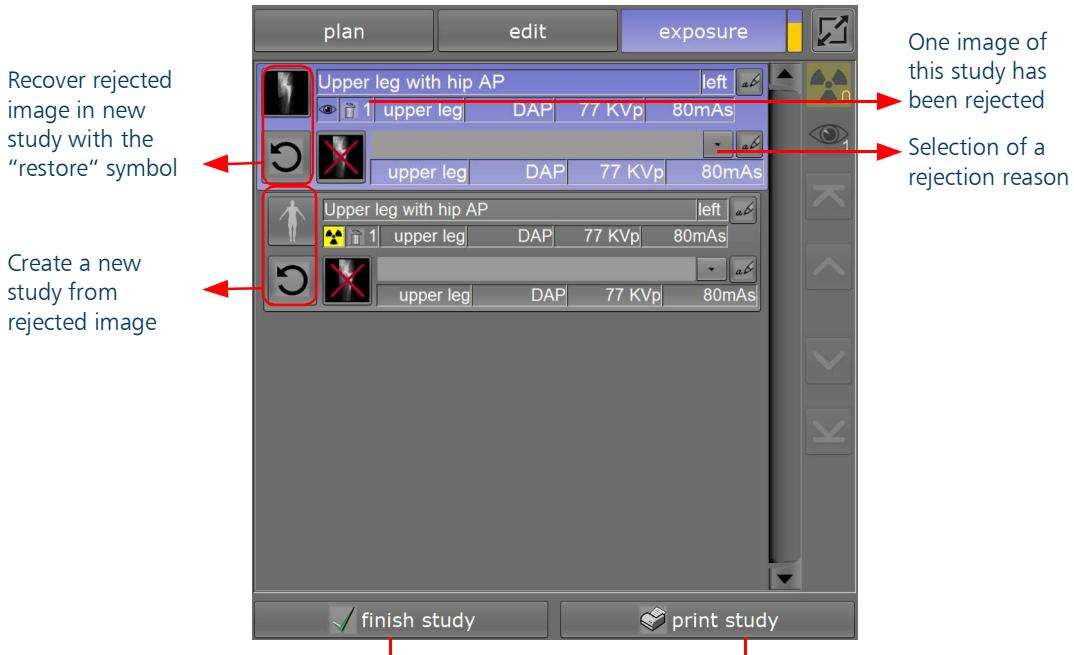


Figure 36. Discarded image

For legal reasons it is not possible to delete rejected images. Thus, a previously rejected image can be restored 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.

It is possible to define the input of a rejection reason as a mandatory information. A technician has to enable this option in the support mode.

If an image or a study is rejected without giving a rejection reason, a dialogue appears. You are requested to complete the missing information.

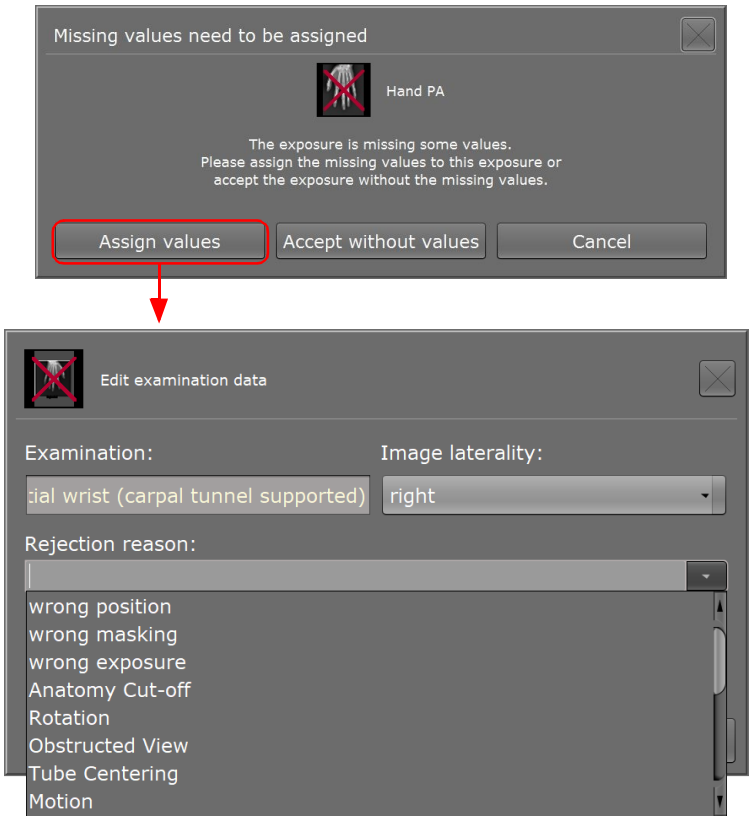


Figure 37. Rejection reasons

3.3.7 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.

3.3.8 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.

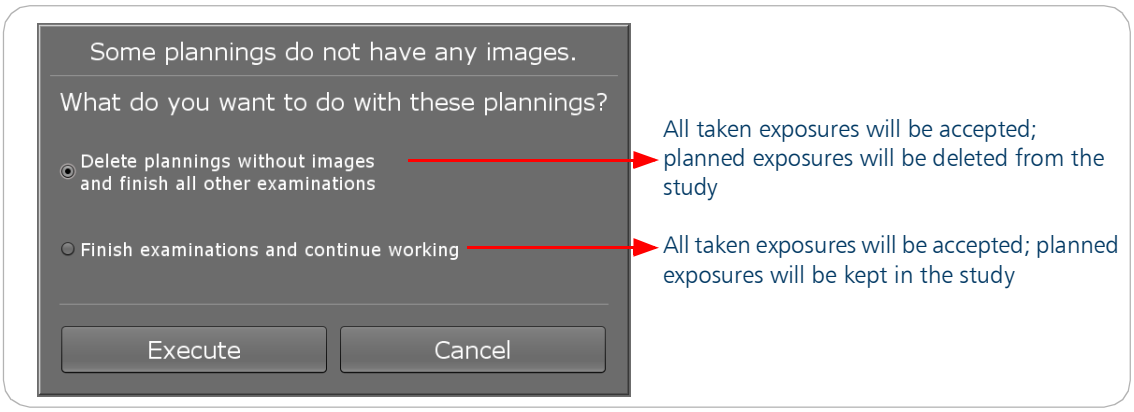


Figure 38. dialogue for exposures not yet taken

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

Figure 39. 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/ATTENTION!

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

FR: L'option pour accepter les expositions avec ou sans valeur de dose doit être configurée. Adressez-vous au vendeur de votre logiciel.

3.3.9 Display images in the viewer

dicomPACS®DX-R 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.

3.3.10 Exposure status

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

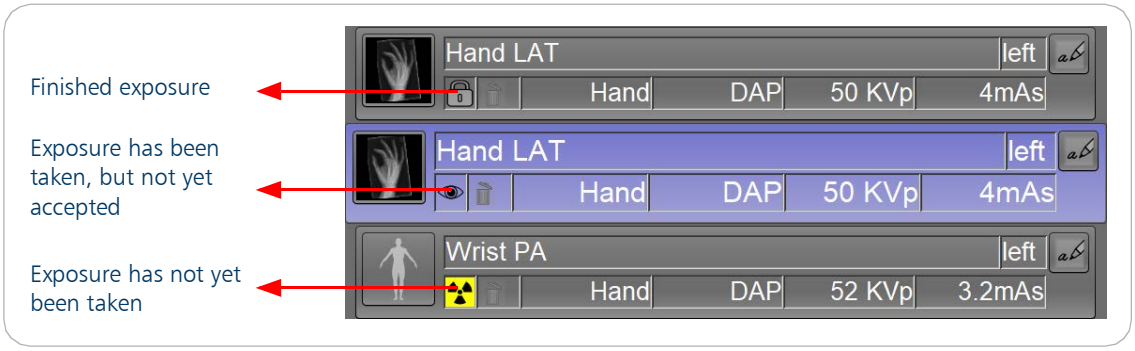


Figure 40. Exposure icons

3.4 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 send 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.

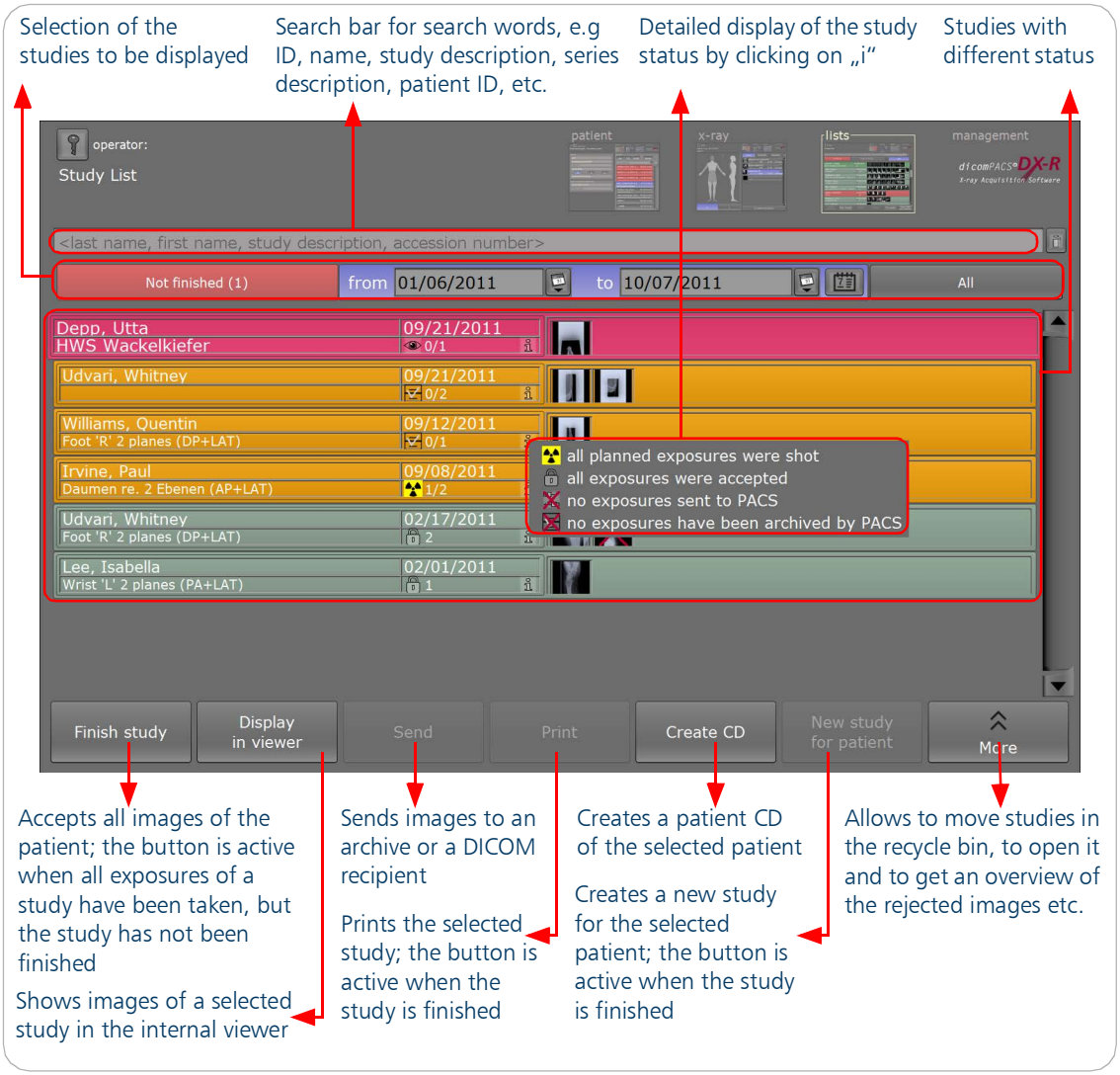


Figure 41. Lists view - with active storage commitment

The lists view has three different tabs:

- “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 images were taken; furthermore, when clicking on the calendar button, further search functions drop down
- “All”: displays any studies ever planned or completed

If there is a large number of images for a study, the “+X” sign indicates the number of additional images available.

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

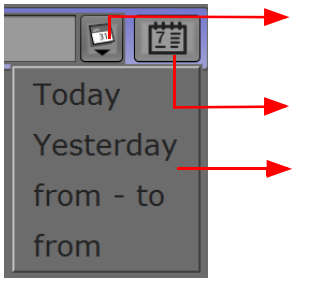


Figure 42. Time frame selection via general calendar button

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.

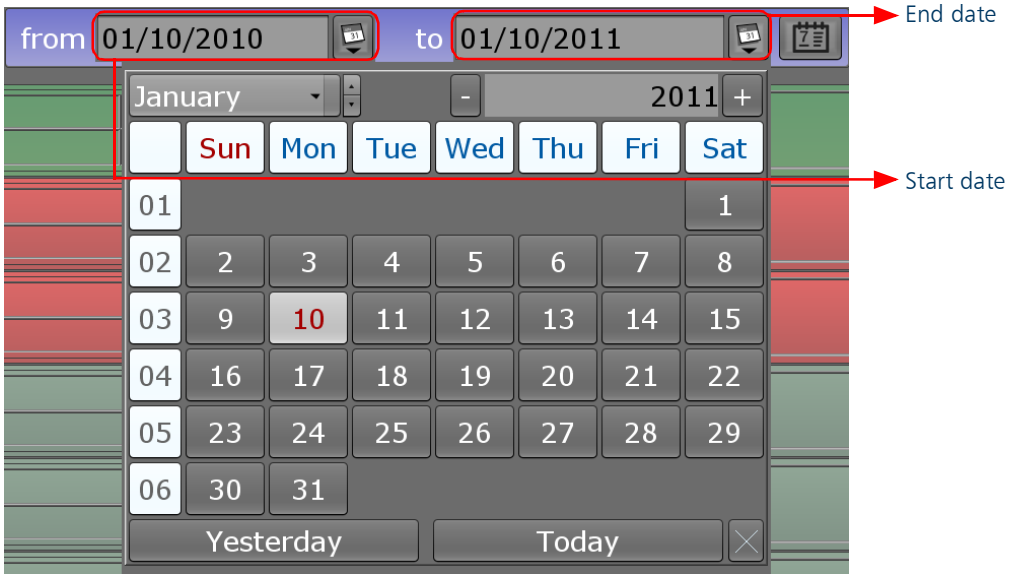


Figure 43. Date range

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 finished

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

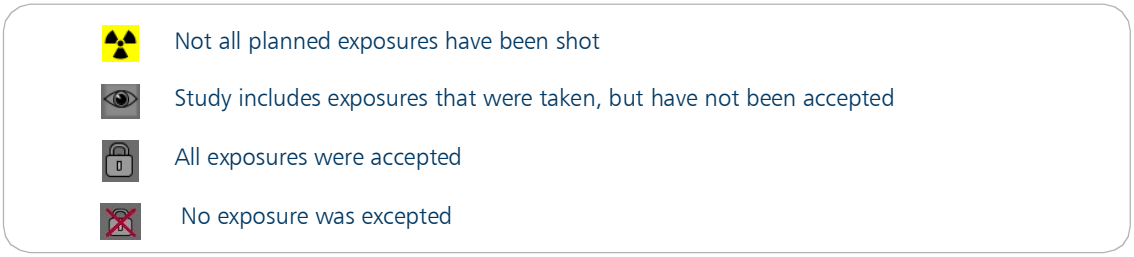


Figure 44. Status symbols without storage commitment

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 45. Status symbols with storage commitment

3.4.1 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.

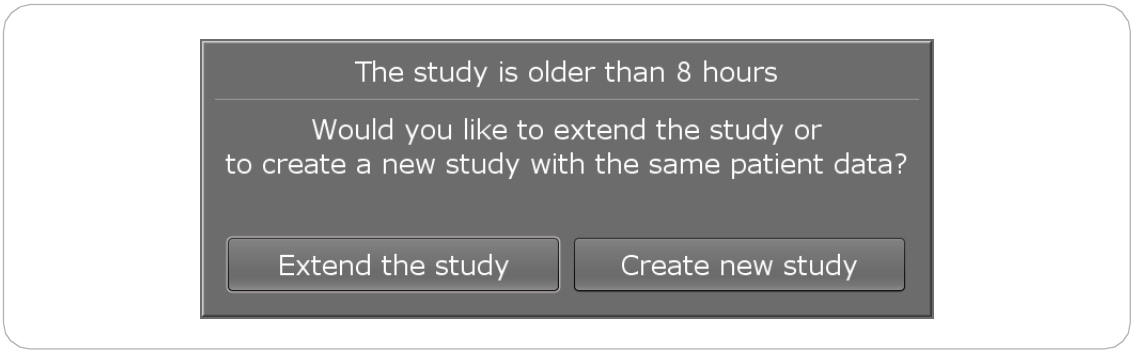


Figure 46. dialogue box to extend a study

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.

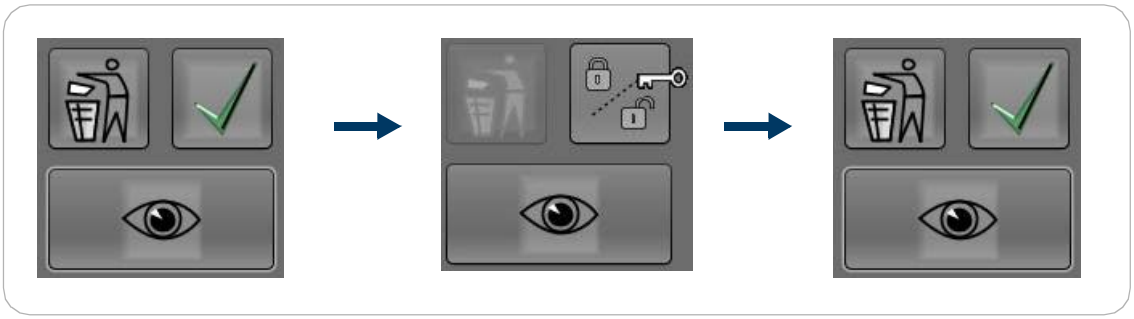


Figure 47. Reopening of images

If the option "Create new study" is selected, automatically a new study is created for the patient, see page 70.

3.4.2 Send

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.

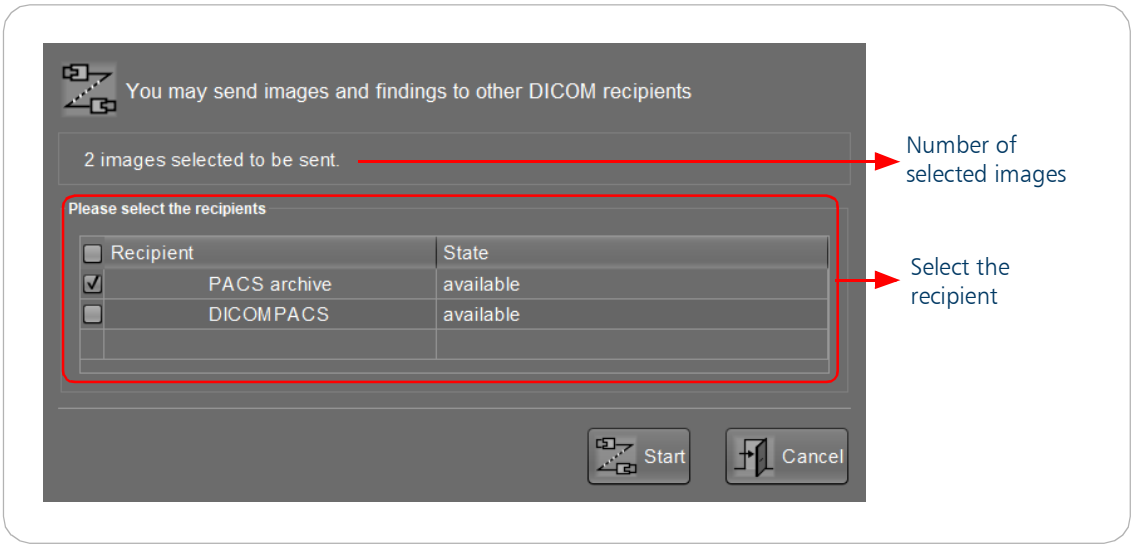


Figure 48. Send dialogue

An extended teleradiology dialogue can be called up via the internal viewer (see "Teleradiology" on page 198)

3.4.3 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 "Print - printing of images" on page 192) 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.

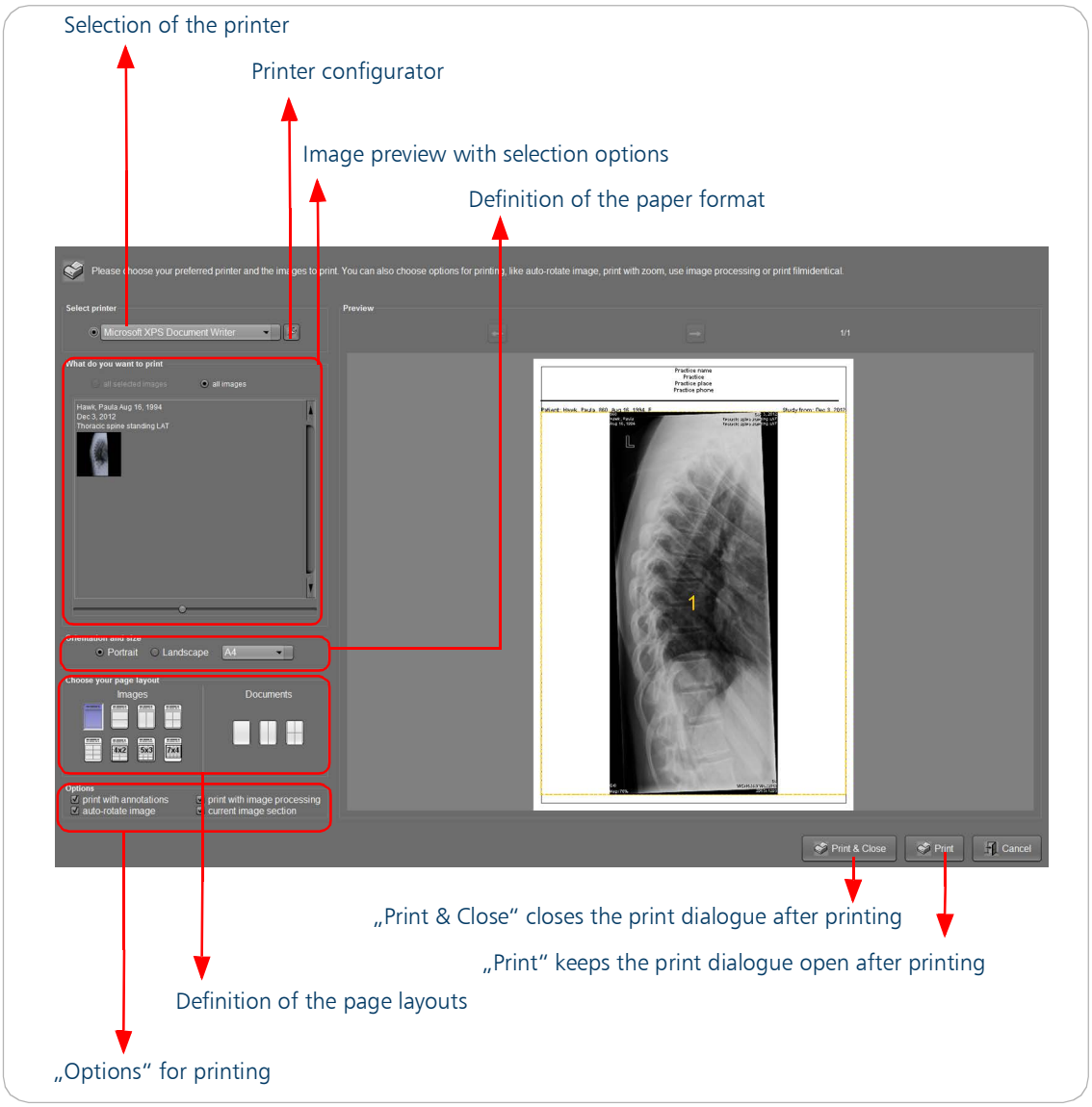


Figure 49. Print dialogue

Note

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

3.4.4 New study

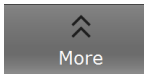
New study for patient

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 finished (green marked) studies.

3.4.5 More



Further functions can be accessed by clicking on the button “More“.

There you have the choice between the following functions:

- Open recycle bin
- Show rejected images
- Move into recycle bin
- Open statistics overview
- X-ray journal
- Upload images
- Change patient data

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.

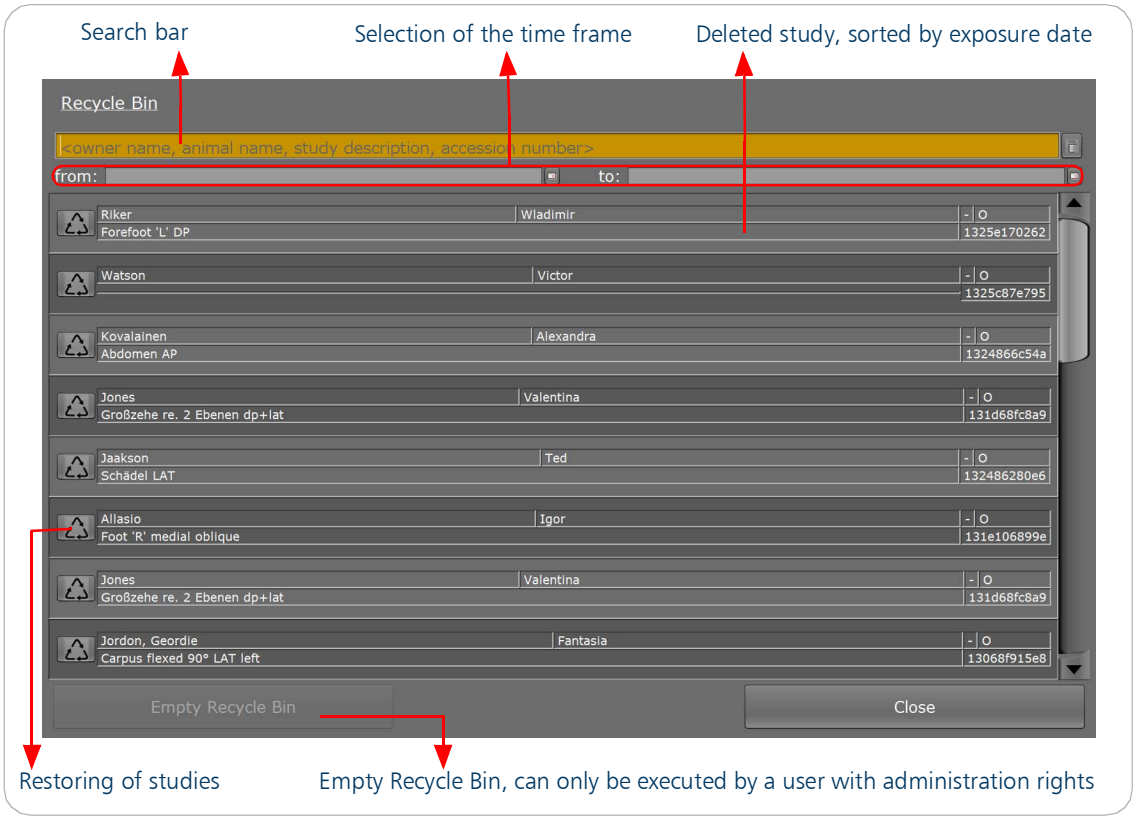


Figure 50. Recycle Bin

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 an accidental emptying of the recycle bin, the daily password is requested. Only after the successful entry of the password the recycle bin can be emptied.

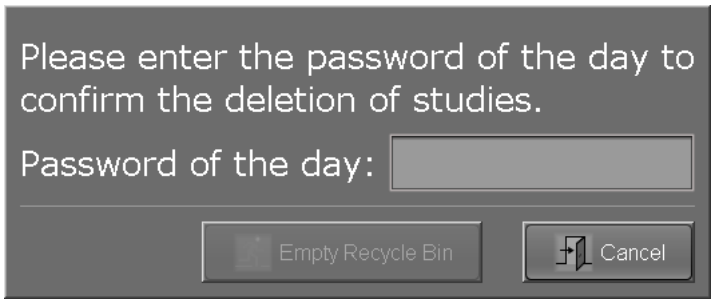


Figure 51. Password of the day

Show Rejected Images - opens a list in which all rejected exposures are listed. 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. Already deleted studies can be listed in the overview of rejected images.

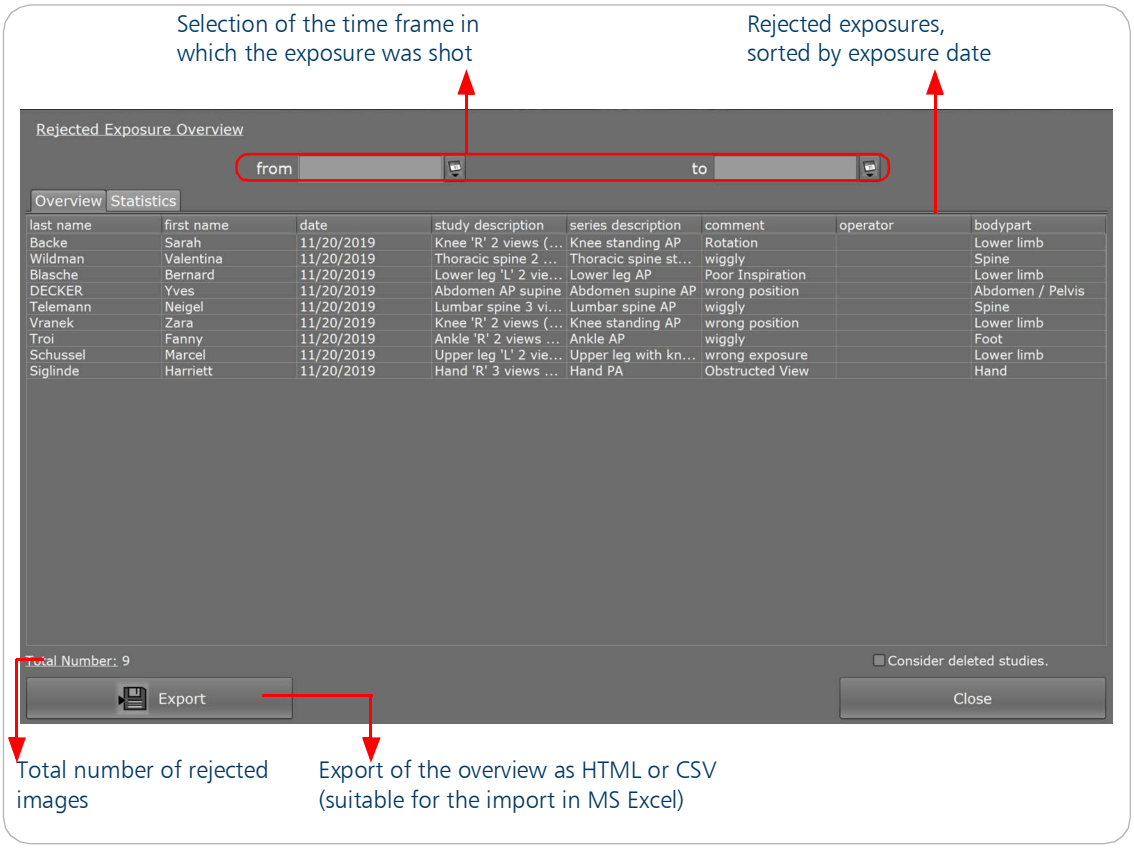


Figure 52. Rejected Exposure Overview

In the tab “Statistics” a summary of the reasons for rejection is displayed.

- all rejected studies
- per body part
- per user

Using “export” the data can exported to Microsoft Excel.

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.

The statistical overview provides the option to display the absolute number 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.

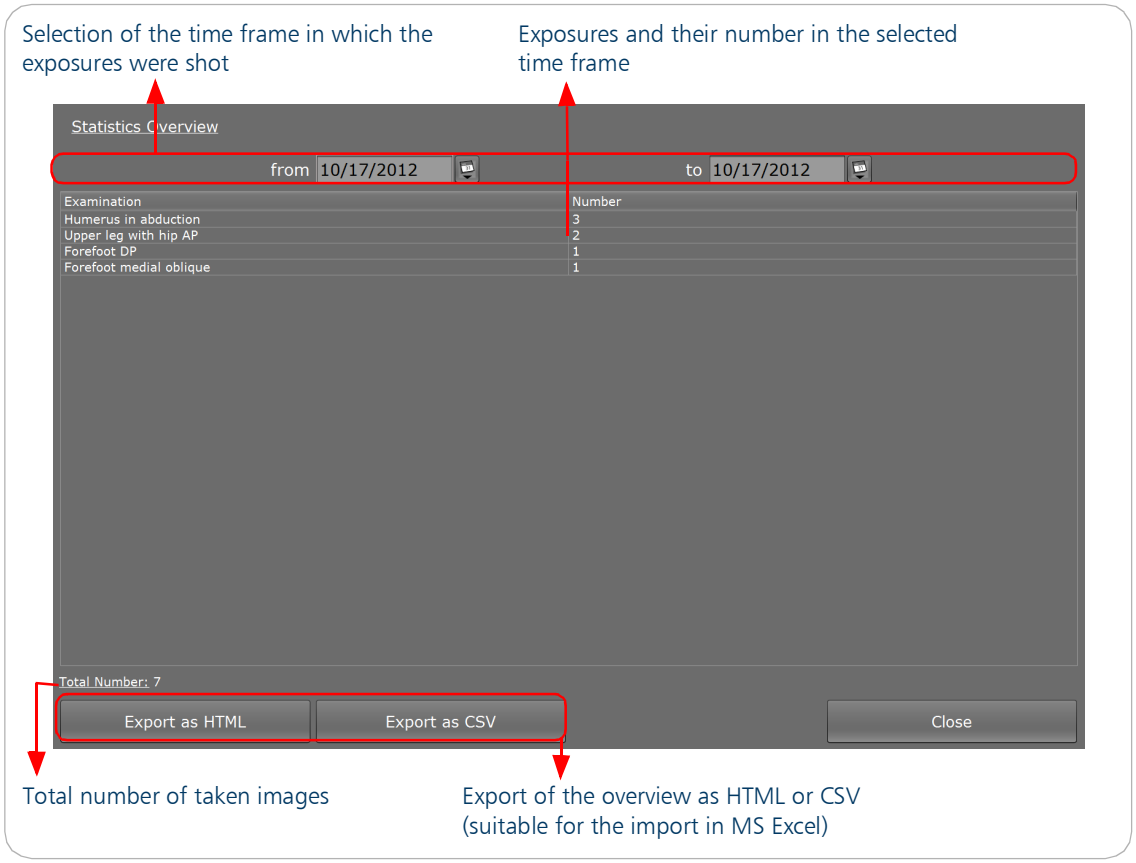
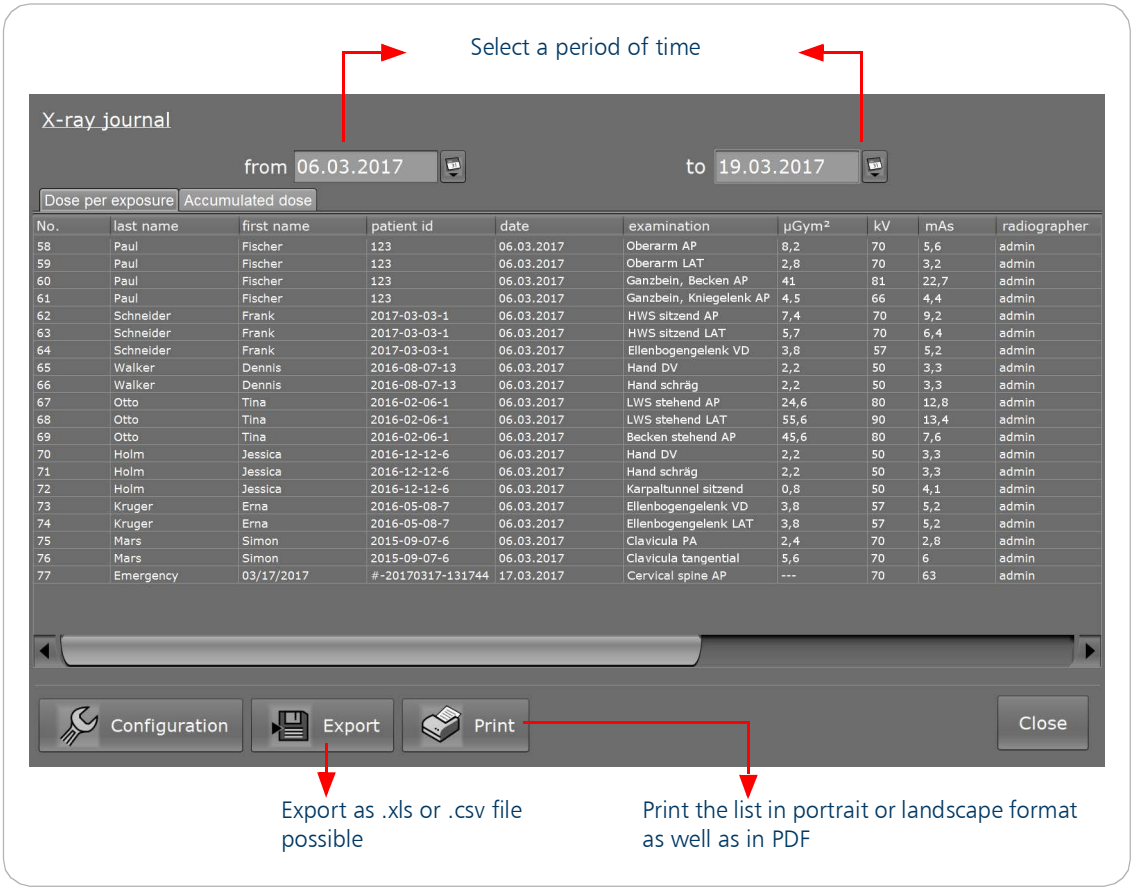


Figure 53. Statistics overview

With the button "More" you can start the X-ray journal directly from *dicomPACS® DX-R*.

Either the dose per exposure or the accumulated dose of all exposures for a patient in a defined time frame can be displayed.



No.	last name	first name	patient id	date	examination	µGym²	kV	mAs	radiographer
58	Paul	Fischer	123	06.03.2017	Oberarm AP	8,2	70	5,6	admin
59	Paul	Fischer	123	06.03.2017	Oberarm LAT	2,8	70	3,2	admin
60	Paul	Fischer	123	06.03.2017	Ganzbein, Becken AP	41	81	22,7	admin
61	Paul	Fischer	123	06.03.2017	Ganzbein, Kniegelenk AP	4,5	66	4,4	admin
62	Schneider	Frank	2017-03-03-1	06.03.2017	HWS sitzend AP	7,4	70	9,2	admin
63	Schneider	Frank	2017-03-03-1	06.03.2017	HWS sitzend LAT	5,7	70	6,4	admin
64	Schneider	Frank	2017-03-03-1	06.03.2017	Ellenbogengelenk VD	3,8	57	5,2	admin
65	Walker	Dennis	2016-08-07-13	06.03.2017	Hand DV	2,2	50	3,3	admin
66	Walker	Dennis	2016-08-07-13	06.03.2017	Hand schräg	2,2	50	3,3	admin
67	Otto	Tina	2016-02-06-1	06.03.2017	LWS stehend AP	24,6	80	12,8	admin
68	Otto	Tina	2016-02-06-1	06.03.2017	LWS stehend LAT	55,6	90	13,4	admin
69	Otto	Tina	2016-02-06-1	06.03.2017	Becken stehend AP	45,6	80	7,6	admin
70	Holm	Jessica	2016-12-12-6	06.03.2017	Hand DV	2,2	50	3,3	admin
71	Holm	Jessica	2016-12-12-6	06.03.2017	Hand schräg	2,2	50	3,3	admin
72	Holm	Jessica	2016-12-12-6	06.03.2017	Karpaltunnel sitzend	0,8	50	4,1	admin
73	Kruger	Erna	2016-05-08-7	06.03.2017	Ellenbogengelenk VD	3,8	57	5,2	admin
74	Kruger	Erna	2016-05-08-7	06.03.2017	Ellenbogengelenk LAT	3,8	57	5,2	admin
75	Mars	Simon	2015-09-07-6	06.03.2017	Clavicula PA	2,4	70	2,8	admin
76	Mars	Simon	2015-09-07-6	06.03.2017	Clavicula tangential	5,6	70	6	admin
77	Emergency	03/17/2017	#-20170317-131744	17.03.2017	Cervical spine AP	---	70	63	admin

Figure 54. View X-ray journal

When clicking on 

you can adjust the X-ray journal. Two configurable settings are available:

- Rename columns: Columns can be renamed according to your own method of operating.
- Select columns: Here you can select, wich columns should be shown or hidden in the X-ray journal.

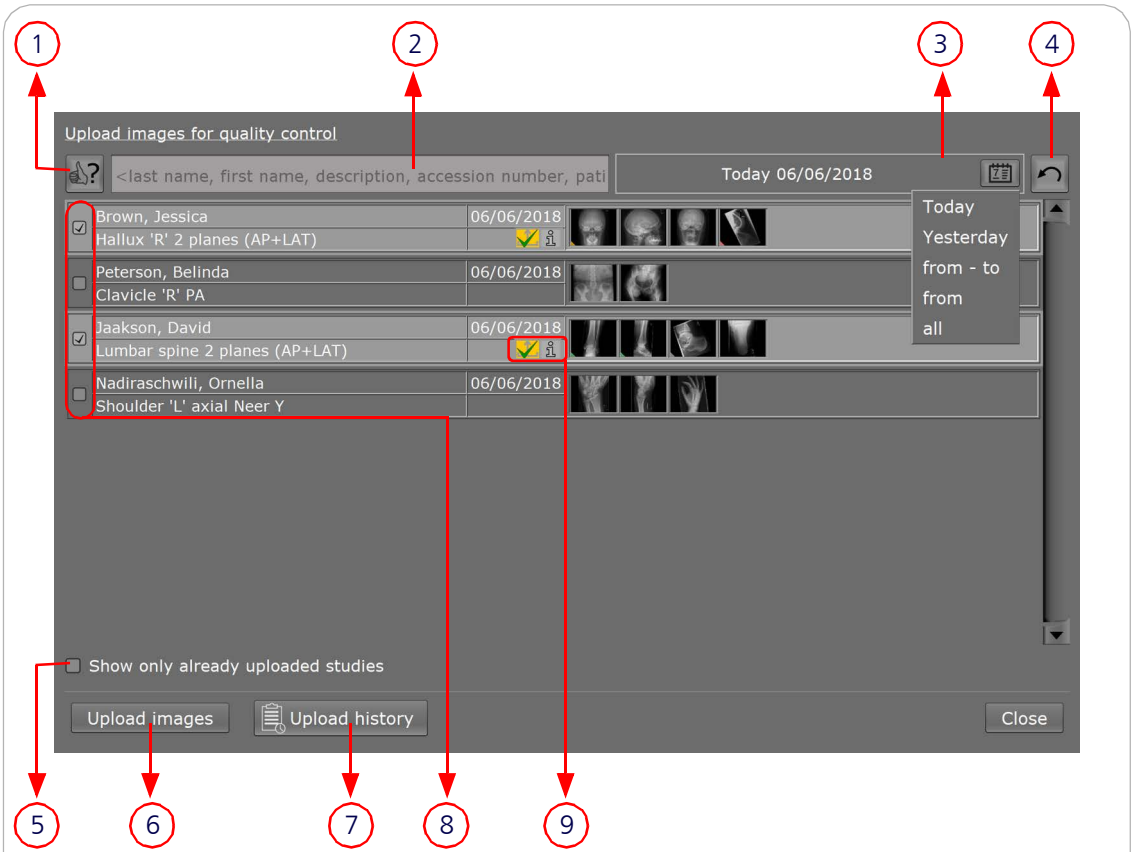
A unit for the dose area product can be defined (e.g. µGym²).

Changes made can be accepted with "Save" and rejected with "Discard changes".

"Upload images" allows the user to easily and securely upload images with faulty processings or other errors to the OR Technology server. Thereby patient data are anonymised and encrypted. The OR Technology support will then take care of troubleshooting.

After selecting this function, a selection dialogue opens in which all studies are displayed. Filters can be used to limit the number of studies displayed. The small coloured triangle on the bottom left of the thumbnails displays the quality evaluation which can be done the X-ray view (see "Quality assessment of images" on page 56).

Available filters are explained in the screenshot.



[1] Filter by image rating
[2] Filter by last name, first name, description, accession number, patient ID
[3] Filter by date
[4] Reset all filters
[5] Only displays studies that have already been uploaded or exported for quality control
[6] Upload images - opens a dialogue for image selection and entering customer data
[7] Displays the list of already uploaded/ exported images
[8] Selection of studies to be uploaded
[9] Status of the study related to upload/export

Figure 55. Selection dialogue

For the upload or export, the corresponding studies are selected first.

"Upload images" in the selection dialogue opens a window in which single images or all images of the chosen studies are selected for the upload/export.

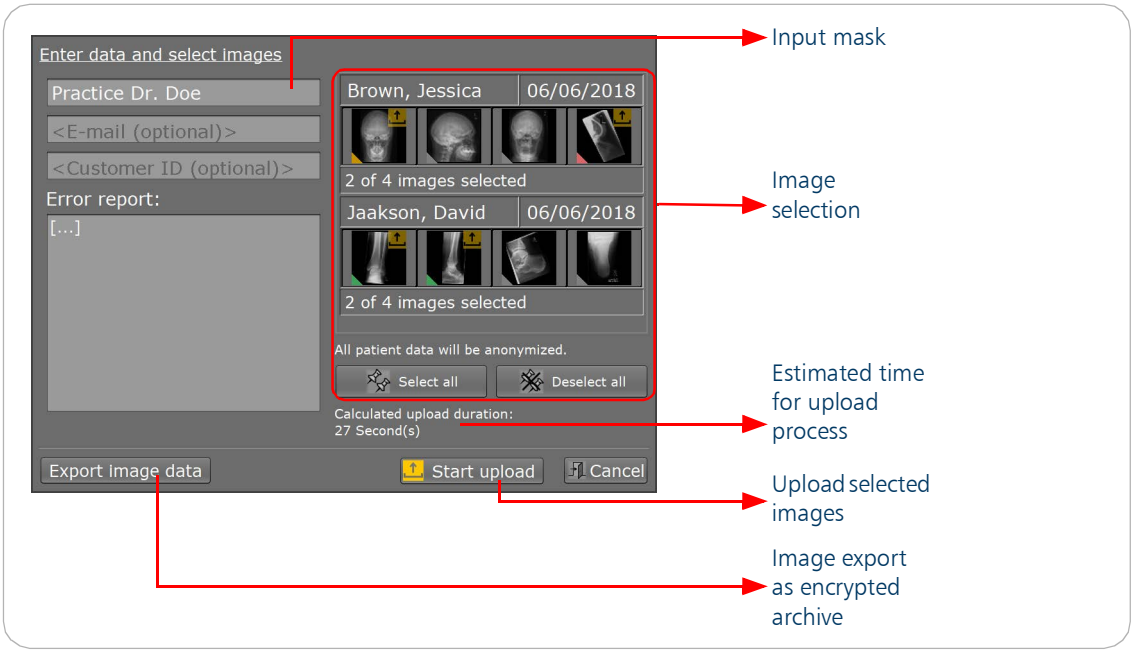


Figure 56. Upload/export dialogue

In the input mask fill in name and error report as mandatory data. Optionally, the e-mail address and the accession number can be given.

RAW files and processings are uploaded automatically. An e-mail with all the necessary information will then be sent to OR Technology. If it is not possible to use the upload due to a missing internet connection, the data can also be exported as an encrypted archive. This option is always available even if there is no internet connection.

After clicking on "Export images" or "Start upload", a progress bar is displayed. This dialogue can be hidden at any time via the "Run in background". The process is not interrupted.

A list of all uploaded/exported images can be displayed via "History" from the image selection dialogue. The time and the status of all uploads/exports is displayed.

Figure 57. Progress of image upload

Change patient data

"Change patient data" patient data is mainly of interest when changing examination data of emergency patients.
It is possible to reassign already finished (closed) studies, because they were e.g. already used for diagnosis, or still open studies.

If a study that is not yet finished is added to a closed study, the status changes to "Not finished" (red).

If a study that is not yet finished is added to a closed study, the status changes to "Not finished" (red).

There are the following ways how to proceed with study/image information:

1. a study is added to another study with the same study date
2. a study is added to an open worklist entry
3. for a study, that cannot be reassigned to a study with the same study date nor to an open worklist entry, a new study is opened, in which the examination data is stored
4. single image/s of a study can be moved to another patient

The workflow for changing patient data usually looks like this: e.g. an emergency patient was created in the worklist and the corresponding images were taken. In the lists view the appropriate study to be changed (e.g. the one of the emergency patient to assign a name) must then be selected. Under the menu item "More" select Change patient data whereby the following dialogue opens.

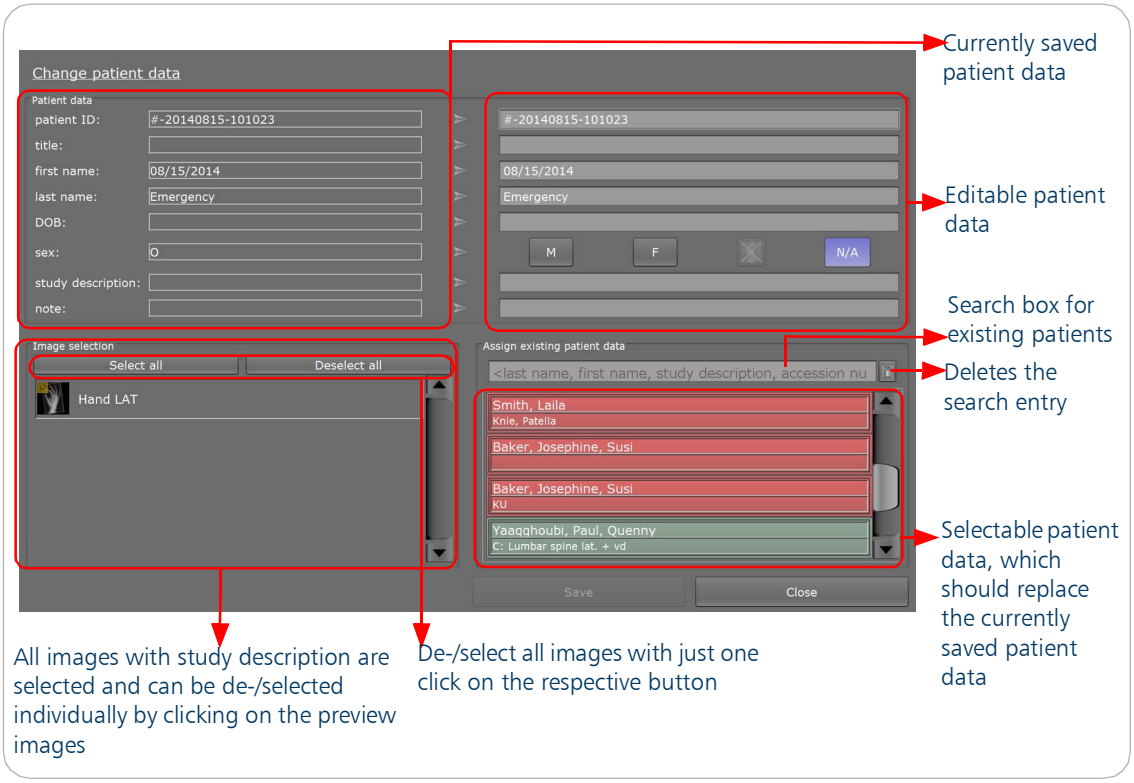


Figure 58. Change patient data

After changes were made in the editable patient data fields, these lines are coloured in orange to show the changed to the currently storied information.

In the section image selection you can select single images to be moved to other studies. Simply click on the respective preview image and a pin icon will mark the image as selected.

The click on "Save" saved the changed data in the lists view, respectively in the archive.

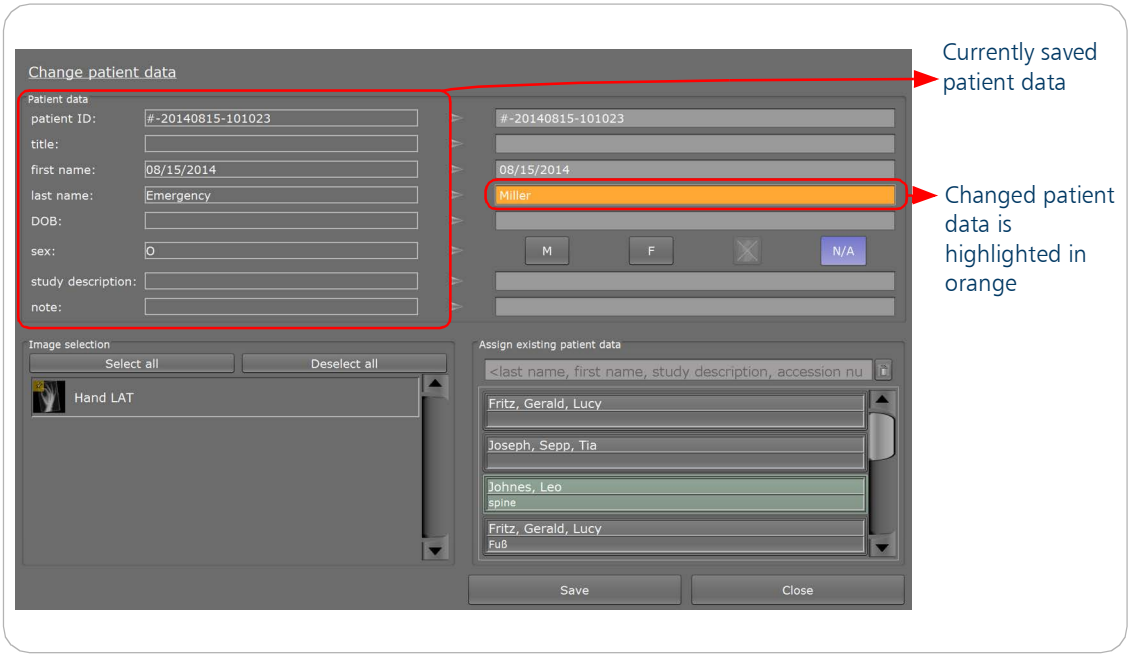


Figure 59. Changed patient data is highlighted

If existing patient data is assigned to the currently selected patient information, then all fields are highlighted, in which there are changes to the existing data. In the search box you can search for patients, the list is then reduced to the potential results. The displayed patient data are composed of the entries in the worklist and lists view and are sorted by date (most recent entry is at the top). Following the change of the patient data from the list of available data, the amended patent data is highlighted. The modified data can still be changed until the operation is "Save"d.

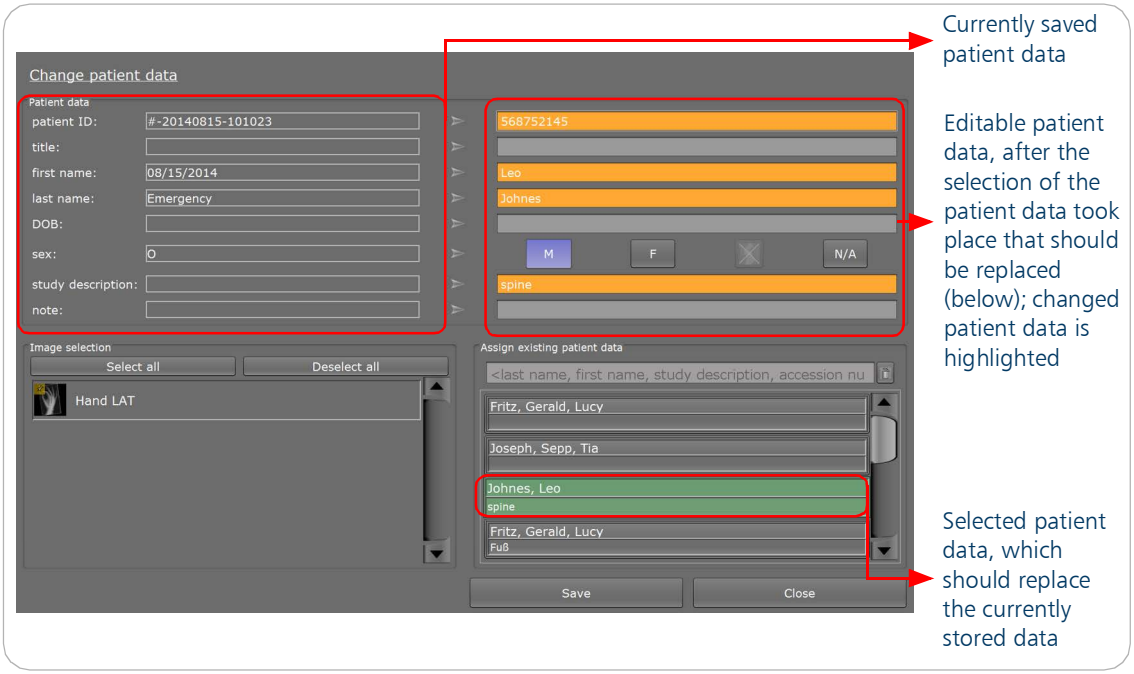


Figure 60. Change patient data with existing data

The X-ray images are now assigned to the new patient data in the list view. The entry of the "emergency" patient is no longer displayed and the images are no longer assigned to this entry.

3.5 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".

For the configuration, the user needs the respective login level with the rights to enter the tab "configuration".

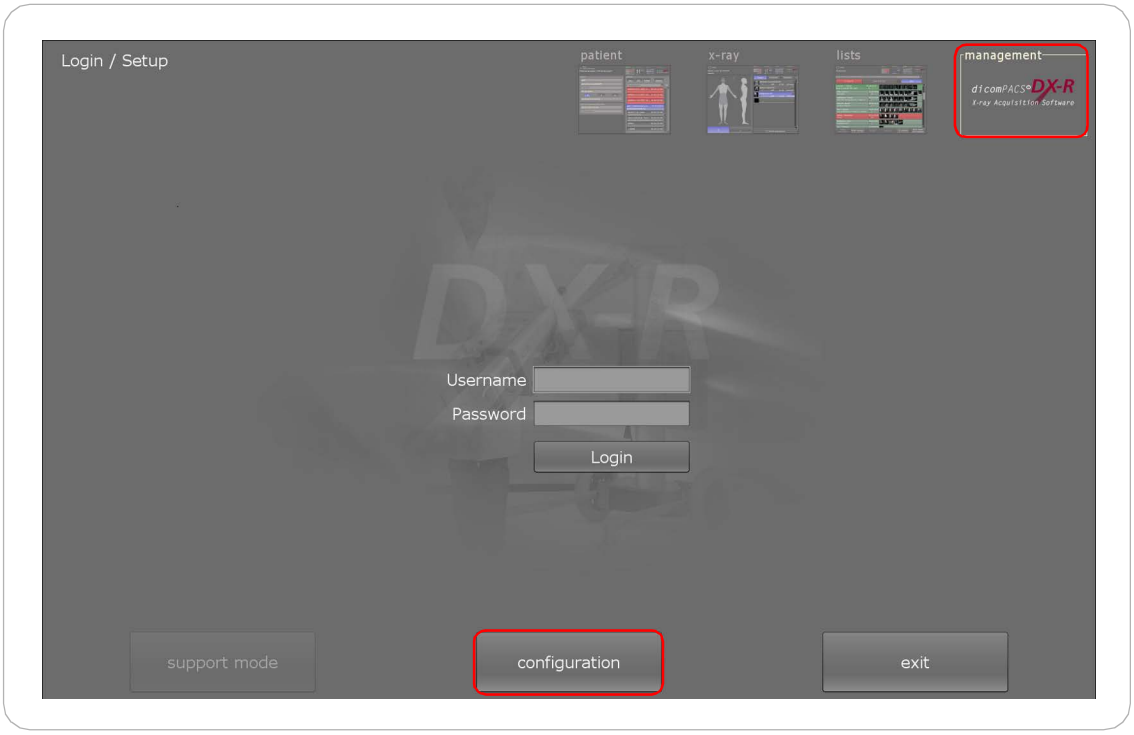


Figure 61. Start screen

The configuration mode is displayed immediately and offers the possibility to customise and extend the supplied examinations in the organ trees for adults, children and babies. 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.

The following list shows the possibilities in the configuration of macros and examinations:

- create new examinations / macros
- change examinations / macros
- hide examinations / macros
- change the colour of examinations
- change / insert procedure codes for examinations
- change the image processing of examinations
- change the order of examinations / macros

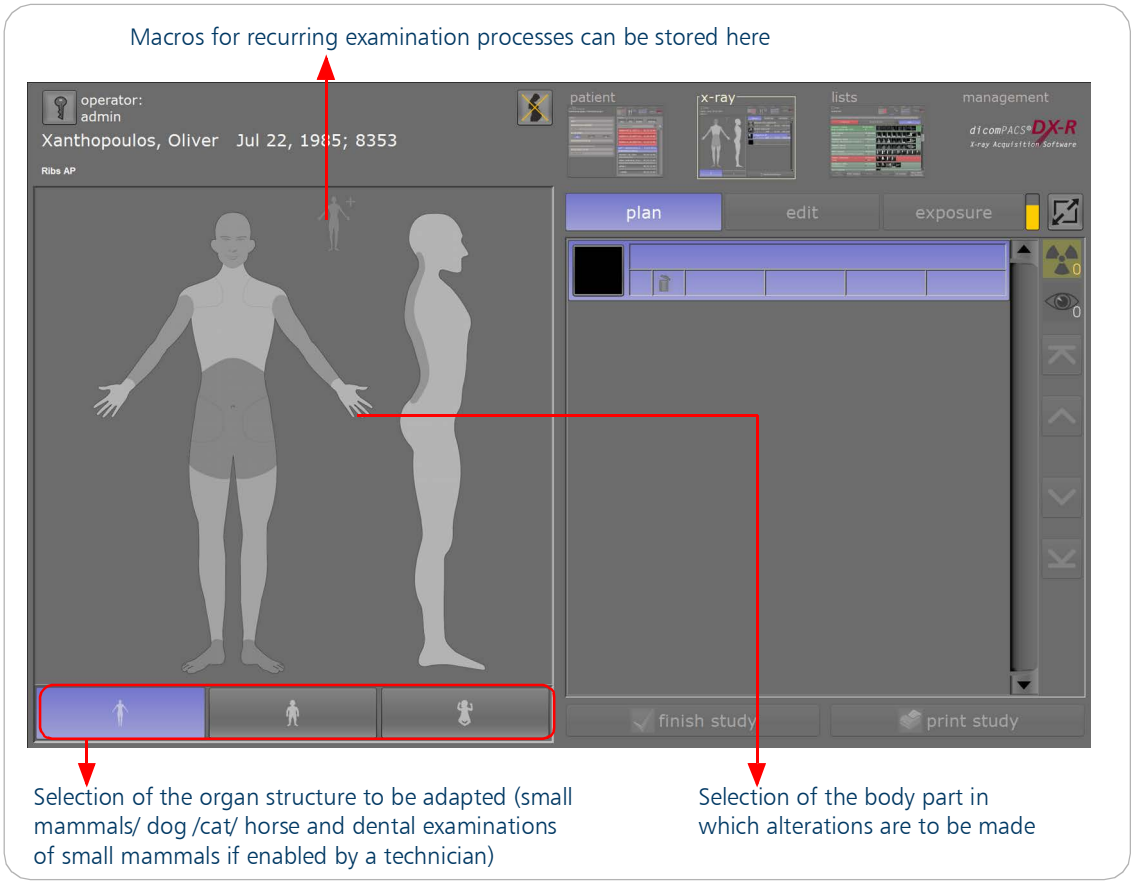


Figure 62. Configuration of macros / examinations

3.5.1 Display of examinations/macros

To display the organ-specific studies / macros, click the respective organ tree button for adult/child/ baby 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 "Move examinations/macros" on page 95).

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: grey)
- 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).

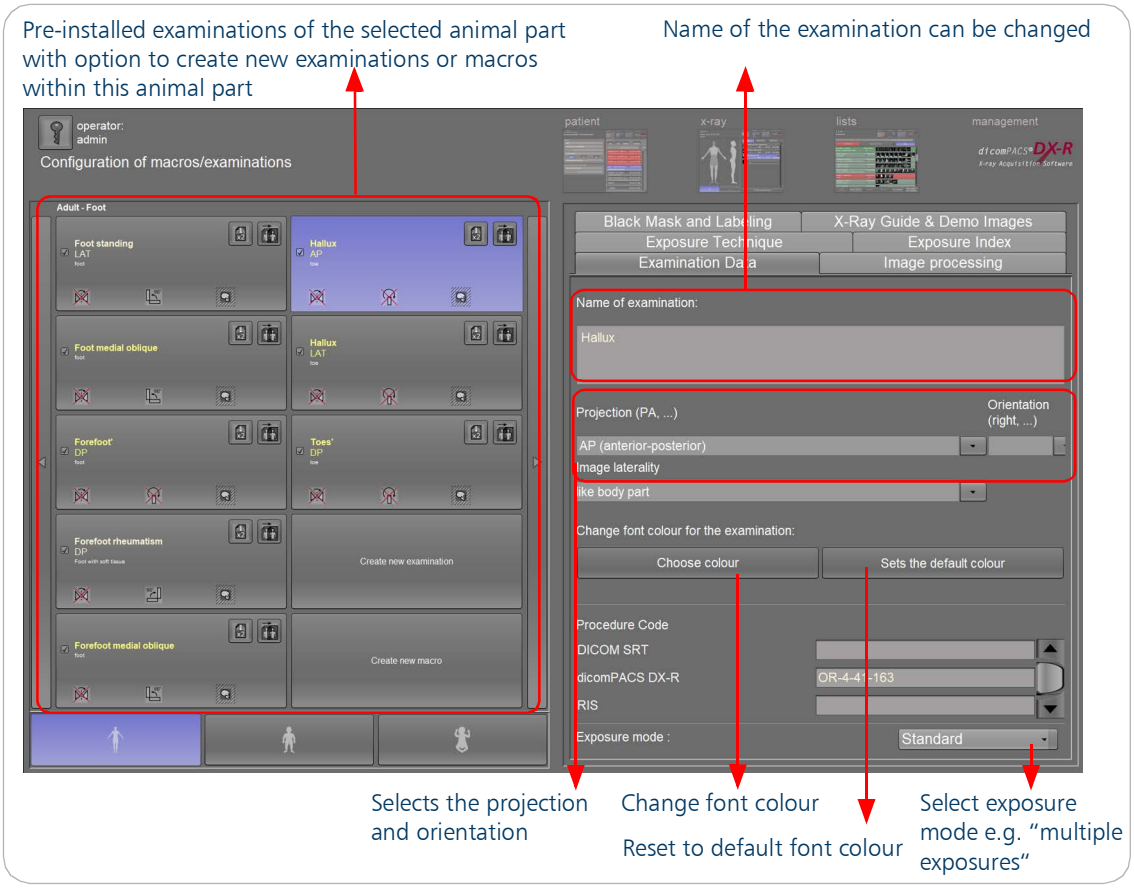


Figure 63. Configuration of macro / examinations

3.5.2 Create examinations/macros

3.5.2.1 Create Examinations

To create a new examination, choose the desired organ tree and the organ for which an examination shall be added. Click on the button "Create new examination" at the end of the list on the left side. On the right side of the screen you find options for editing newly created examinations:

- Examination Data
- Image Processing
- Black Mask & Labeling
- Exposure Technique
- Exposure Index
- X-Ray Guide & Demo Images

3.5.2.2 Create Macros

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.

There are two types of macros:

- Macro with examinations of the selected organ (organ-specific)
- Macro with examinations of different body parts and organs (superior macro)

To create a new macro, proceed as follows:

Create organ-specific macro

1. Choose the organ tree.
2. Click on the button "Create new macro" at the end of the examinations list.
3. Enter the name of the newly created macro in the text field "Name of macro". The name will appear on the newly created button - no further confirmation is necessary.
4. Click on the button "Add examinations" on the bottom right.
5. Click on the examinations on the left side of the screen to add them to the macro.
6. Confirm the creation of the organ-specific macro by clicking "Finished".

Create superior macro

1. Click on the macro button  .
2. Click on the button "Create new macro" at the end of the examinations list.
3. Enter the name of the newly created macro in the text field "Name of macro". The name will appear on the newly created button - no further confirmation is necessary.
4. Click on the button "Add examinations" on the bottom right.
5. Select the organ tree for which the superior macro shall be created.
6. Click on the examinations on the left side of the screen to add them to the macro.
7. Further examinations of other body areas can be added by clicking on the organ tree and the desired body area. Then proceed as described in step 6.
8. Confirm the creation of the superior macro by clicking "Finished".

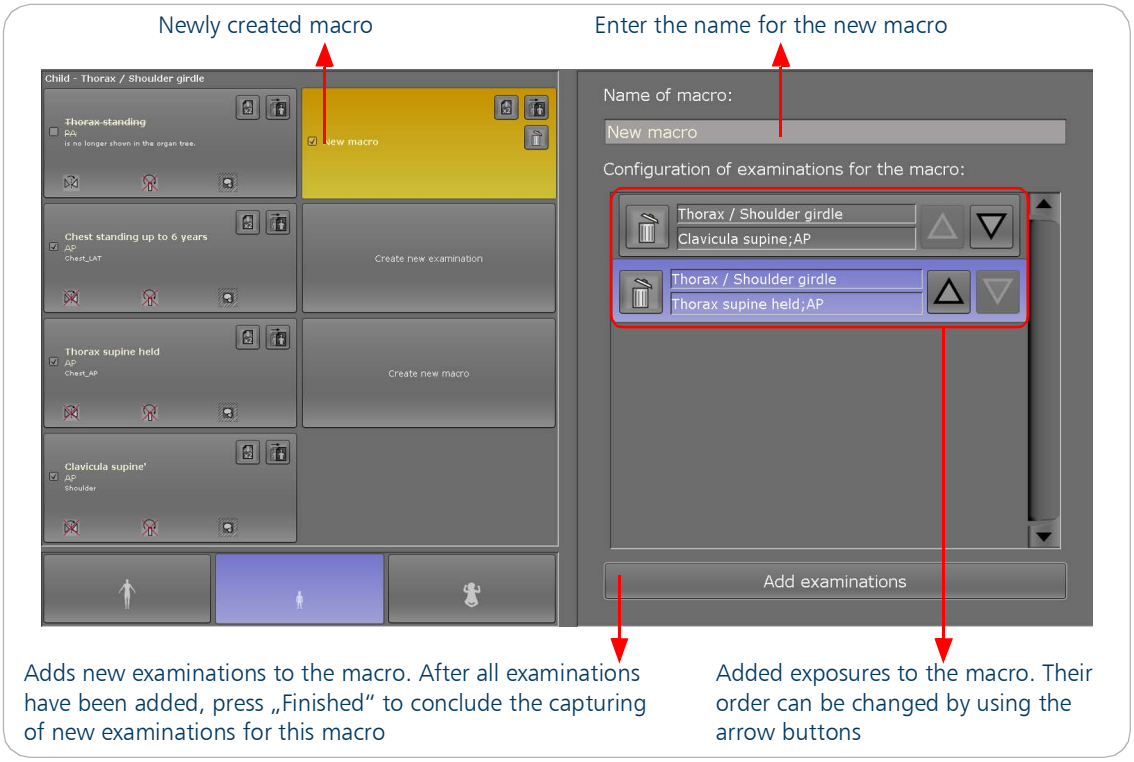


Figure 64. Create a macro

3.5.3 Edit examinations / macros

After calling up an examination/macro, the right side of the screen shows several options to edit the examination / macro.

3.5.3.1 Tab Examination Data

Name of the examination

For the naming of a newly created examination, click in the text field “Name of examination:“ (if needed, first click on the tab “Examination Data“ 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.

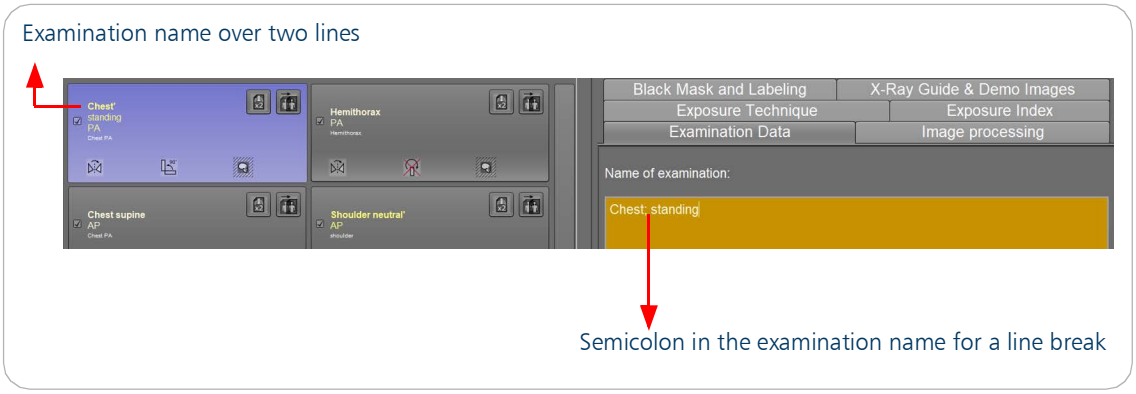


Figure 65. Change the name of an examination

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 to set 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. *dicomPACS®DX-R* offers the possibility to work with those different procedure codes.

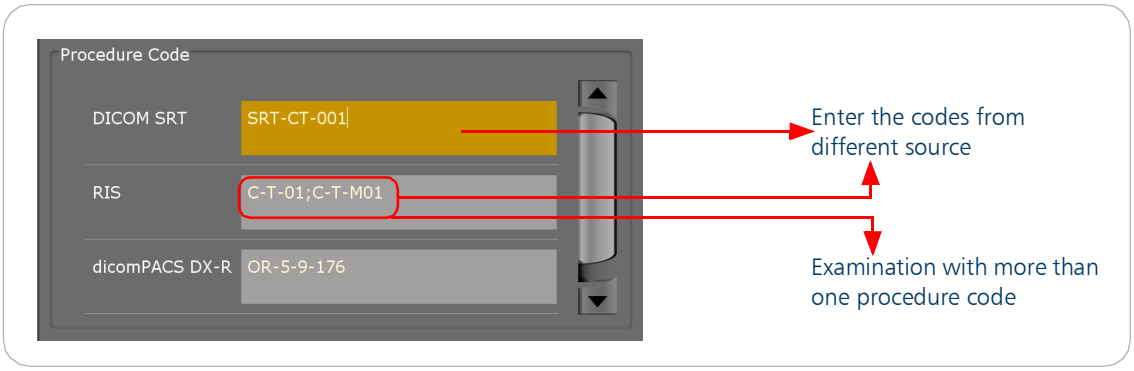


Figure 66. Procedure codes

[The procedure codes of *dicomPACS®DX-R* are a proprietary OR Technology solution.]

If *dicomPACS®DX-R* receives a worklist entry that includes a configured procedure code, the appropriate examination will automatically be planned for the patient.

Also created macros can be assigned to procedure codes, whereby the examinations are planned in the order specified in the macro.

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. But you can only assign one macro to one procedure code, i.e. you cannot define a procedure with several macros.
Once 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.

3.5.3.2 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.

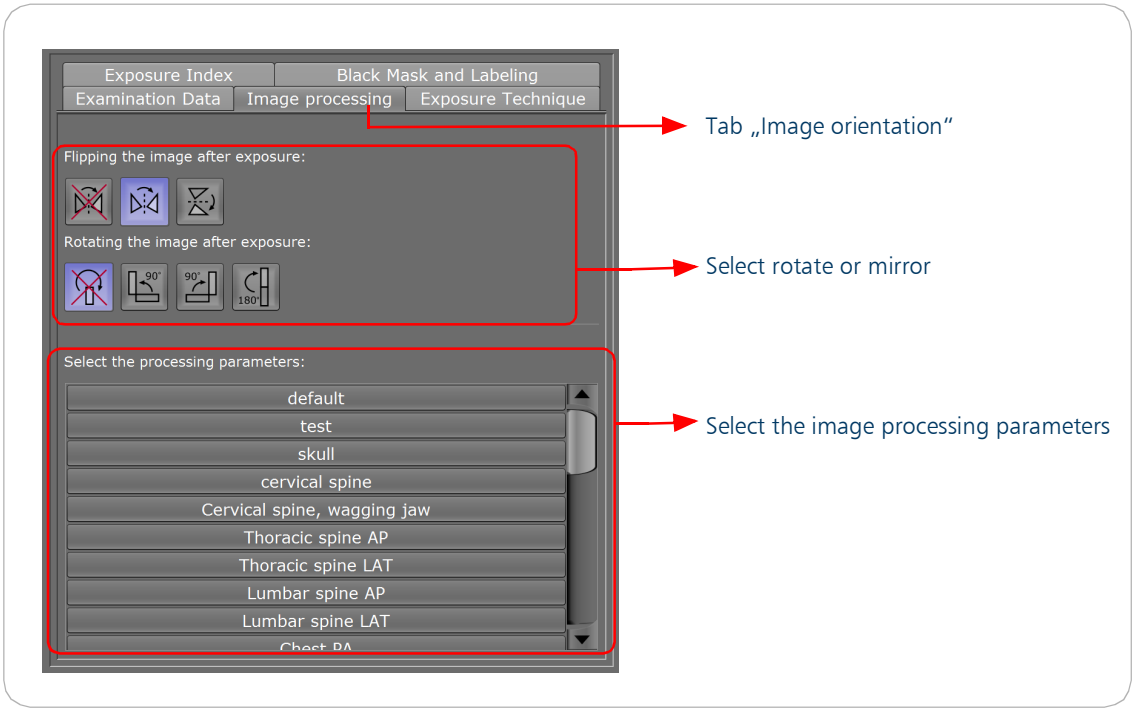


Figure 67. Image orientation

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.

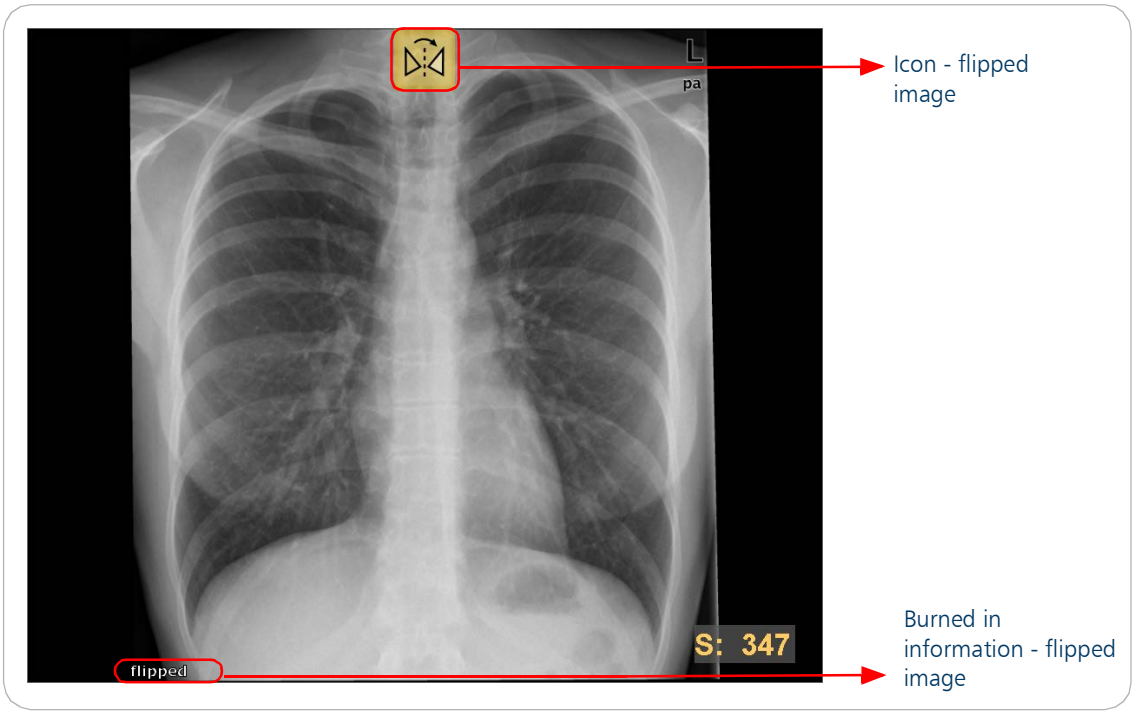


Figure 68. Flipped image with icon and burned in information

3.5.3.3 Tab Black Mask and Labeling

Apart from the image orientation, the user may also configure the black mask and burn in examination data. Position markers can be inserted automatically.

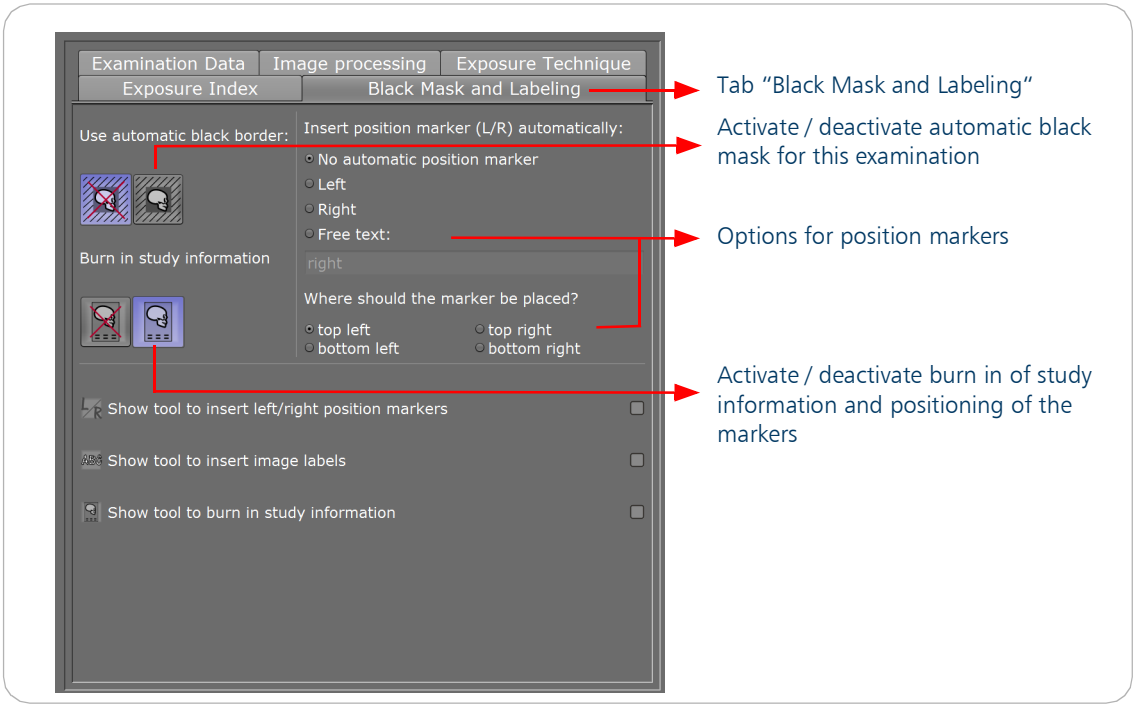


Figure 69. Black mask and burn in of IDs

Position markers can be shown/hidden at a predefined position. It is possible to burn in ID data of

- the physician
- the patient (name, ID, DOB)
- the date and time
- 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 140.

3.5.3.4 Tab Exposure Technique

The tab "Exposure Technique" allows the adjustment of the suggested generator values. The suggested X-ray values of an exposure depend on whether AEC is activated.

When creating a new examination, by default no values for the Exposure Technique are assigned. These values must be stored manually.

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.

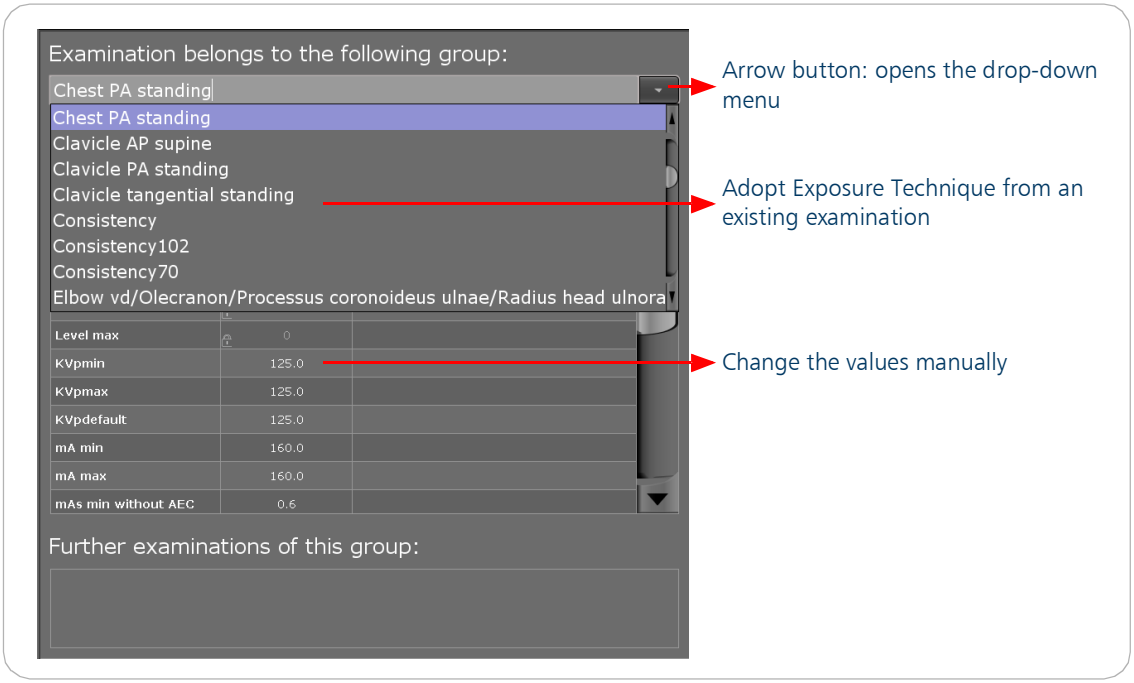


Figure 70. Exposure Technique

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

Note

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 you want to use 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.

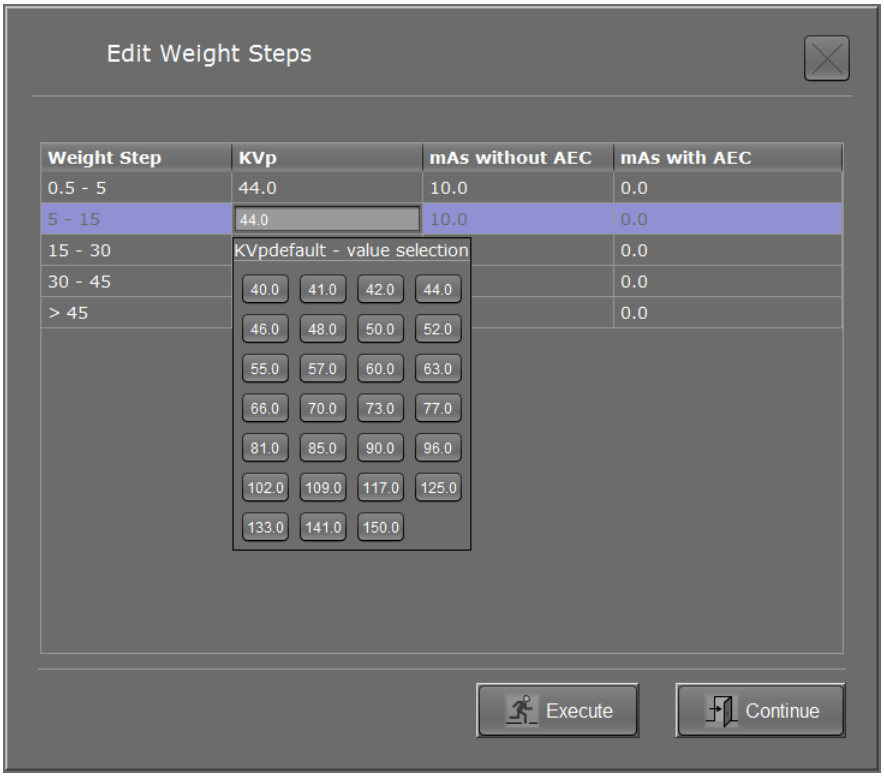


Figure 71. Edit weight steps

3.5.3.5 Tab Exposure Index

For the exposure index according to IEC 62494-1 the user can adjust the settings for each examination. The software also provides a statistical evaluation of the exposure index for each protocol/planning.

Adjusting the target exposure index

To adjust the target exposure values (TEI) for a specific examination, select the required examination. Edit the target exposure index by typing in a new value into the input field "Adjust target exposure index (TEI)".

Exposure index statistic

To access the statistical evaluation for a specific examination, select the required examination. Then you get precise information for this single examination about:

- the number of shots since the exposure index had been activated
- the average exposure index
- the average deviation index

Additionally, you have a quick overview of the exposure level ranges and the number of shots being an optimal exposure, overexposure, underexposure, strong overexposure or strong underexposure.

If you adjust the target exposure index (TEI), the evaluation is updated immediately using the new value for the TEI. The statistics can also be limited to the time frame "last year" and "last 30 days".

Figure 72. Tab "Exposure Index" with statistics

3.5.3.6 Tab X-ray guide & Demo images

Customise videos for the X-ray helper in this section. Choose an examination on the left. Then enter the path of the video and the preview image for this examination.

Furthermore, new images can be stored for the examinations in demo mode. First, select the corresponding examination on the left side. Then a new demo image can be added to the selected examination. Both DICOM and RAW images can be selected. In the support mode an acoustic signal can be activated for demo recordings.

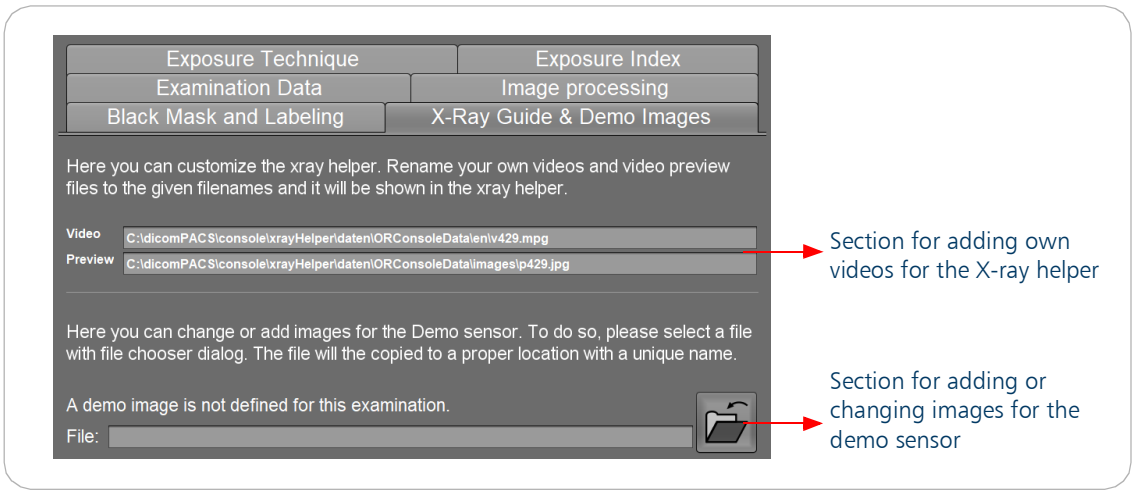


Figure 73. Tab "X-ray Guide & Demo Images"

An acoustic signal can be activated for demo recordings. Settings can be made in the support mode by users with admin rights.

3.5.4 Copy 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 83).

It is possible to make multiple copies.

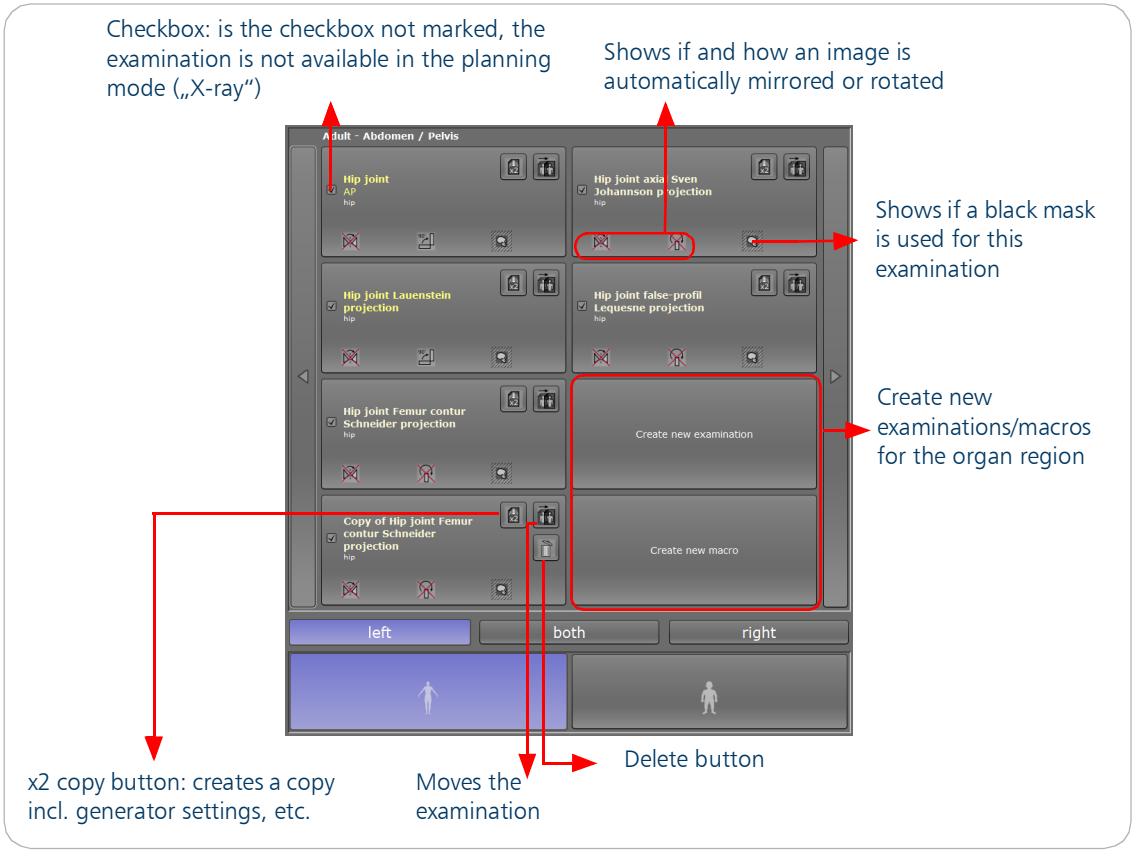


Figure 74. Configuration of macros/examinations

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

3.5.5 Move examinations/macros

Macros and examinations can be changed in their order in the X-ray view.

Just click on the respective button at the top far right (tool tip: "move examination"): the respective examination will now appear green and with a smaller shadow graphic at the cursor - follow the mouse pointer to the desired position and click again on the left mouse button to fix the position.

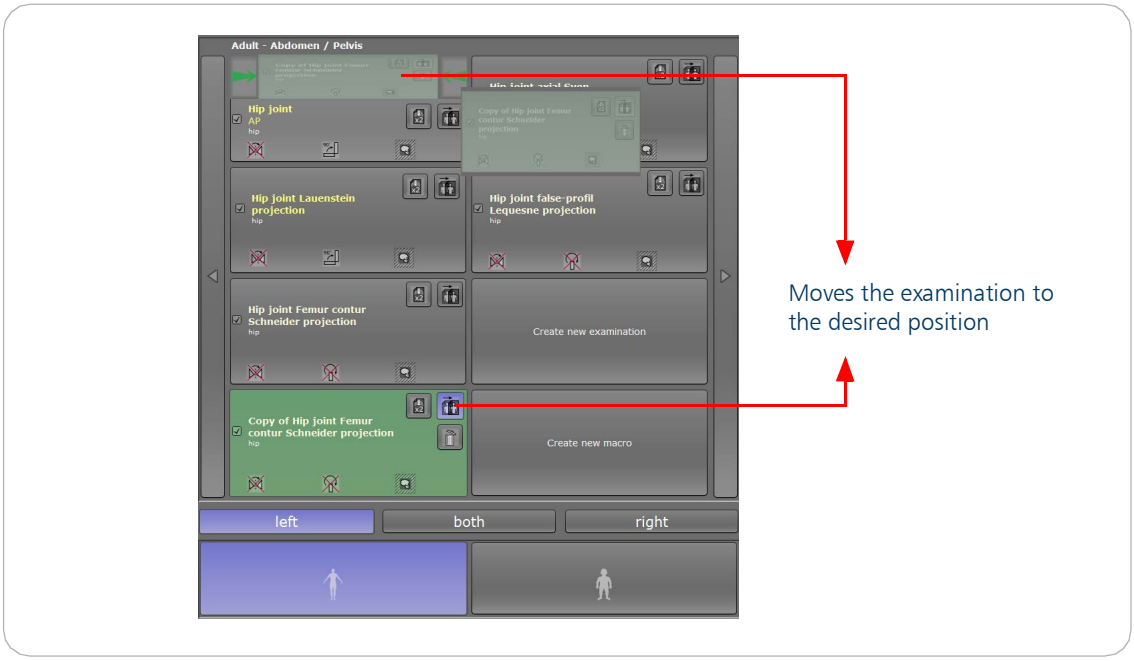


Figure 75. Move a macro

To move an examination outside a displayed area, move the cursor with the attached shadow graphic to the appropriate page selection button by clicking on the arrows (scrolls for-/ and backward) and fix it on the position of your choice.

3.5.6 Delete examinations/macros

You can only delete examinations and macros that you have created or copied.
To do this, click on the delete button with the trash can (tool tip: "delete examination").

Predefined examinations (standard examinations) can only be removed from the organ tree view, so that they are no longer visible when planning examinations (X-ray view) - they are however saved, so that they can be displayed at any time.

The de-/activation takes place in a checkbox of each examination/macro on the left next to the examination name.

A deactivated examination is displayed as crossed out in the configuration mode.

Chapter 4. The *dicomPACS®DX-R* 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.

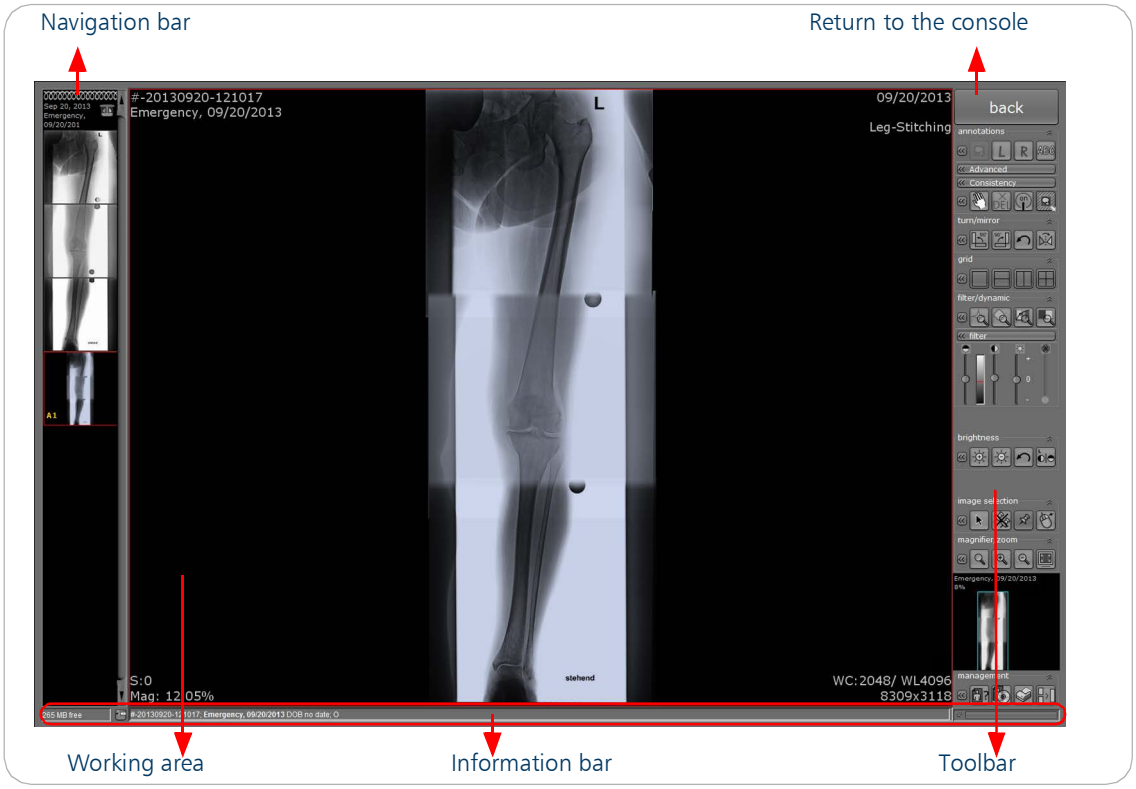


Figure 76. Viewing application

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. It is possible to either automatically load previous images of the patients according to defined rules or display them for selection by clicking on further examinations.

Information bar

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

4.1 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.

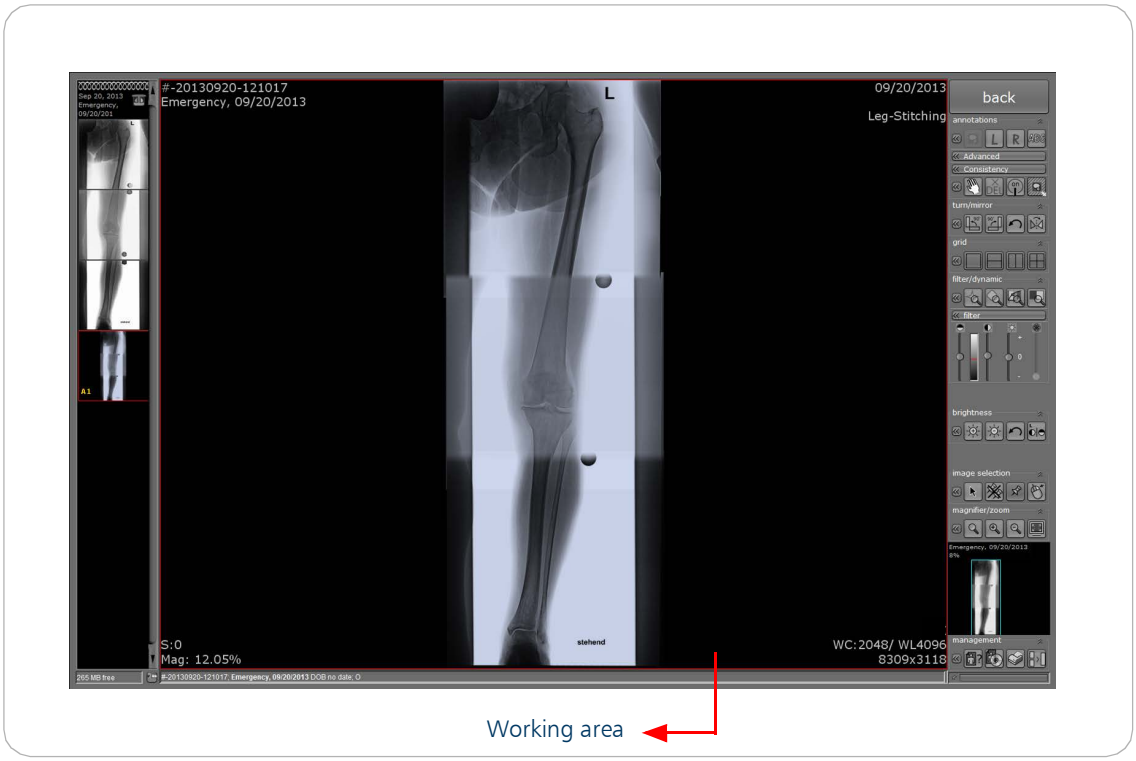


Figure 77. Working area of the viewer

4.1.1 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.

4.1.2 Quick access menu

It is possible to set an individual favourites 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.

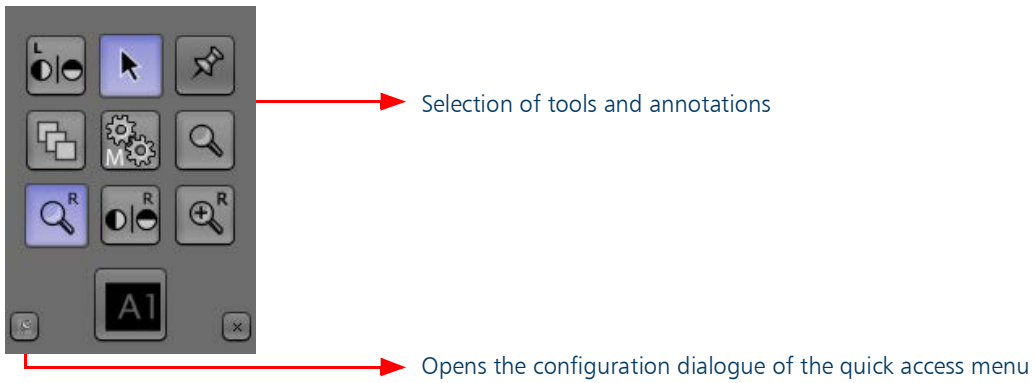


Figure 78. Quick access menu

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 177.

Note

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.

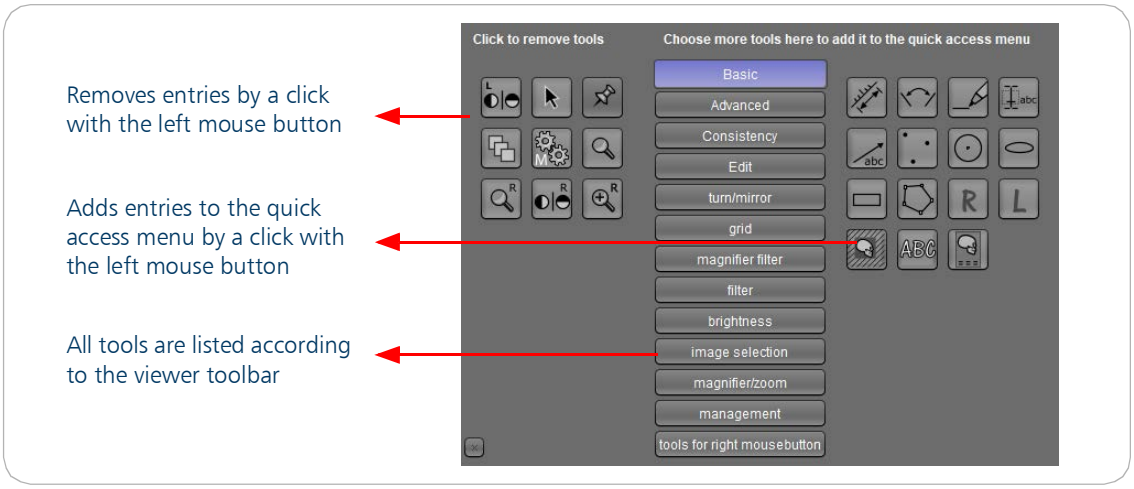


Figure 79. Configuration of the quick access menu

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 177.

4.1.3 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 invisible. 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 99.

Figure 80. Full screen mode

4.2 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.

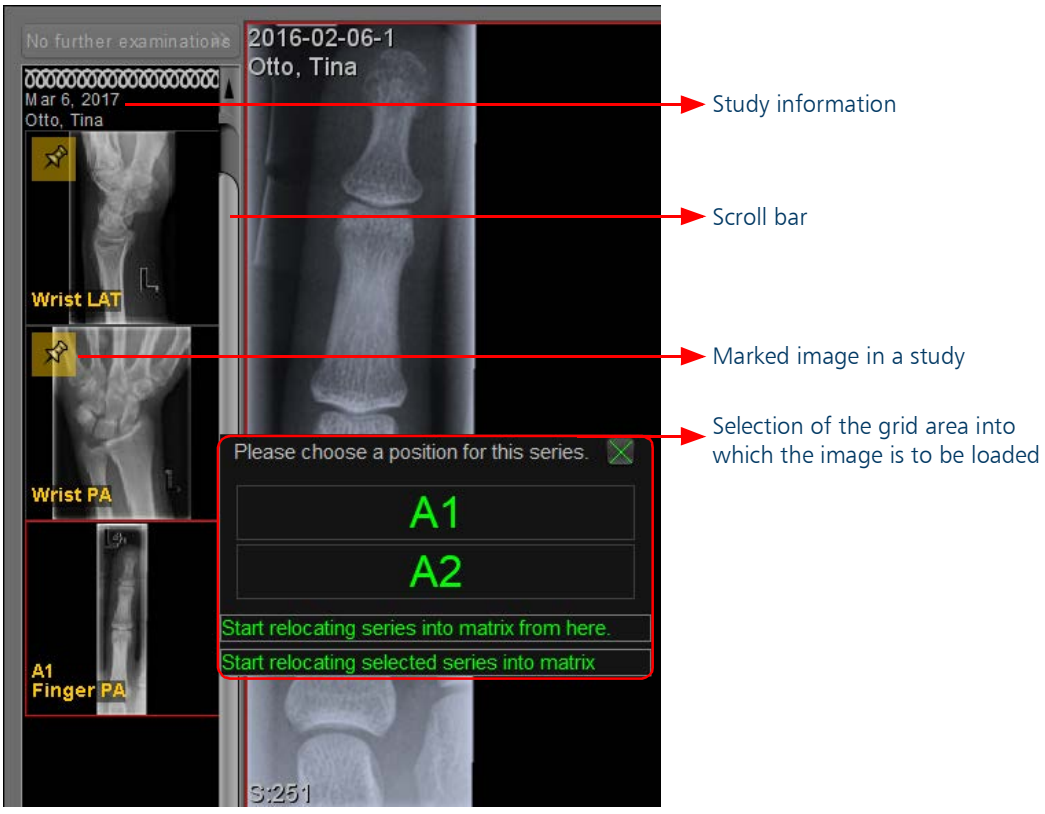


Figure 81. Navigation bar

4.3 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.

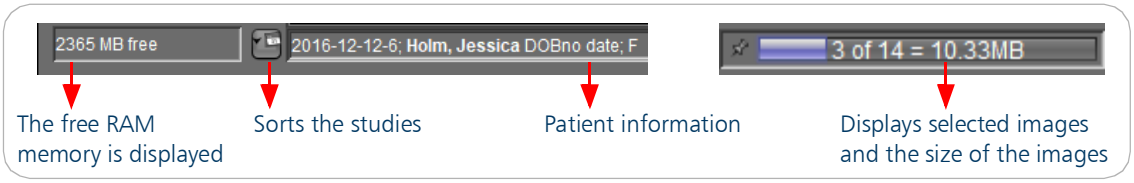


Figure 82. Information bar

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 study according to their time of exposure.

4.4 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.

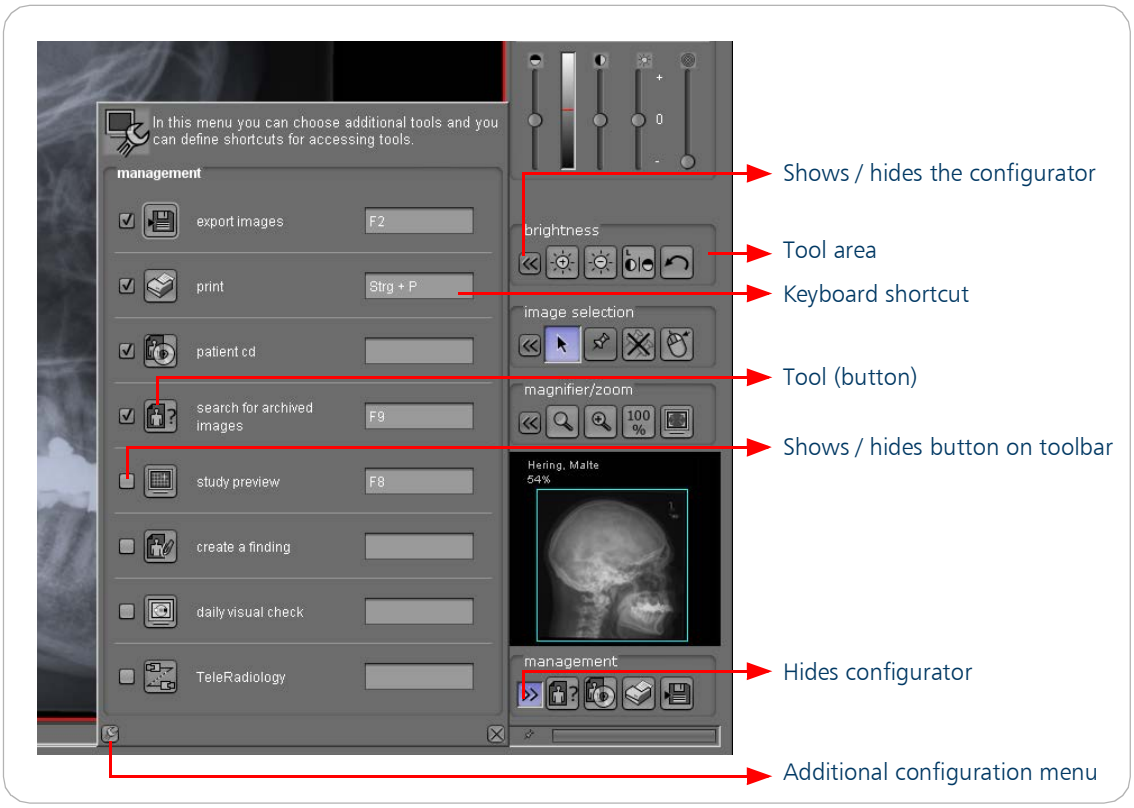


Figure 83. Configurator

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.

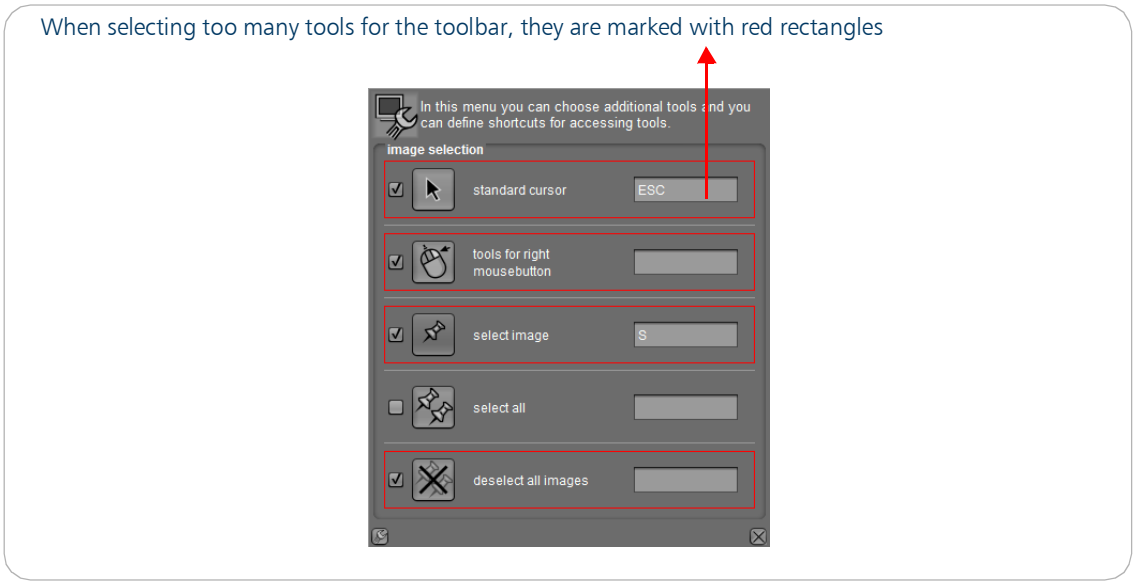


Figure 84. Customizing toolbar - too many selected tools

A further important element of the toolbar is the overview area. It displays the selected 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:

- with the left mouse button held down in the working area
- 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.

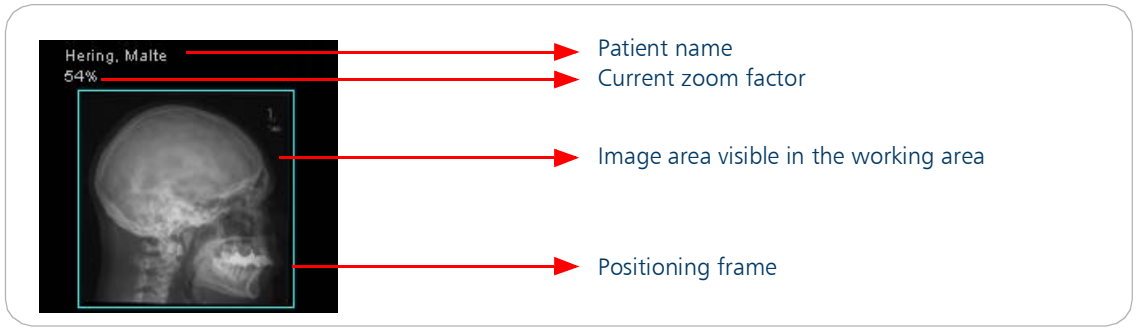


Figure 85. Overview of the current image

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.

4.4.1 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.

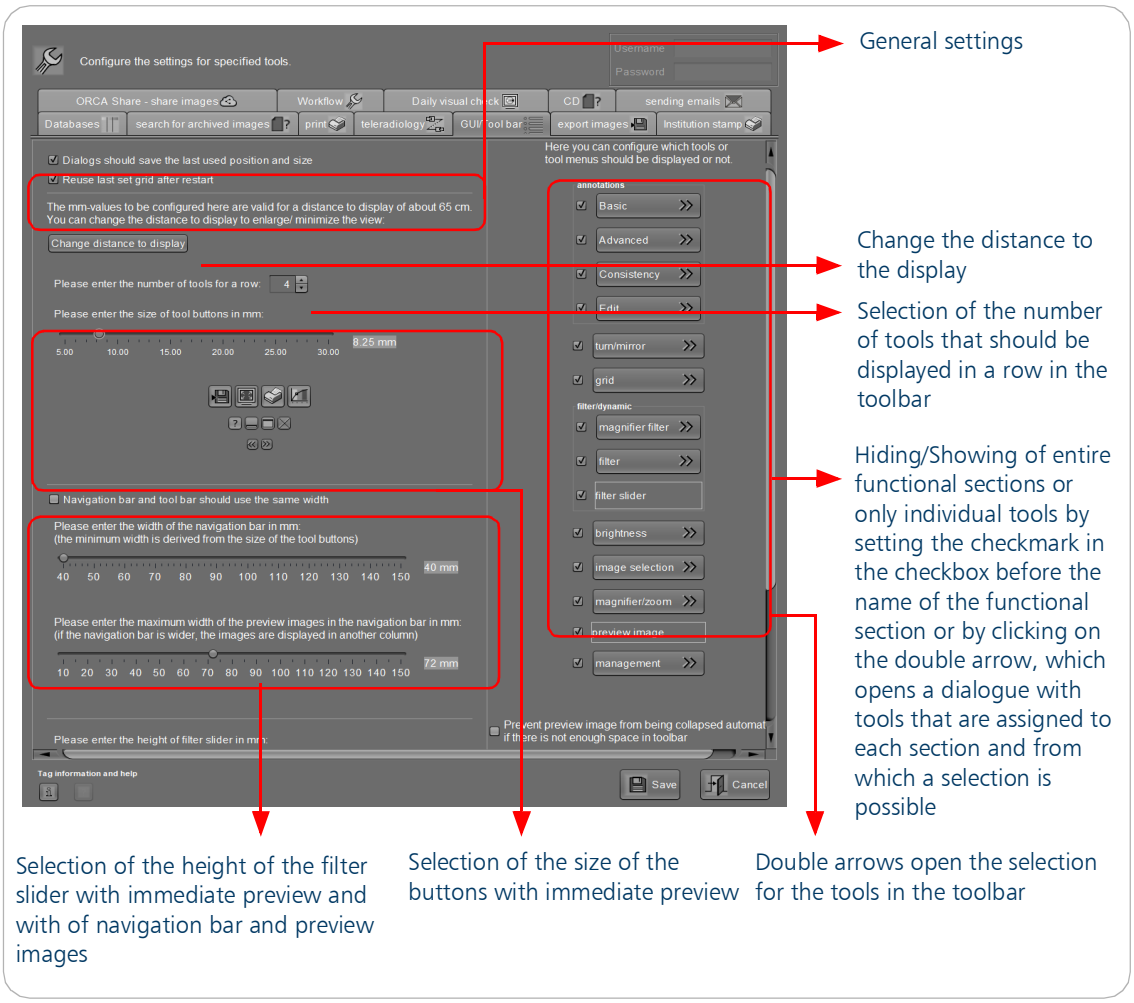


Figure 86. Configuration dialogue tab „GUI/Toolbar“

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 dialogue to determine the layout for your toolbar.

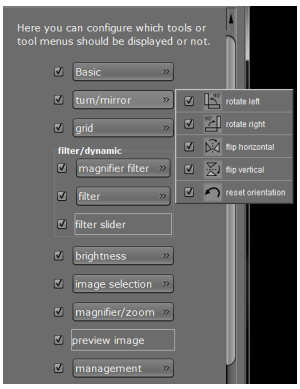


Figure 87. Selection of tools for the toolbar

4.4.2 Dynamic of the toolbar

dicomPACS®DX-R internal viewer 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.

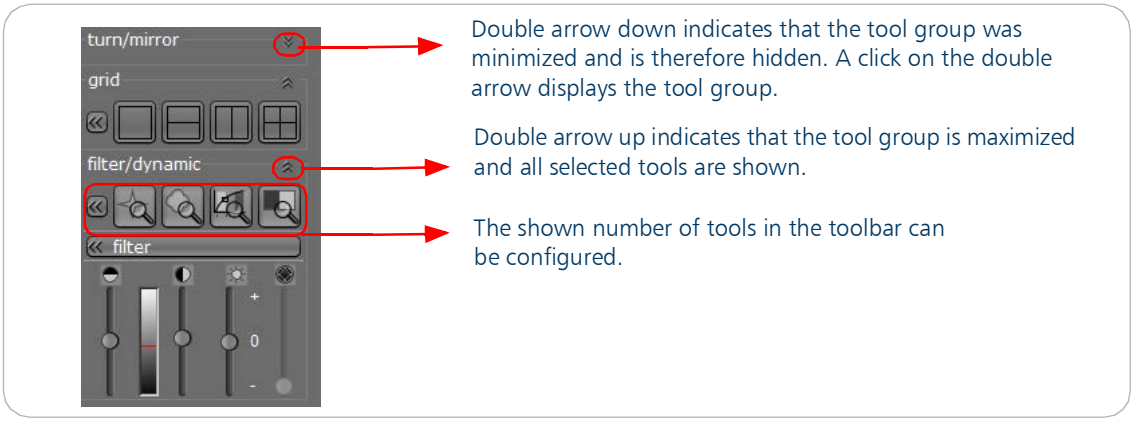


Figure 88. Minimizing and maximizing of tool groups by clicking on the double arrows

The shown number and size of the tool buttons can be configured in the configuration dialogue "GUI/Toolbar". This is advantageous for monitors with lower resolution.

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

4.5 General notes on the use of annotations

4.5.1 Shortcuts

For easier editing of annotations shortcuts have been introduced making 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 dialogue in the tab "Annotation Common Options".

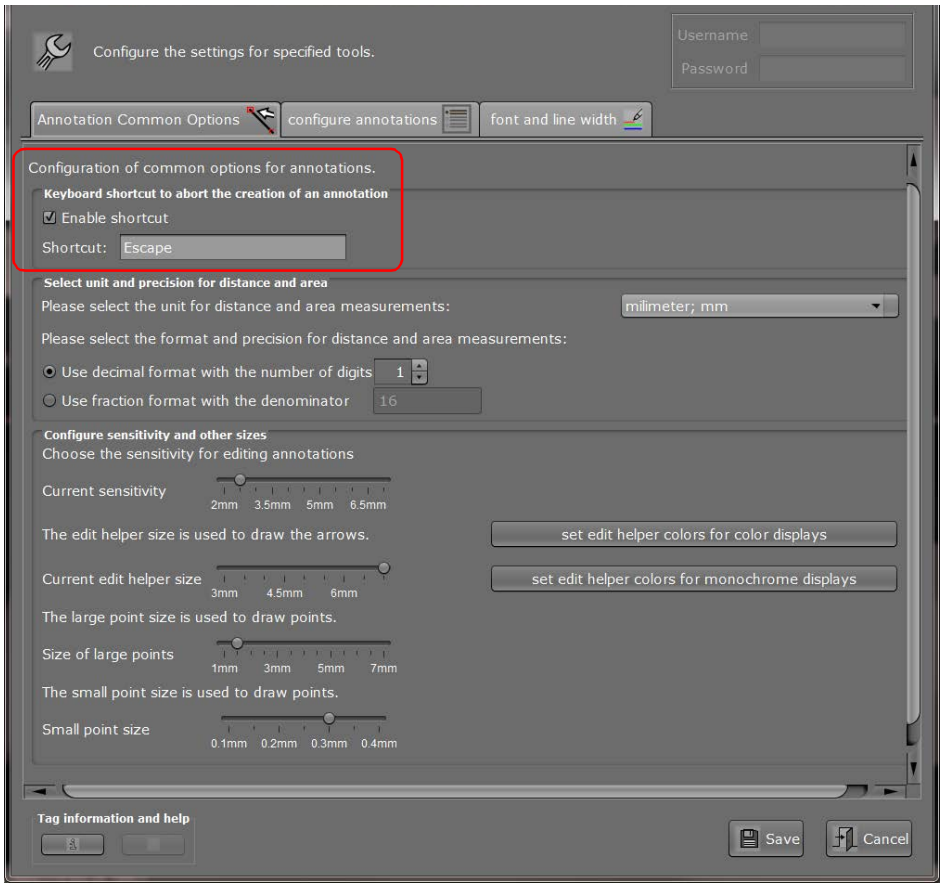


Figure 89. Configuration dialogue "Annotation Common Options"

- "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 dialogue of the tool "edit annotations" (see section "Annotation hints") when in the edit mode.

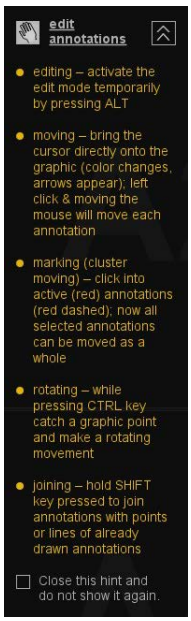


Figure 90. "Annotation hints"

4.5.2 Edit helper for annotations

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

The colour of the edit helper can be defined while the configuration dialogue 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, which are always drawn; points are only drawn if they are active, otherwise they are hidden
  - geometric objects.
- There is a black/white scheme for auxiliary arrows, which is advantageous for black/white monitors, and a colour scheme for colour monitors. The colour scheme for auxiliary arrows is enabled by default. The colours 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.

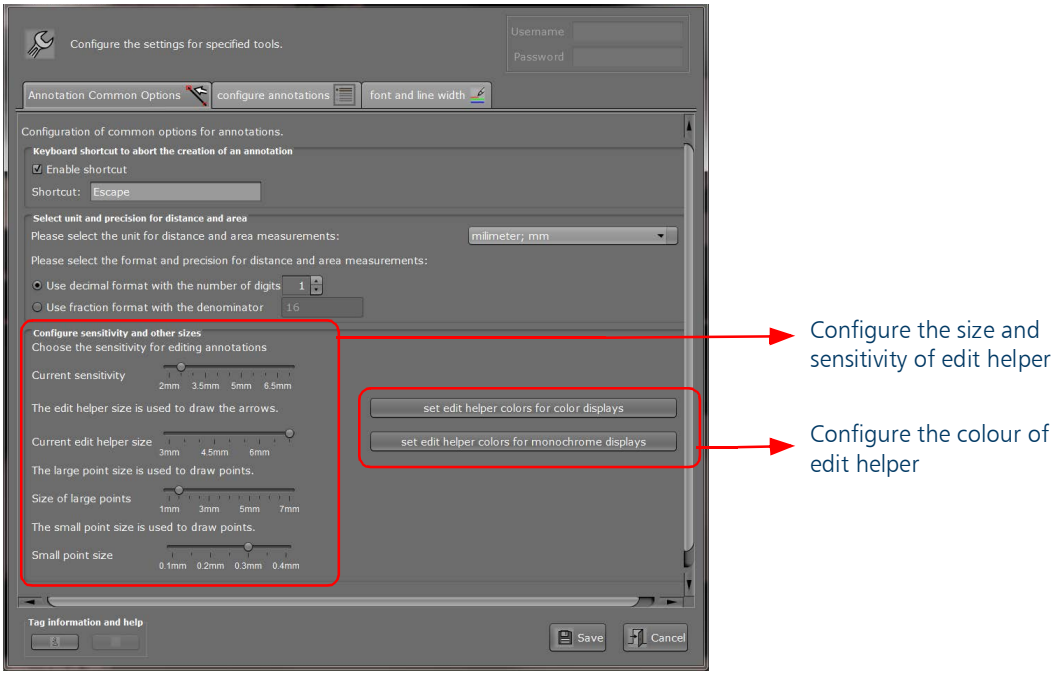


Figure 91. Configuration dialogue for common options

4.5.3 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 92. 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 activating the checkbox 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 side 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 the field with the double arrows and on the help text. If you hold the moue button down, you can 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 dialogue "Annotation hints" can be selected which hints should be shown during the creation of annotations.

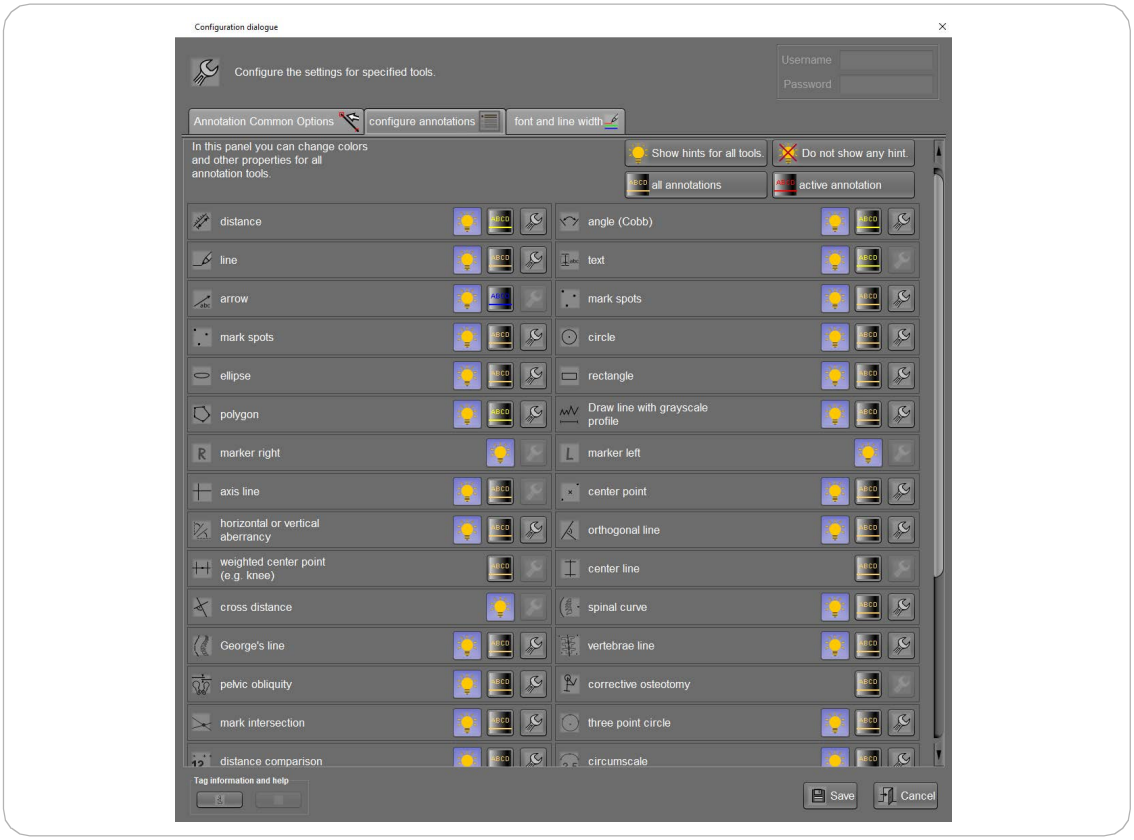


Figure 93. Configuration dialogue "Annotation hints"

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.

4.5.4 Drawing annotations

Annotations can be drawn in two different ways:

- by clicking and selecting (Click-Move-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)

4.5.5 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 turns in red colour and by holding the left mouse button down, it can be moved to the desired position.

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

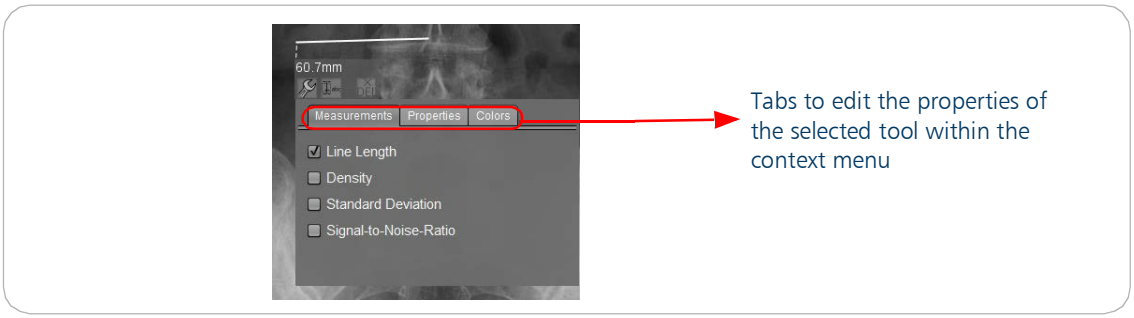


Figure 94. Context menu for editing the properties of annotations

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").

4.5.5.1 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.

4.5.6 Annotation colours

Colours can be specified for every annotation. To choose a colour, you have to click on the screw wrench button of the tool in the edit mode  . You can not only change the colour of one annotation, you can also change the colour 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 95. Adjust colours

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

4.5.7 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 grey 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 96. Add text to annotations

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

4.5.8 Deleting annotations

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

4.6 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 such as left and right marker, burn in study information etc.
- consistency - special tools for consistency checks are located here
- edit - tools to edit annotations are located here

4.7 Annotations - basic

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

4.7.1 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.

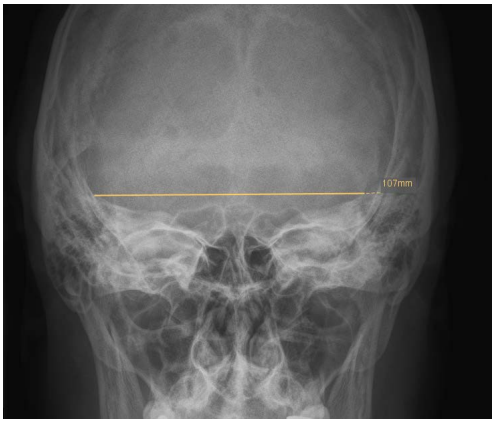


Figure 97. Measure a distance

CAUTION/ATTENTION!

EN: 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.

FR: Pendant le processus, la distance actuelle est affichée en millimètres (mm). Si aucune échelle de référence n'a été enregistrée dans l'image (dans l'en-tête DICOM), la longueur ne sera pas spécifiée et est affichée sous forme de pixel. Seule la ligne de mesure sera tracée. Un nombre illimité de mesures peut être pris avant qu'un outil différent soit sélectionné.

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 98. Edit mode of the distance in the tab "Measurements"

In the tab "Properties" it is possible to extend the line to the image borders.

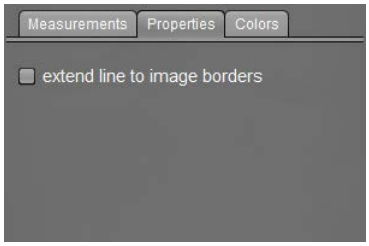


Figure 99. Edit mode of the distance in the tab "Properties"

4.7.2 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.

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

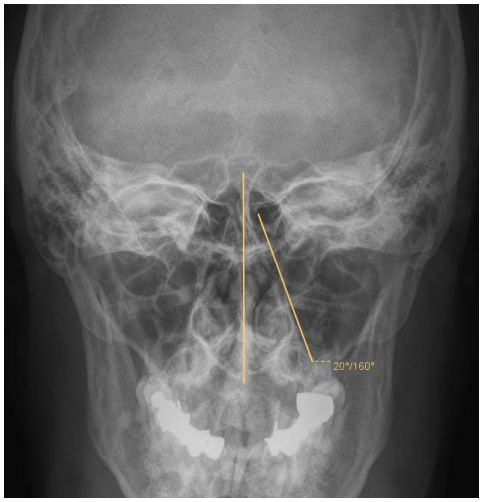


Figure 100. Measure an angle

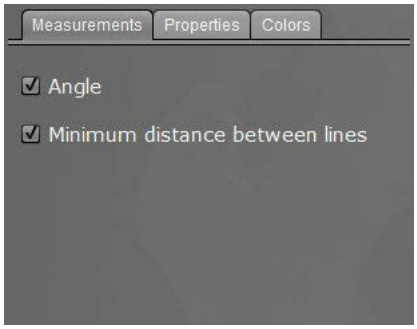


Figure 101. Configuration options in the tab "Measurements" in the context menu of the angle annotation

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

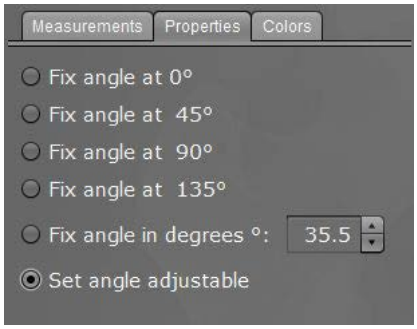


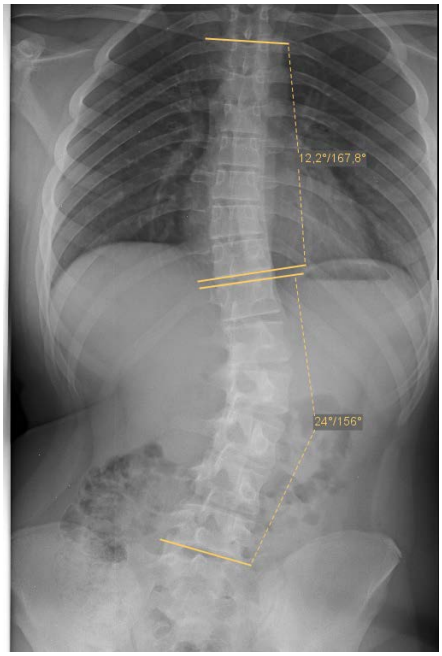
Figure 102. Configuration options in the tab "Properties" in the context menu of the angle annotation

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

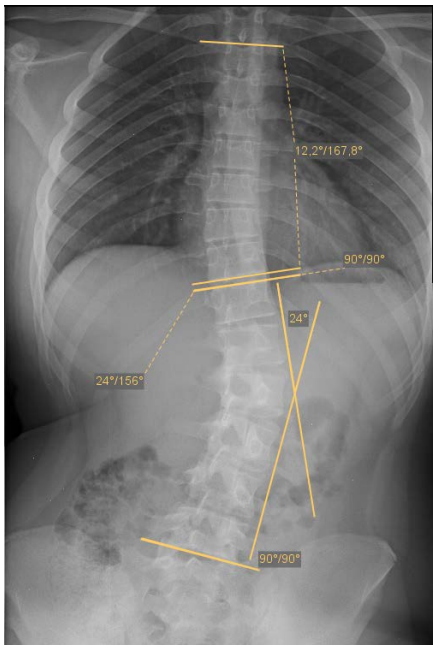
1. Draw two freely chosen lines. Two angles are displayed, because the intersection is outside of the image.
2. Draw the first line and connect, through holding down the Shift key, the second line with the first. Only one angle is displayed, because the intersection is within the image.

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 internal viewer



Cobb angle with conventional method

Figure 103. Measurement of the Cobb angle

4.7.2.1 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

It is also possible to add existing lines to a distance measurement in the same way.

Note

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

4.7.3 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 104. 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.

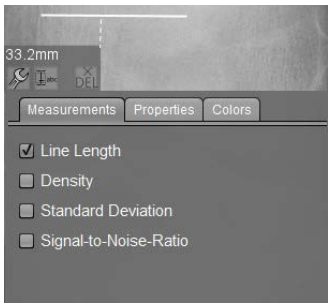


Figure 105. Edit mode of the line in the tab "Measurements"

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

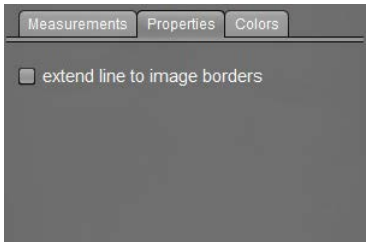


Figure 106. Edit mode of the line in the tab "Properties"

4.7.4 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 *dicomPACS®DX-R*.

Figure 107. Enter a text

4.7.5 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.

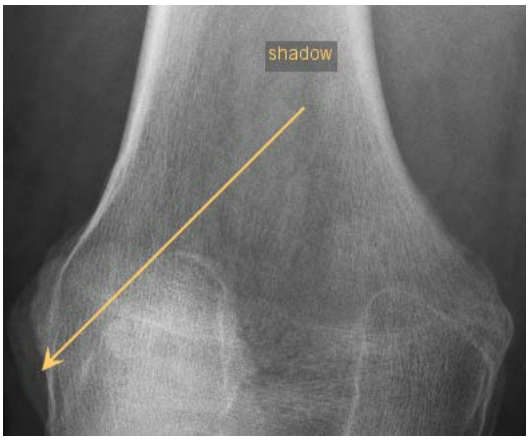


Figure 108. Draw an arrow to give a hint

4.7.6 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.

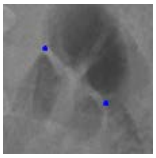


Figure 109. Mark spots

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".

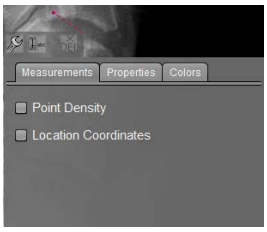


Figure 110. Edit mode tab "Measurements"

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

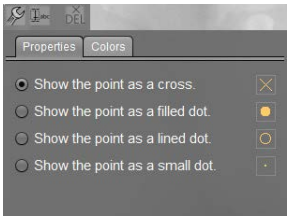


Figure 111. Selection of the graphical display of the marking

4.7.7 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.

In the tab "Measurements" it's possible to enable the display of the length in the image.

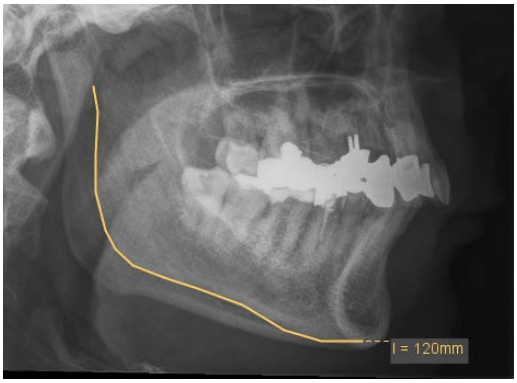


Figure 112. An open shape

Figure 113. 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.

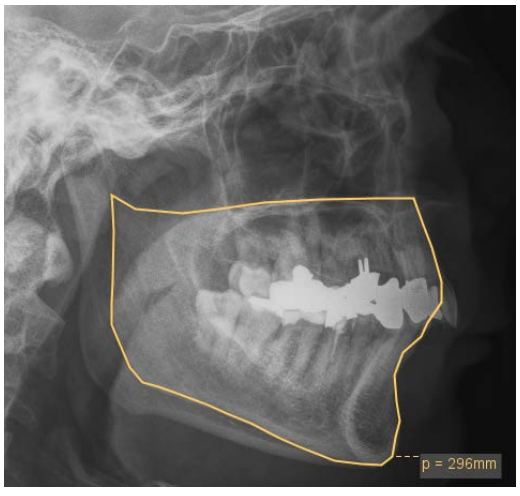


Figure 114. A closed shape

In the edit mode it is possible to de-/activate the following values in the tab “Measurements“:

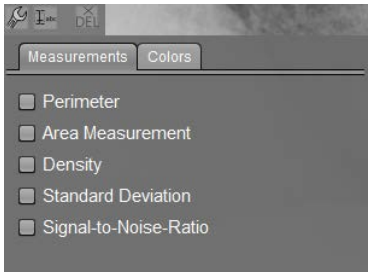


Figure 115. Tab “Measurements“ of a closed polygon

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.

4.7.8 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), the text is shown semi-transparent. For an ellipse without text, press the input key without entering text.

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

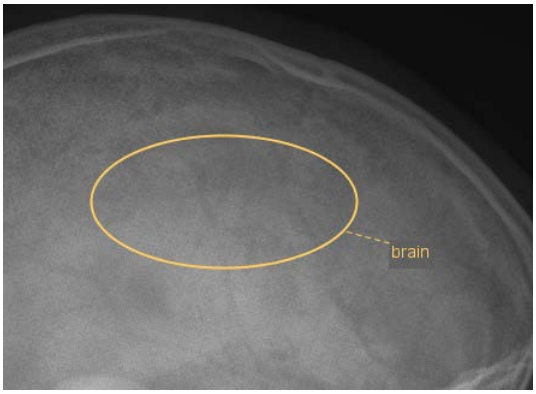


Figure 116. Draw an ellipse to mark a region

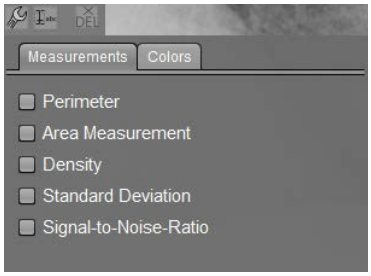


Figure 117. Tab “Measurements“ of ellipse

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.

4.7.9 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.

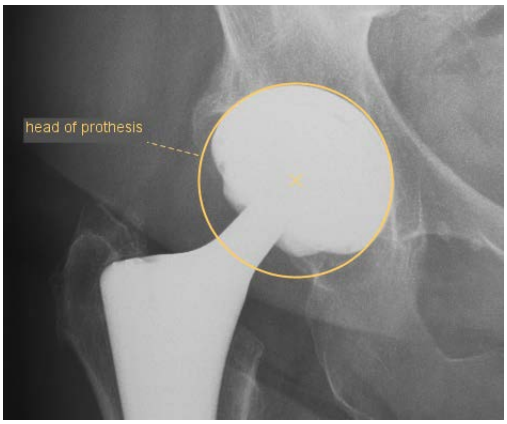


Figure 118. Draw a centercircle

To move a circle, position the mouse pointer in its middle. Once it is displayed in the "active" colour 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 dialogue box, where changes to the settings of this annotation can be done.

The tab "Measurements" offers various measurement options.

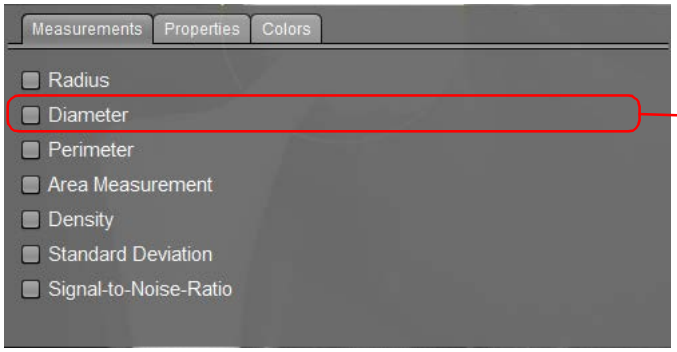


Figure 119. Properties of the circle

The tab "Properties" determines the display of the center point.

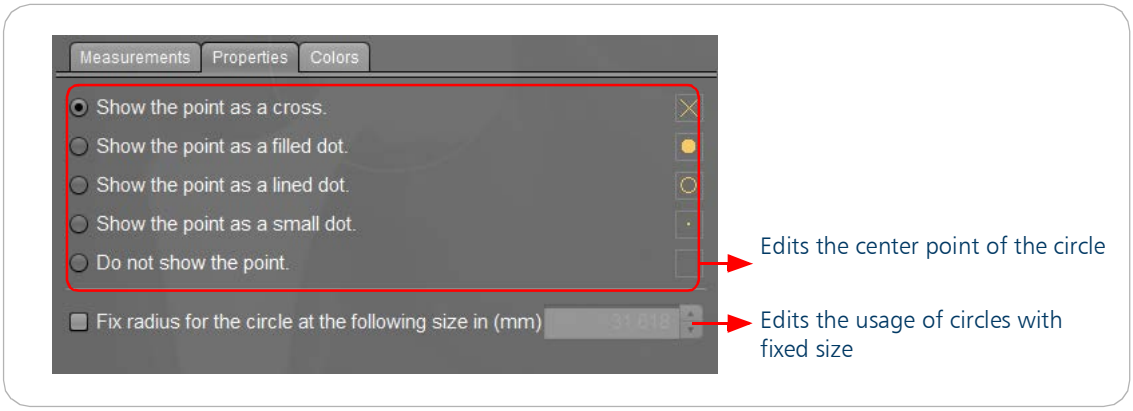


Figure 120. Settings of the circle

4.7.10 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 finishes the drawing of the annotation.

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":

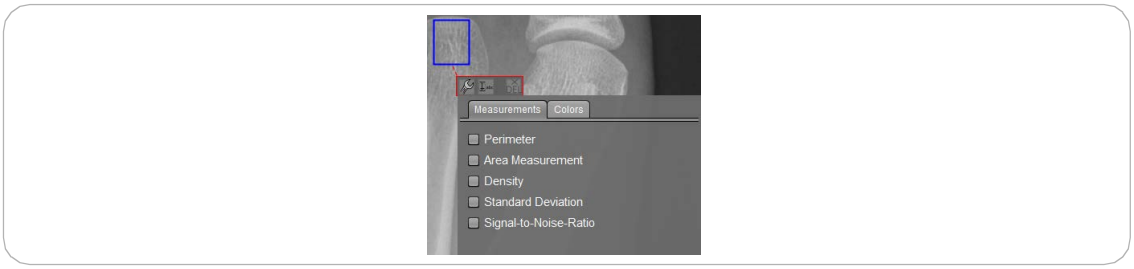


Figure 121. Edit mode tab "Measurements"

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.

4.7.11 Add image label

CAUTION/ATTENTION!

EN: The user is responsible for the correct application of the image labels.

FR: L'utilisateur est responsable de l'application correcte des repères image.

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.

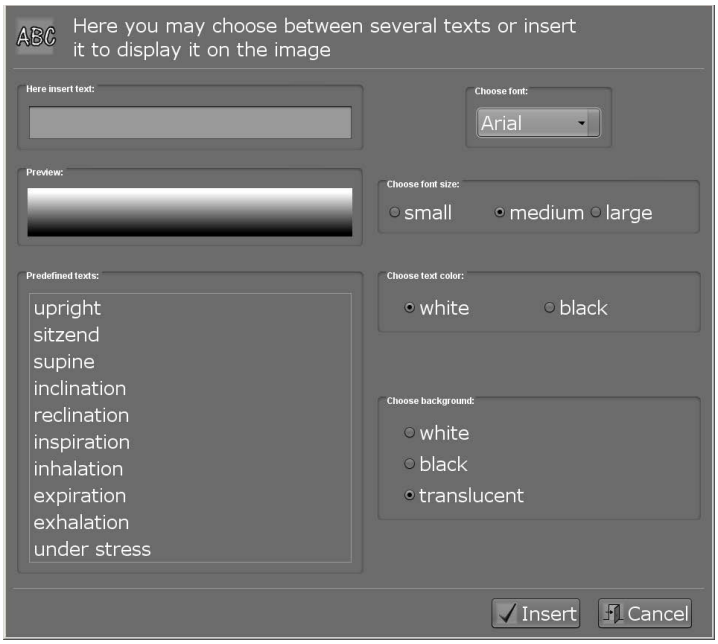


Figure 122. Add image label

4.7.12 Position marker - insert left / right position marker

CAUTION/ATTENTION!

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

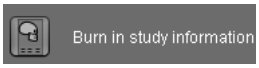
FR: L'utilisateur est responsable de l'application correcte des repères gauche et droit.

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.

4.7.13 Black mask on / off - de- /activate black mask

The digital X-ray process usually creates troublesome white borders around an image. By clicking on the black mask on/off button, a black mask frame can be activated and deactivated. If the black mask is activated, the white borders around the image are coloured black. When the black mask is deactivated, the white borders around the image will be displayed again. This tool only displays the black mask. For the definition of the black mask view 4.10.1 "Draw black mask" page 152.

4.7.14 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 into 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 "Black mask & Labeling" when configuring examinations, see Tab Black Mask and Labeling on page 89.

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

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.

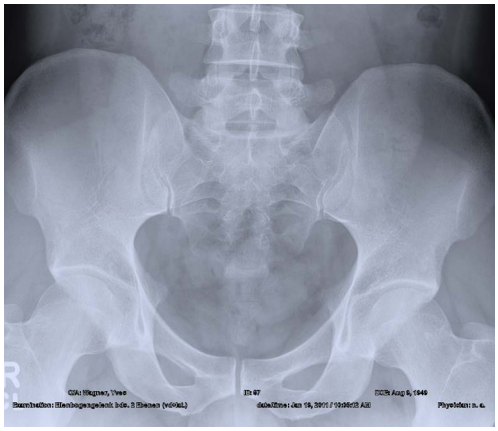


Figure 123. Burn in study information

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).

4.8 Annotations - advanced

4.8.1 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 dialogue for inserting prosthesis templates can be called up by clicking on this icon.

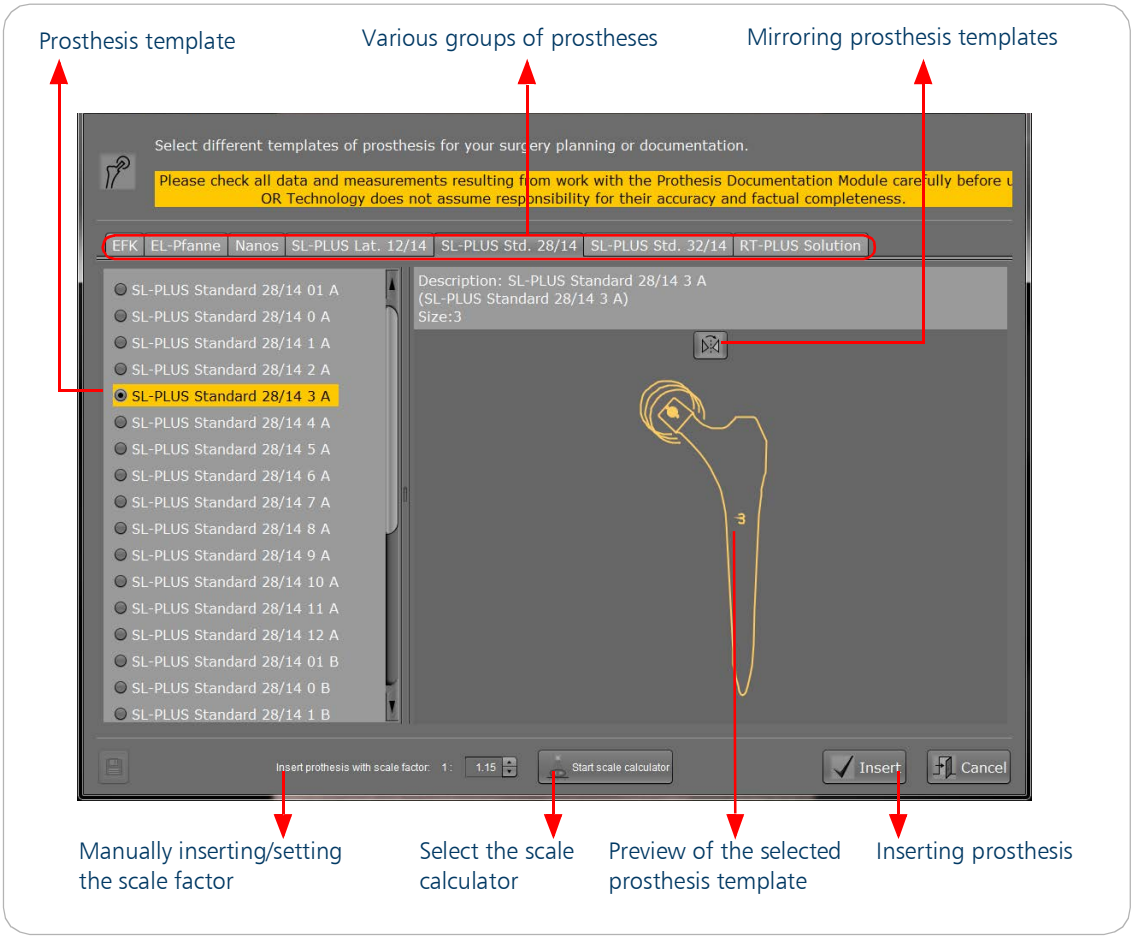


Figure 124. Select a prosthesis template

Various groups of prostheses

Here 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 with 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.

Preview of 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.
When you click on the „Start scale calculator“ button, a dialogue 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.

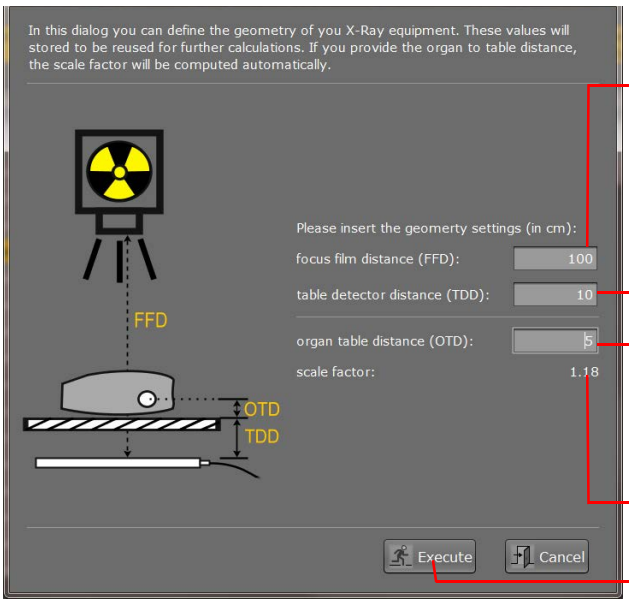


Figure 125. Scale calculator

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.

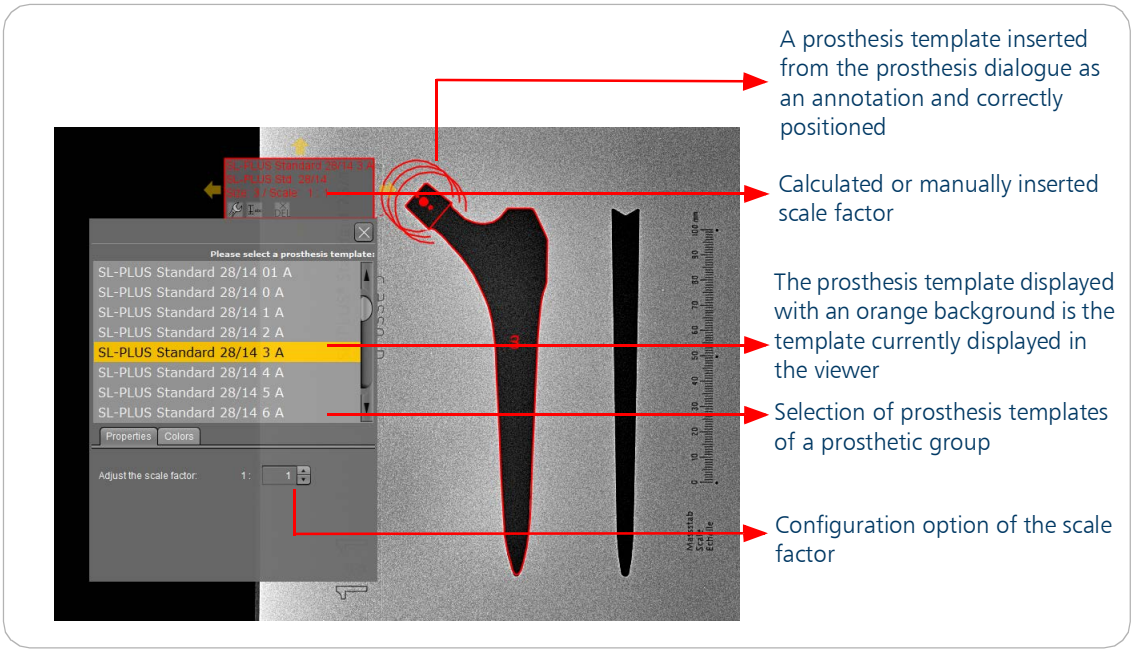


Figure 126. An inserted prosthesis image from the prosthesis dialogue

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 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 157.

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

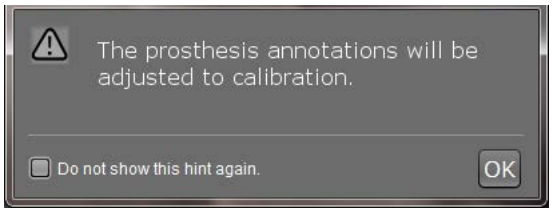


Figure 127. Dialogue to adapt the prosthesis template to the newly selected resolution

4.8.2 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.

Figure 128. Draw a center line

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.

4.8.3 Cross distance

By activating this tool it is possible to draw two lines orthogonal 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.

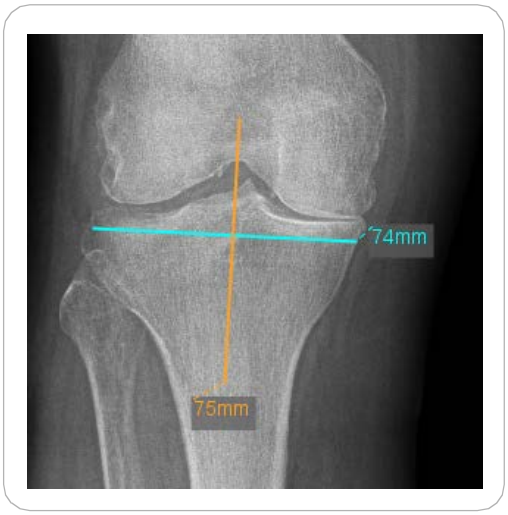


Figure 129. Measure to crossing distances

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.

4.8.4 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.

Figure 130. Determine a center point

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.

4.8.5 Corrective osteotomy

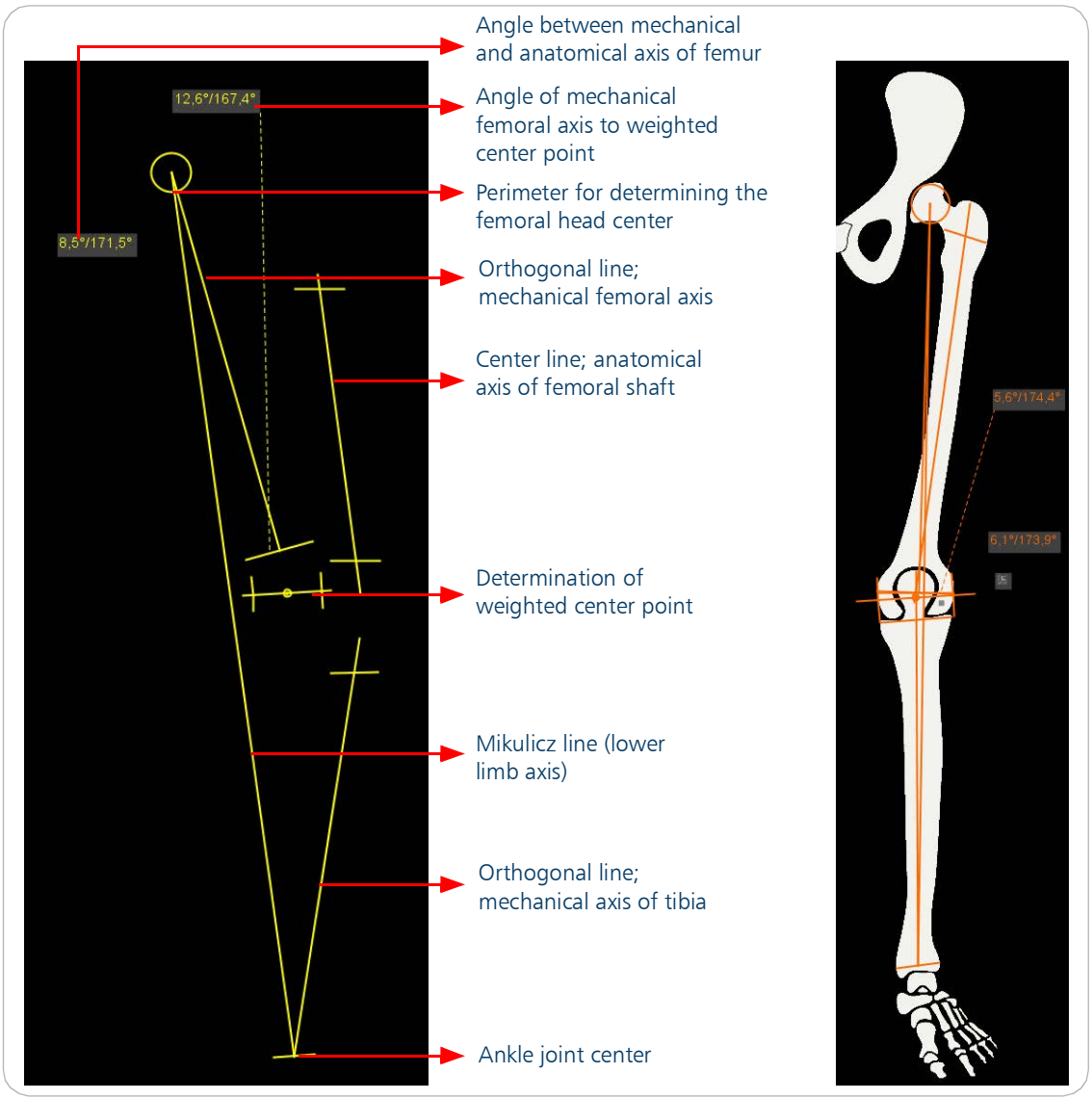


Figure 131. Corrective osteotomy

By clicking on this button  a complex annotation appears to determine the hip-leg statics.

It consists of a perimeter, four positionable lines and a determination of the weighted center point.

At first, the Mikulicz line is drawn. To do this, position the perimeter in the center of the femoral head and the lower line to the ankle joint centre.

The upper orthogonal line defines the mechanical femoral axis. The center line is aligned with the anatomical axis of the femoral shaft.

This annotation measures two angles: the angle between the mechanical and anatomical femoral axis and the angle of the mechanical femoral axis to the weighted center point.

4.8.6 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.

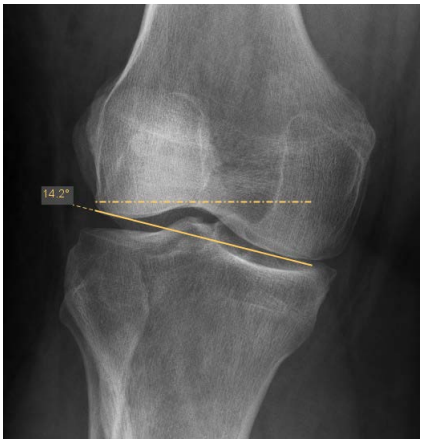


Figure 132. Measure the aberrancy

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".

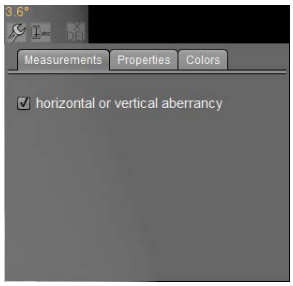


Figure 133. Edit mode "horizontal or vertical aberrancy"

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

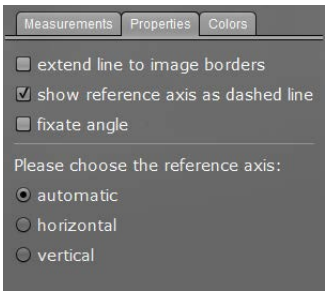


Figure 134. Properties of "horizontal or vertical aberrancy"

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/ATTENTION!

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

FR: La direction horizontale et verticale fait toujours référence au support de l'écran, indépendamment de la manière dont l'image a été pivotée.

4.8.7 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 takes on a red editing colour and you can move the axis either horizontally or vertically to the desired position.

Figure 135. Horizontal and vertical line

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

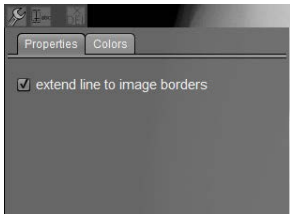


Figure 136. Properties of "Axis line"

If the checkmark in front of "extend line to image border" is not set, the length of the axis is shortened. It 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 137. 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.

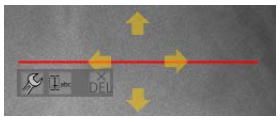


Figure 138. Moving an axis

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

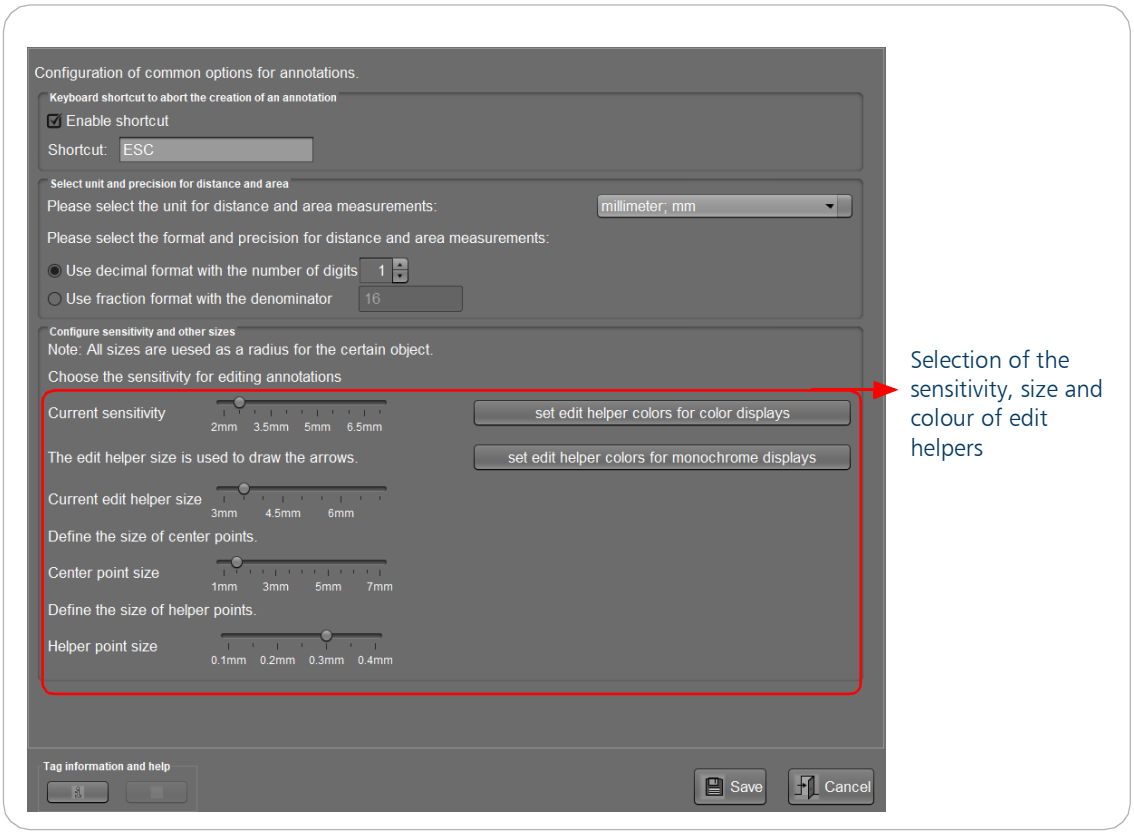


Figure 139. Configuration dialogue "Annotation Common Options"

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 colour, which can be moved to the desired position.

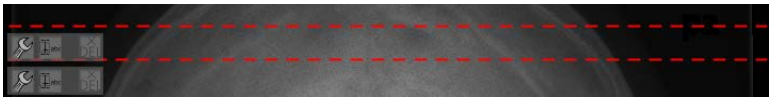


Figure 140. Moving several axes

4.8.8 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.

Figure 141. Center point

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.

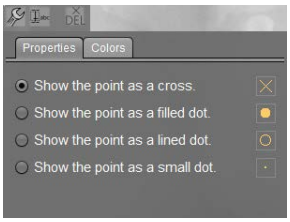


Figure 142. Selection of how the center point should be displayed

4.8.9 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 can 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.

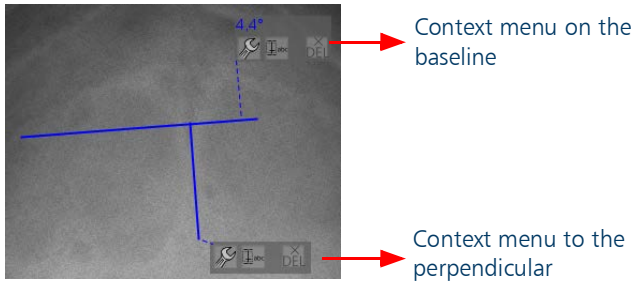


Figure 143. Edit mode for "orthogonal line"

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

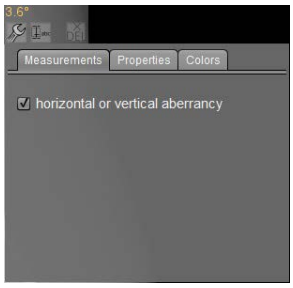


Figure 144. Edit mode "orthogonal line" on the baseline

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 "Colour" of the baseline.

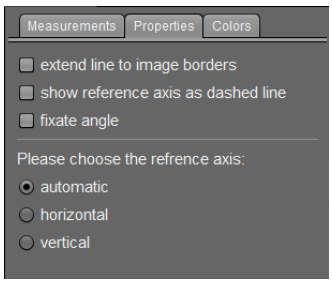


Figure 145. Properties of "orthogonal line" on the baseline

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".

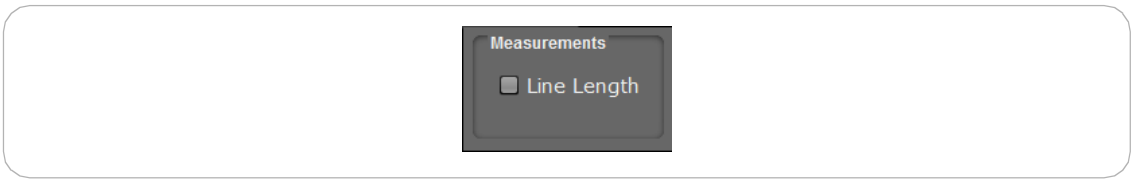


Figure 146. Measurements of "orthogonal line" at the perpendicular

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

4.8.10 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.

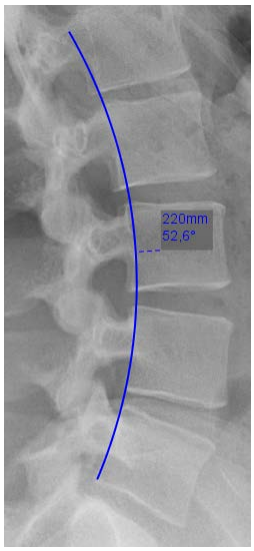


Figure 147. Spinal curve

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.

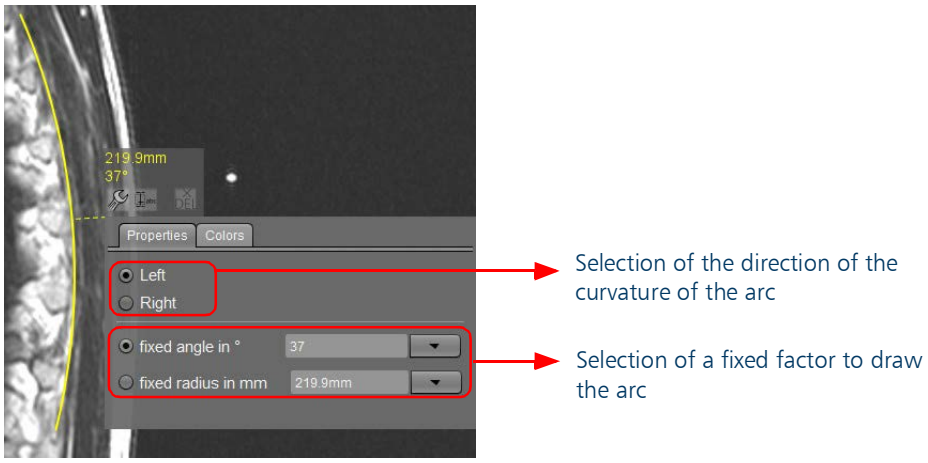


Figure 148. Edit mode of "Spinal curve"

4.8.11 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 dialogue (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.

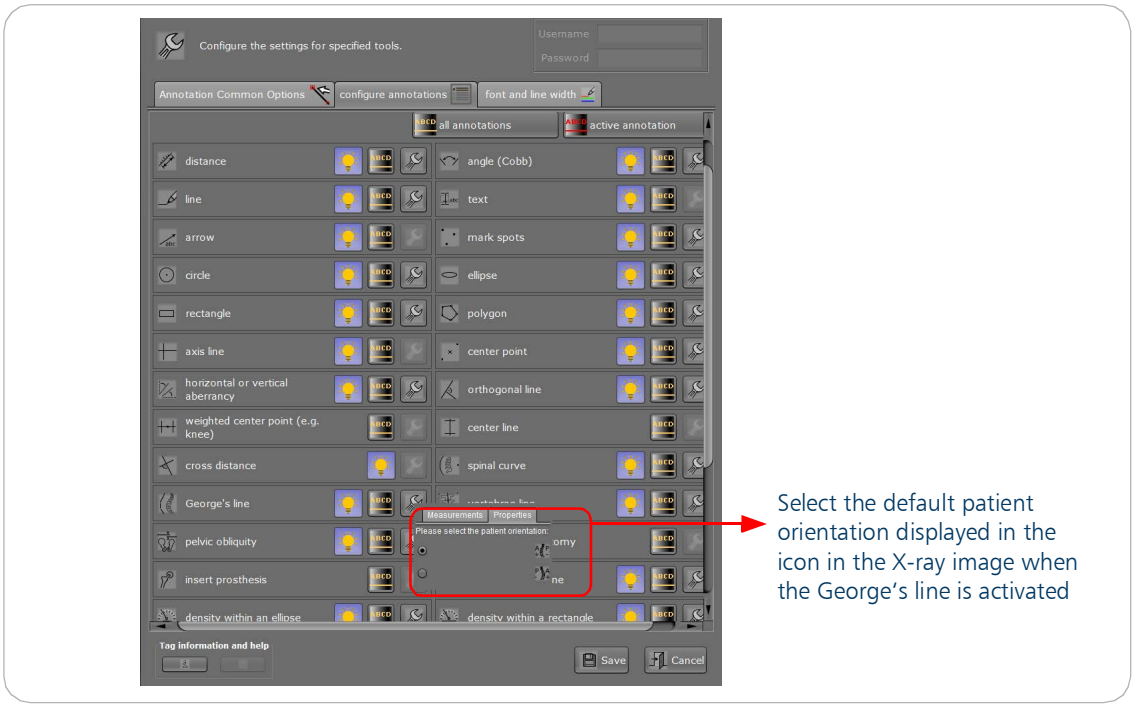


Figure 149. Configuration dialogue „configure annotation"

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.

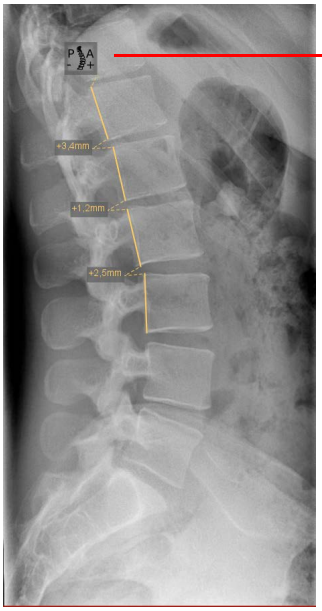


Figure 150. George's line

4.8.12 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.

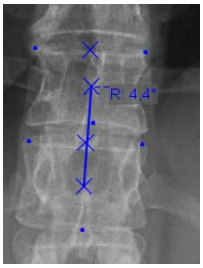


Figure 151. Vertrebrae line

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

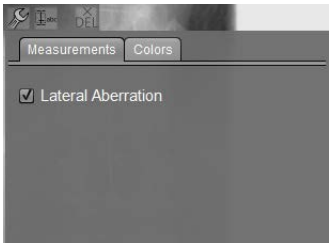


Figure 152. Edit mode tab “Measurements“ of vertebrae line

4.8.13 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.

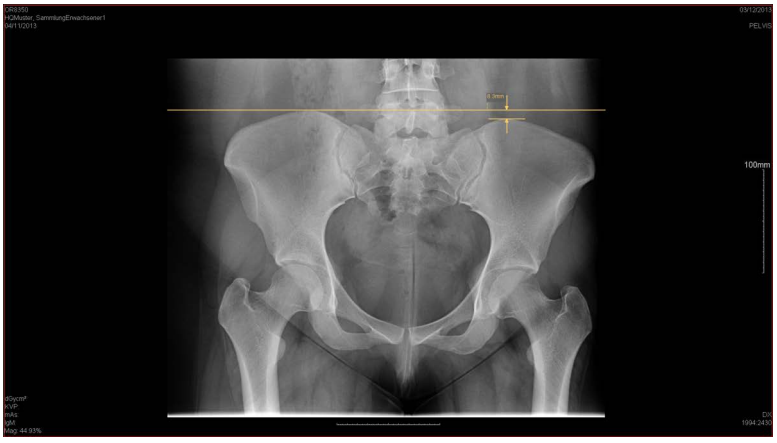


Figure 153. Pelvic obliquity

4.8.14 Three point circle

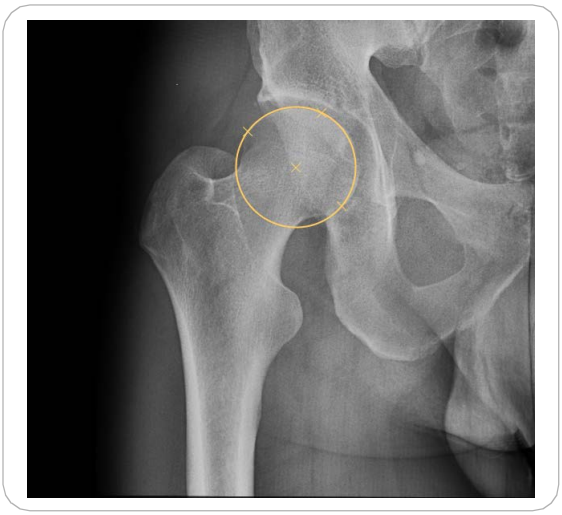
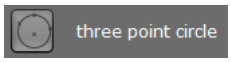


Figure 154. Measure the density within a line



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

The values are automatically displayed after the selection.

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

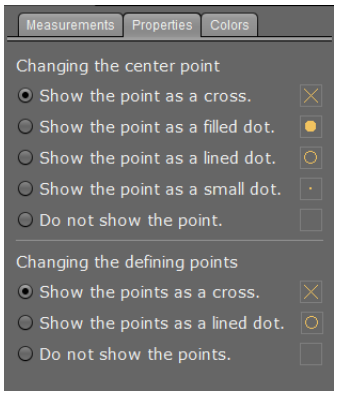


Figure 155. Edit mode tab “Properties“ of three point circle

4.8.15 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 156. Circumscale

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

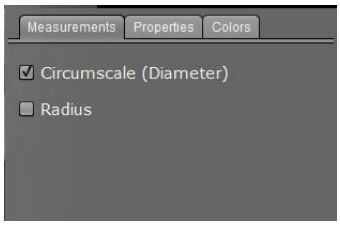


Figure 157. Tab Measurements of circumscale

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

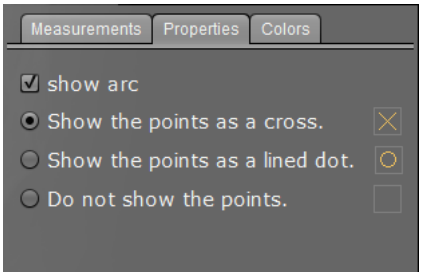


Figure 158. Tab Properties of circumscale

4.8.16 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 159. Distance comparison

4.8.17 Mark intersection

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

Figure 160. Mark intersection

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

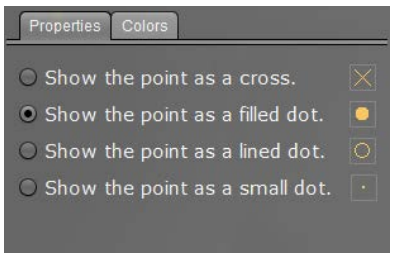
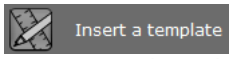


Figure 161. Edit mode of mark intersection

4.8.18 Insert a template



You have the option to define and save templates, so that they are accessible 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 programme.

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 dialogue is displayed with the message that no templates are available.

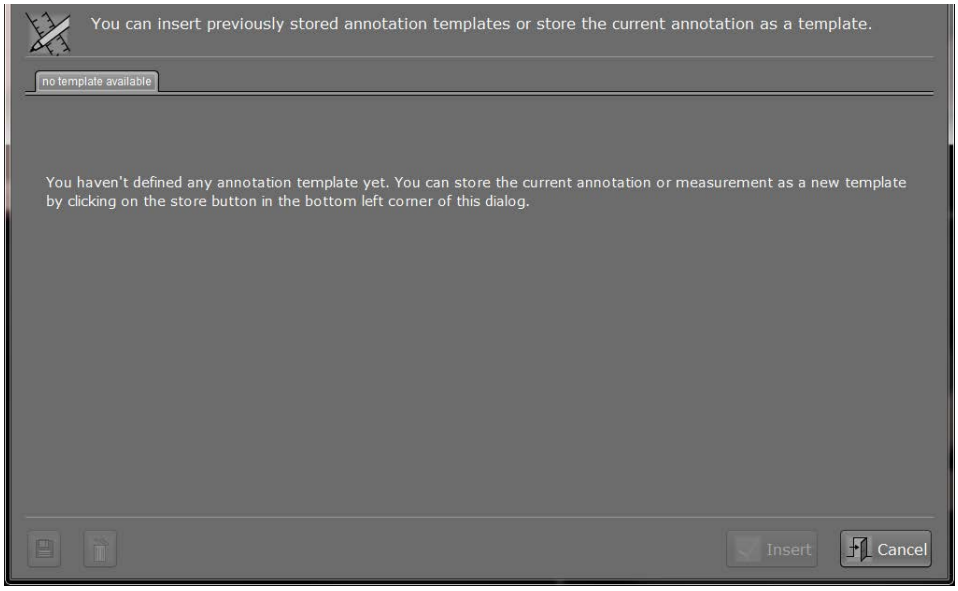


Figure 162. Dialogue to save templates

Note

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

Click on the save icon (floppy disk) to save the template. A dialogue 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 dialogue in which the template is saved and can be recalled or deleted.

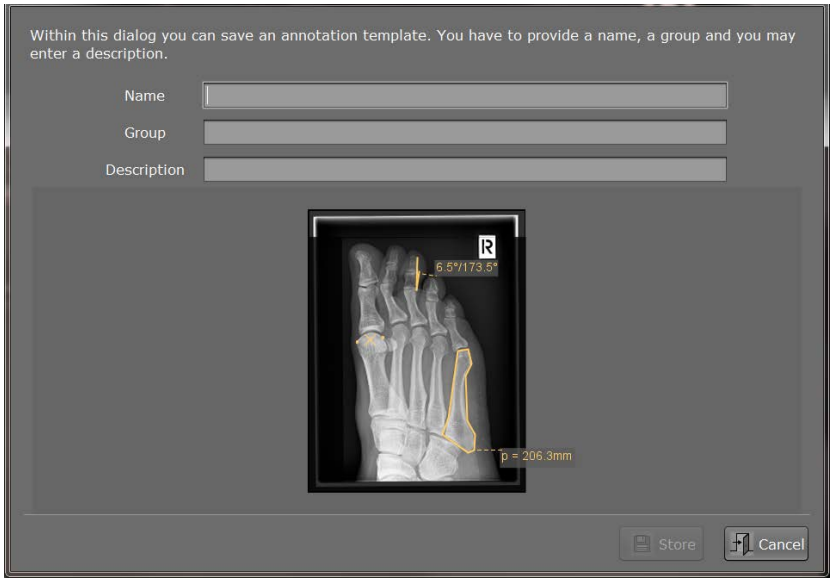


Figure 163. Creating a template

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.

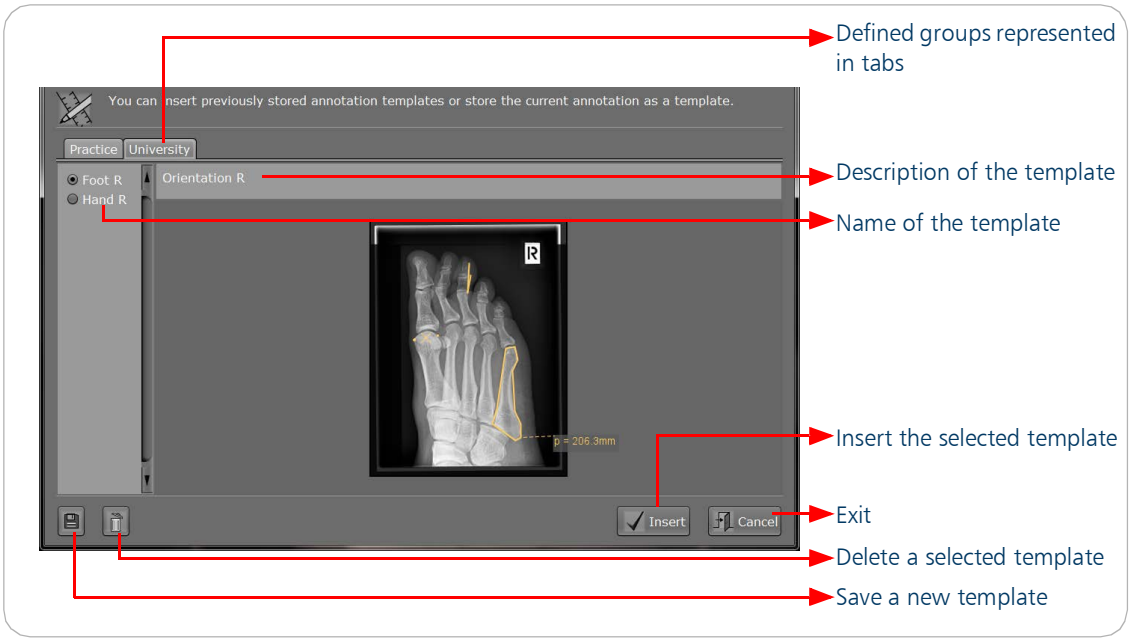


Figure 164. Inserting a template

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.

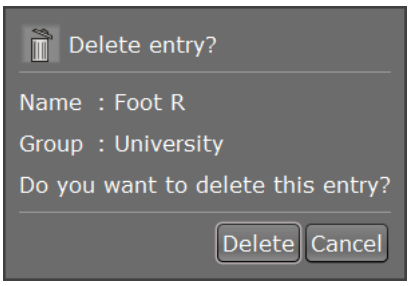


Figure 165. Security question to delete templates

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 dialogue for annotations. In the tab "configure annotation" allows the configuration dialogue 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.

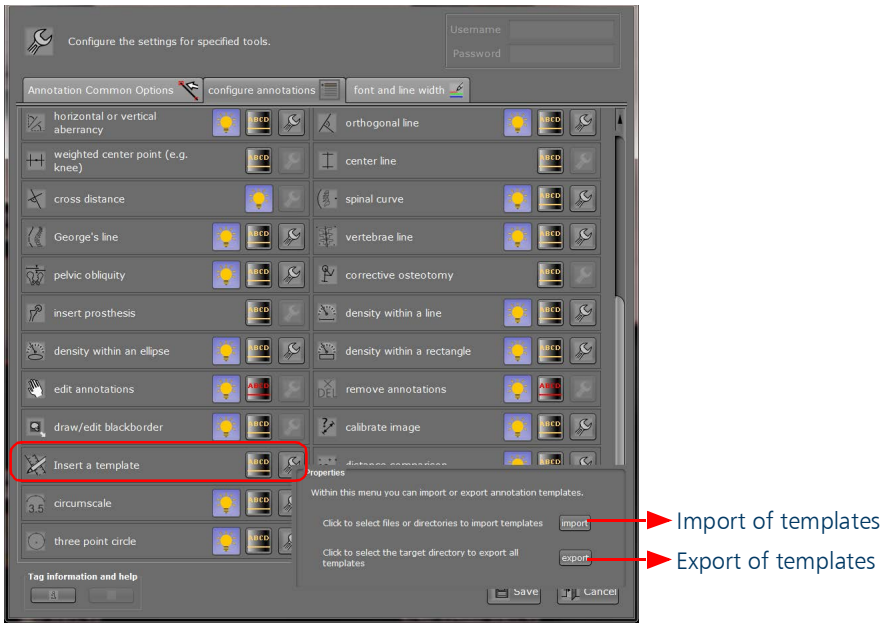


Figure 166. Configuration dialogue to export/import templates

4.9 Annotations - consistency

4.9.1 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.

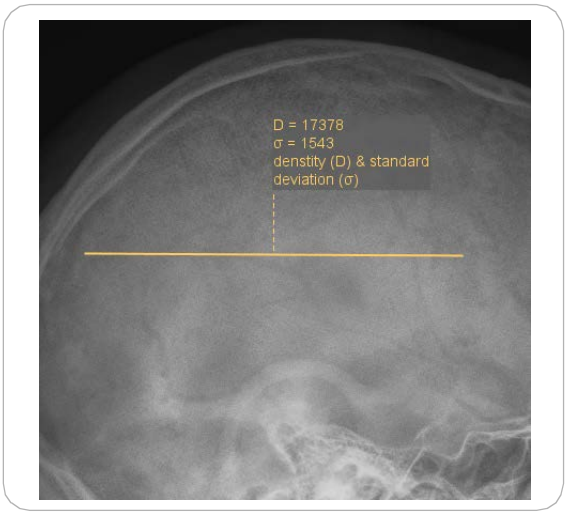


Figure 167. Measure the density within a line

4.9.2 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 168. Measure the density within a quadrilateral

4.9.3 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.

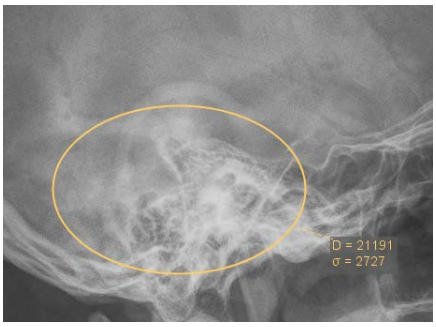


Figure 169. Density over an elliptical area

4.10 Annotations - edit

4.10.1 Draw black mask

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 mask annotation.

The saturation of the black mask 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 170. Black mask

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 mask.

It is possible to draw just one black mask in an X-ray image; additional black mask can only be drawn via the context menu. After the black mask was drawn, the edit mode is enabled automatically and the context is displayed. After clicking on the screw wrench button a dialogue opens, in which the shadowing can be adjusted from 70-100% (100% represents black) and in which you can add another black mask 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 black mask, a shaded area is drawn. This area represents the area of the image that has been shaded off by the black mask.

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

Figure 171. Drawn black mask with context menu

Note

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

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

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

Figure 172. Activated black mask

4.10.2 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:

4.10.2.1 Move the complete element

Position the mouse pointer in the middle of the shape to be moved (line, ellipse, etc.). Once this is highlighted 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; then release the mouse button.

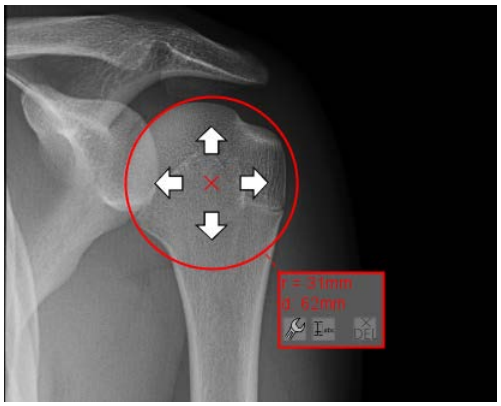


Figure 173. Move a shape

4.10.2.2 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 highlighted 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.

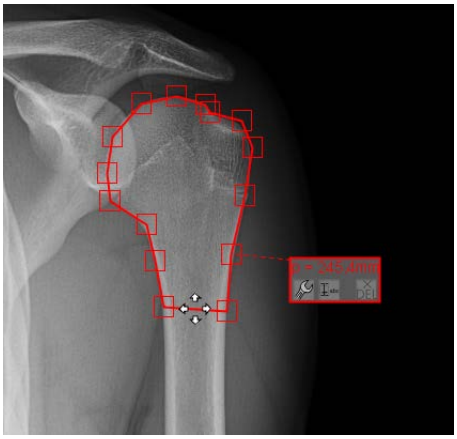


Figure 174. Move the edges of an element

4.10.2.3 Move a corner point

Position the mouse pointer near the corner of the element to be edited (line, rectangle, etc.). Once this is highlighted 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.

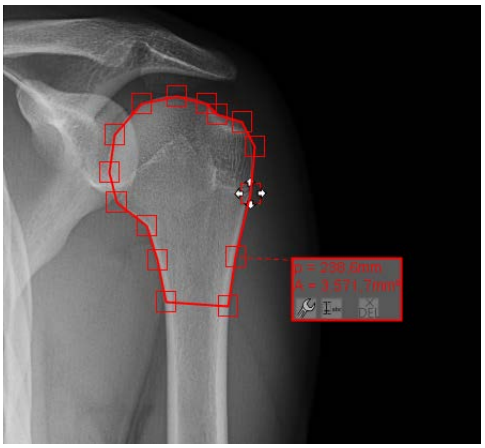


Figure 175. Move a corner point

4.10.2.4 Mark, move and rotate elements

Position the mouse pointer near the element to be marked (line, ellipse, etc.). Once this is highlighted 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.

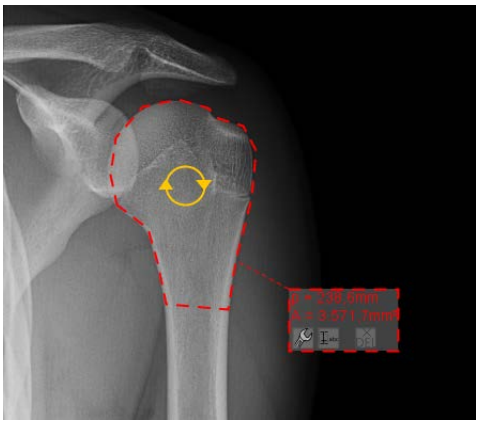


Figure 176. Marked element

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

4.10.2.5 Rotate elements without prior marking

Position the mouse pointer near to the element to be rotated (line, ellipse, etc.). Once it is highlighted 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.

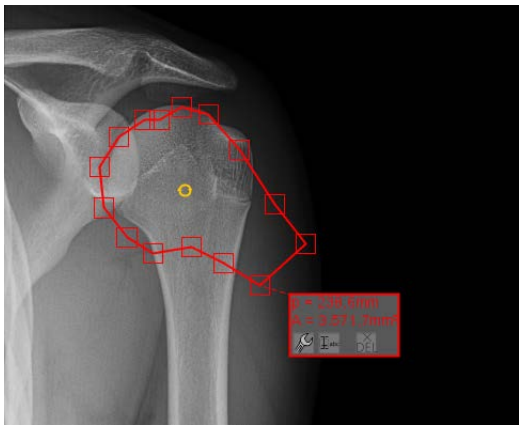


Figure 177. Rotate elements without prior marking

4.10.3 Annotations on/off

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

4.10.4 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.

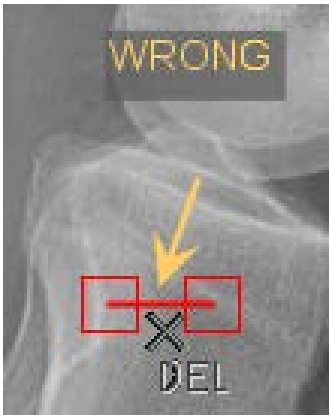


Figure 178. Remove a wrong annotation

4.10.5 Clear all annotations

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

Note

The action of deleting all annotations cannot be "undone".

4.10.6 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 analogue 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 performed 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 dialogue of the section "edit" (configuration button, tab "Annotation Common Options") the unit that should be used as default (mm, cm, inch) can be configured.

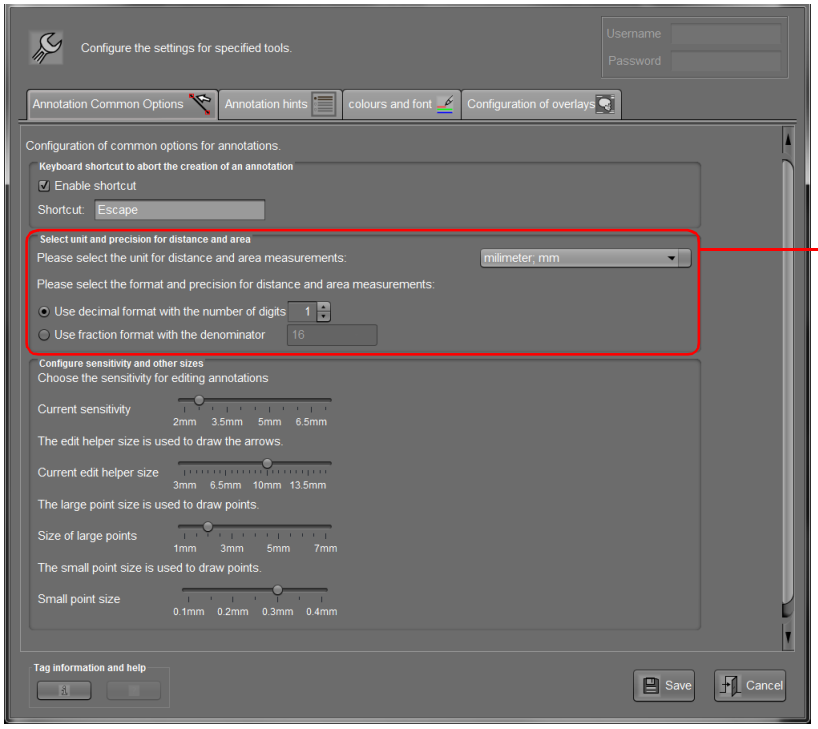


Figure 179. Selection of the measurement unit

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 to the end point. A window will open automatically for you to enter the known value and measuring unit (see screen shot below).

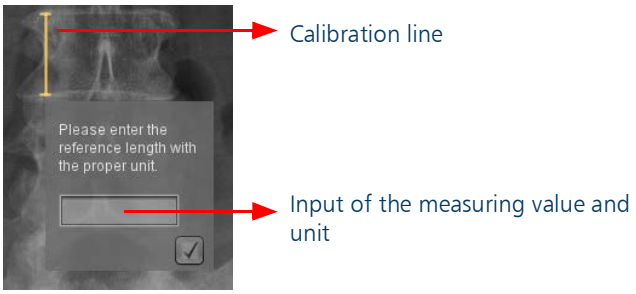


Figure 180. Calibrate image

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“.

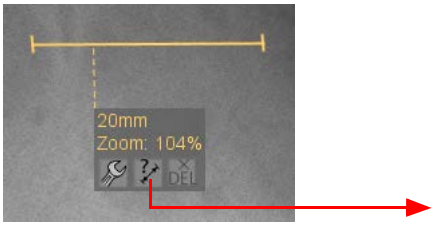


Figure 181. Calibration lien with measuring value and unit

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

Figure 182. Warning dialogue "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 colour of the reference length; the "DEL" icon deletes the annotation.

Figure 183. Calibrated image with the display of the reference length

To refer to a manual calibration on an already calibrated 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.

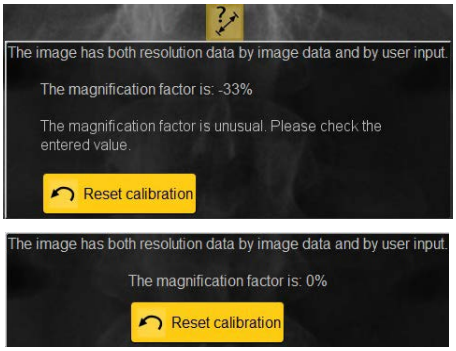


Figure 184. Symbol and note for the manual calibration for already calibrated images

4.11 Configuration dialogue of the annotations

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

4.11.1 Configuration of the annotation colour

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

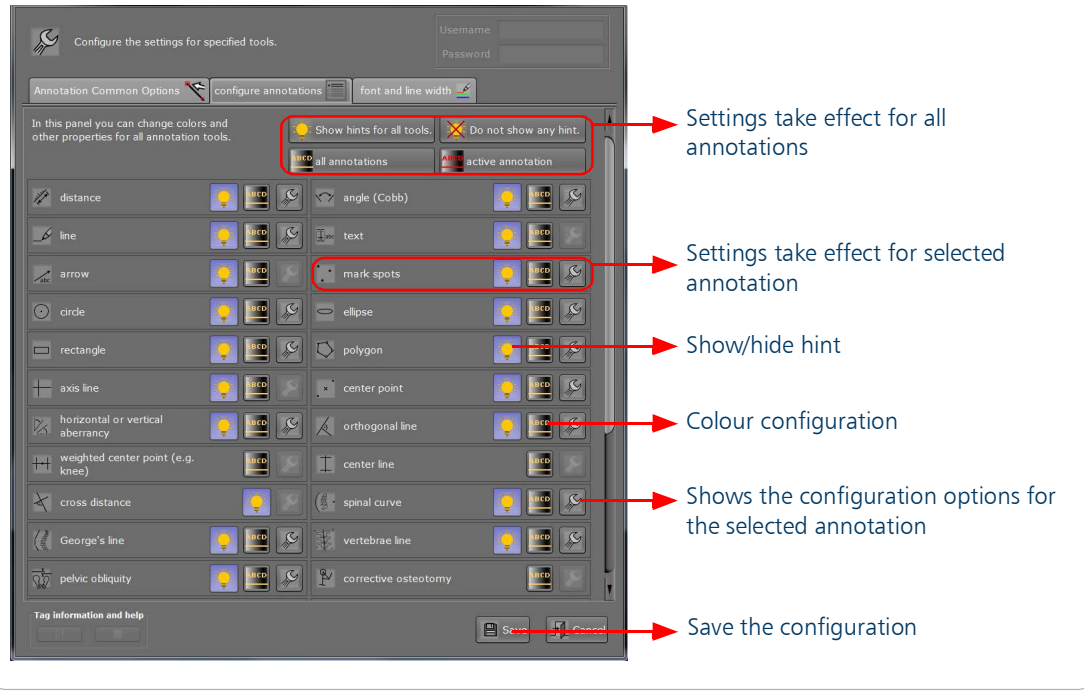


Figure 185. Configuration dialogue for annotations

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.

4.11.2 Configuration of font and line width

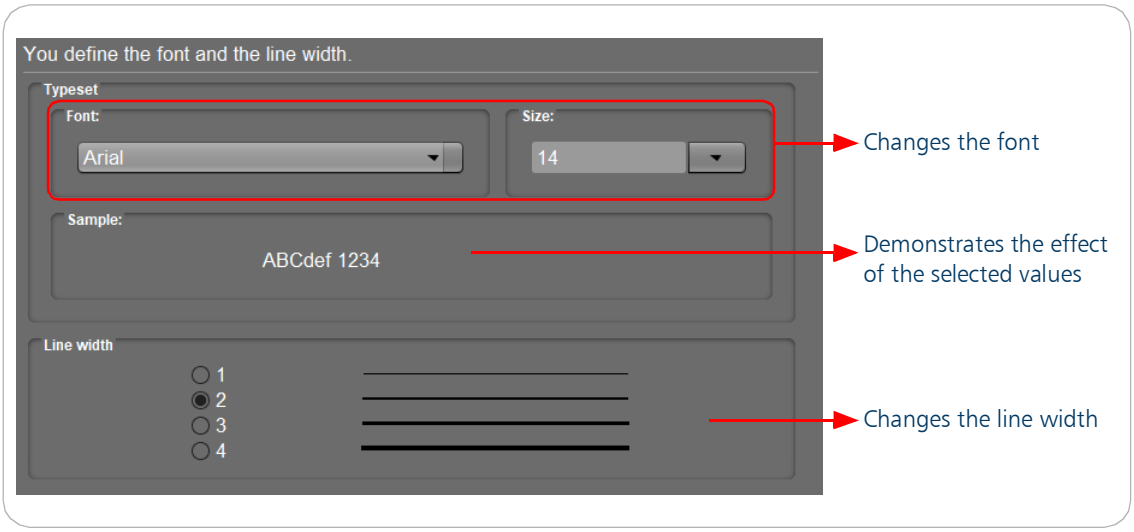


Figure 186. Font and line configuration

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.

4.11.3 Configuration of the position marker Left / Right

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

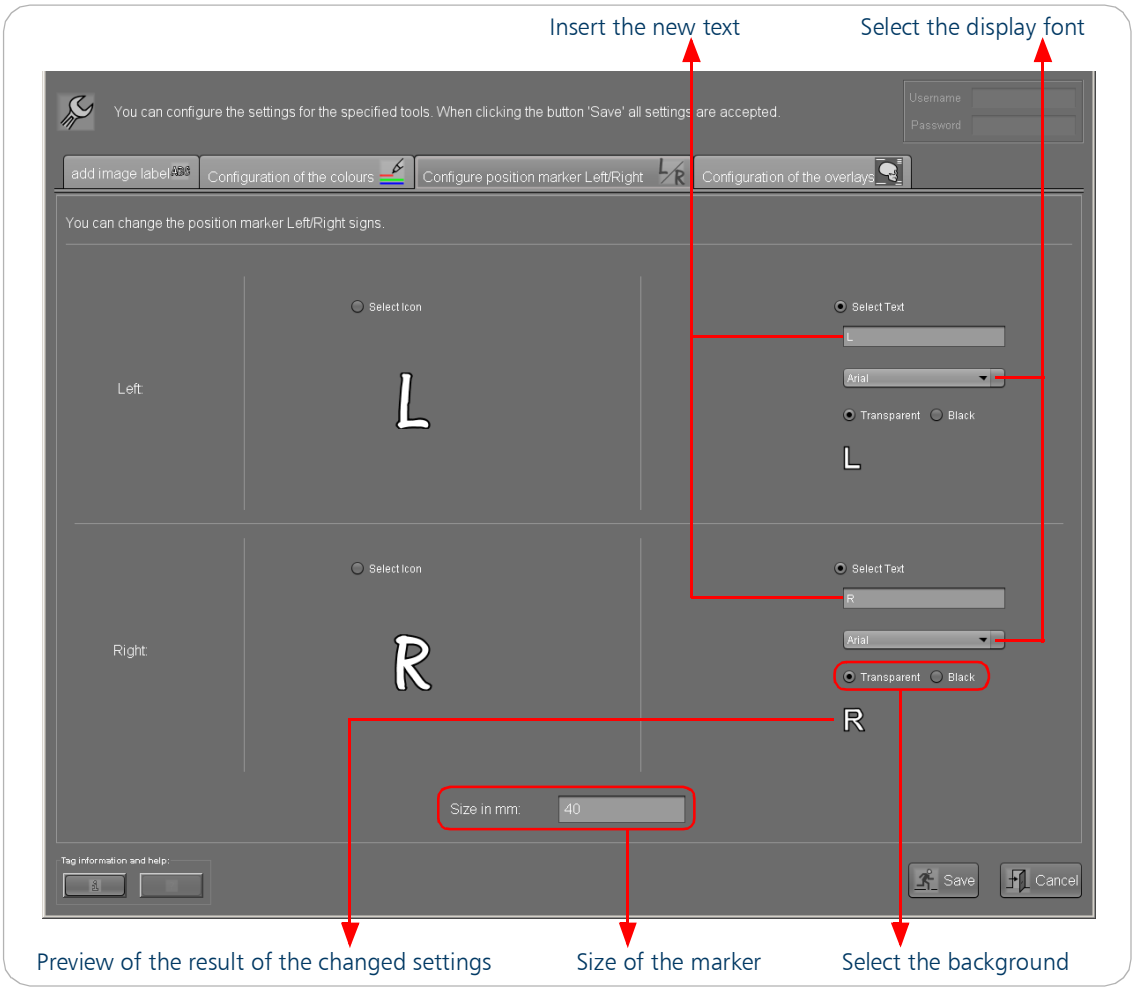


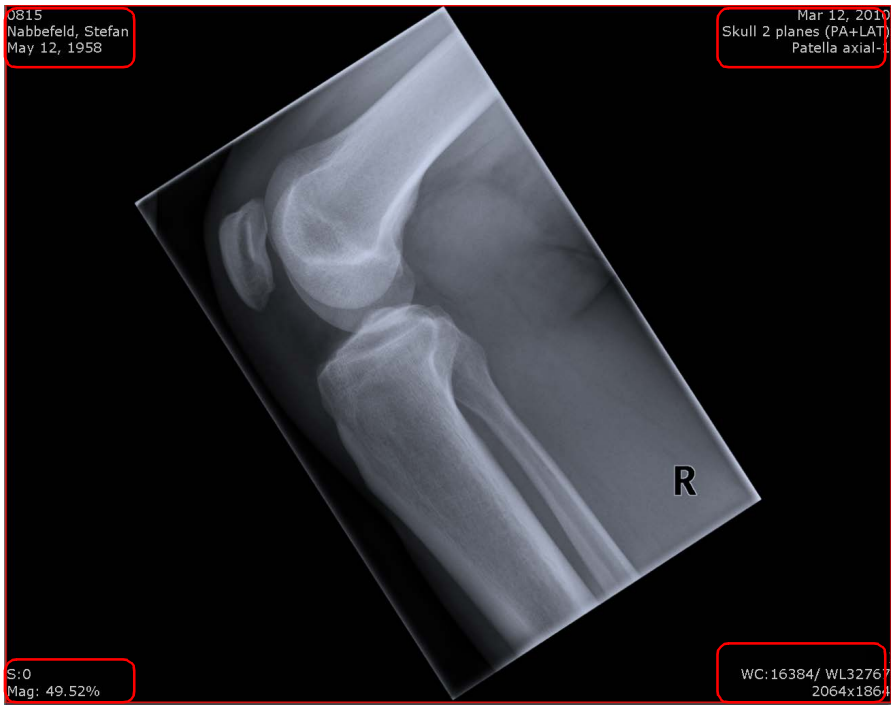
Figure 187. Configuration dialogue box of position marker Left/Right

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.

4.11.4 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.



Overlays in an image with information of the study date, study description, modality, etc.

Figure 188. 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.

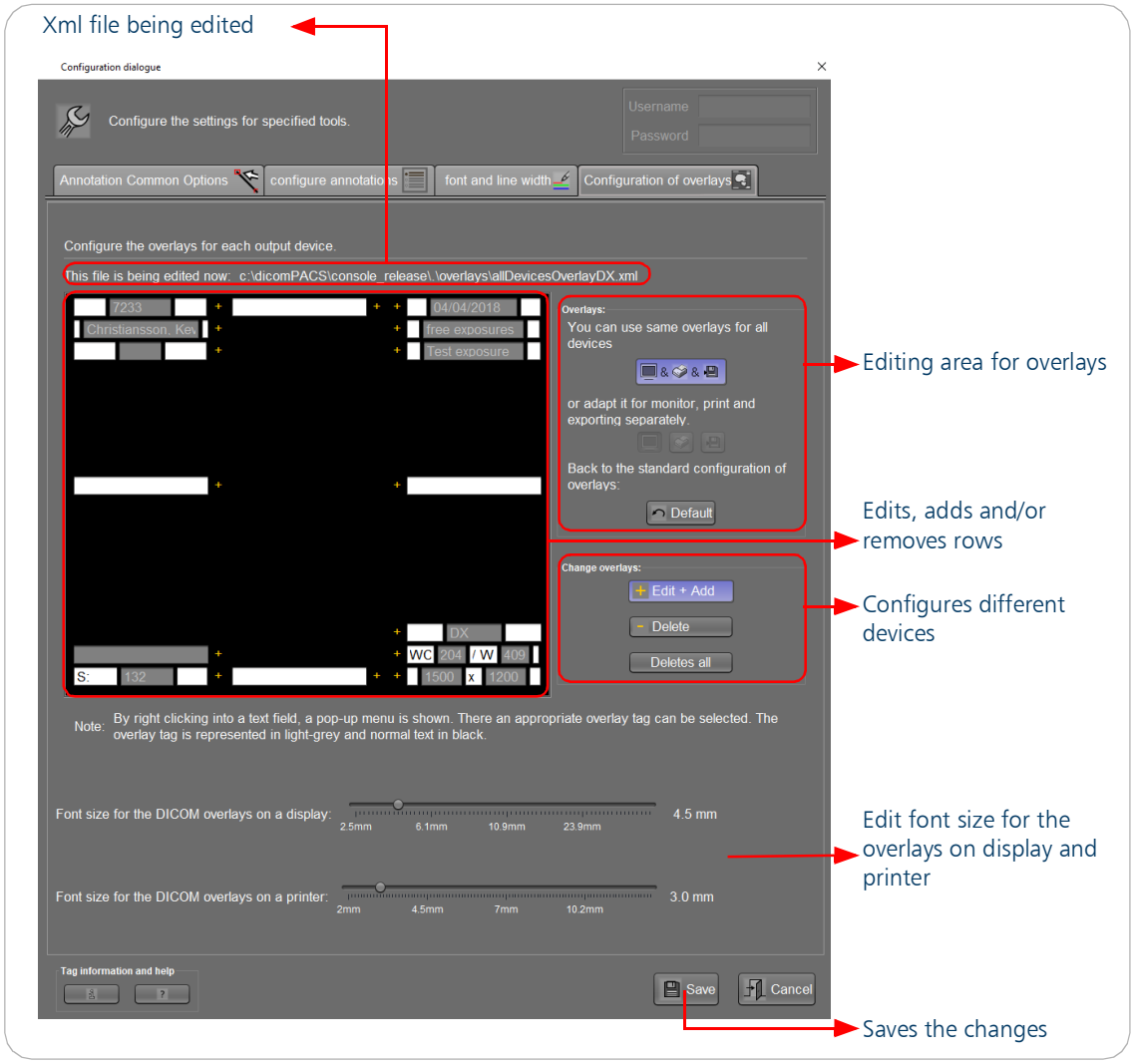


Figure 189. Configuration dialogue for overlays

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 190. Example of an overlay tag

Clicking again outside the pop up menu without 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.

4.11.5 Configuration of the image label

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

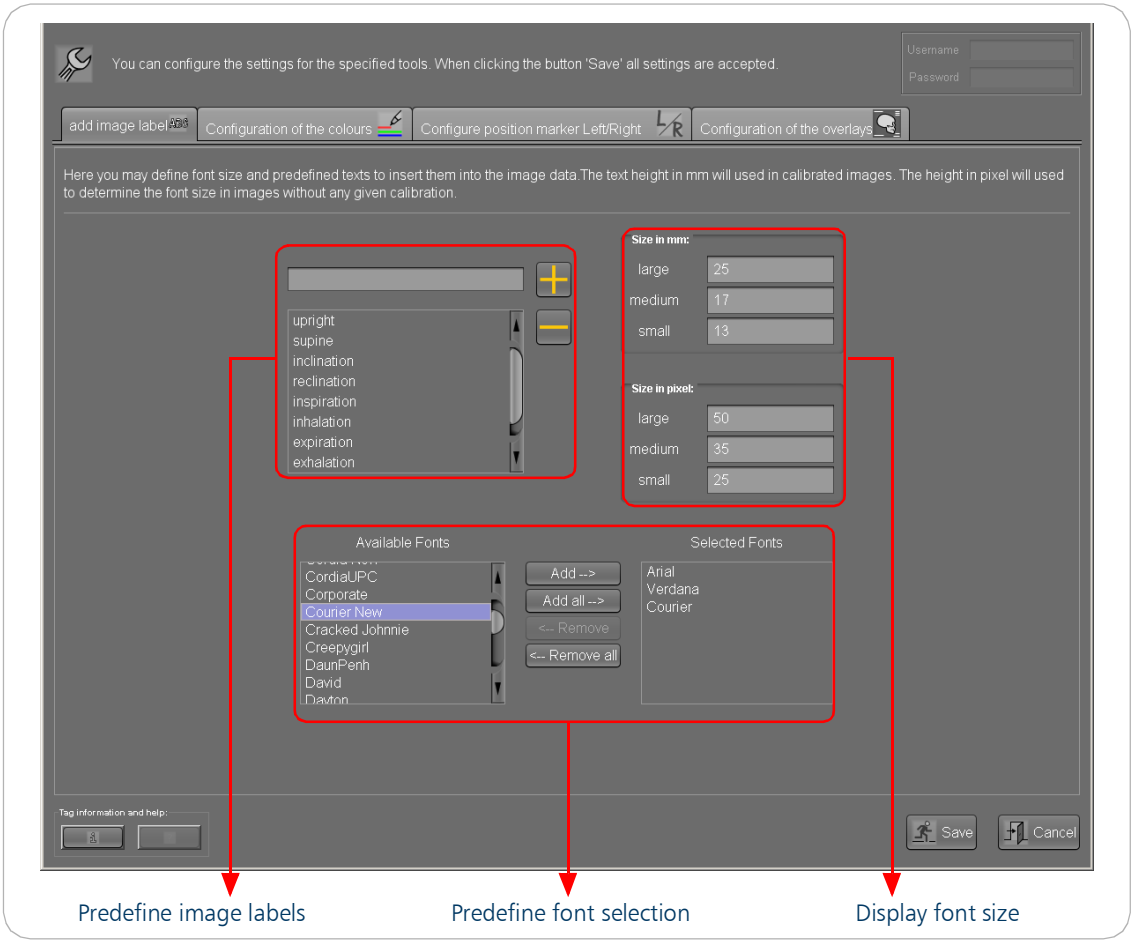


Figure 191. Configuration dialogue box "Add image label"

The font size in millimeters 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 pre-selection and the pre-selection 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.

4.11.6 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.

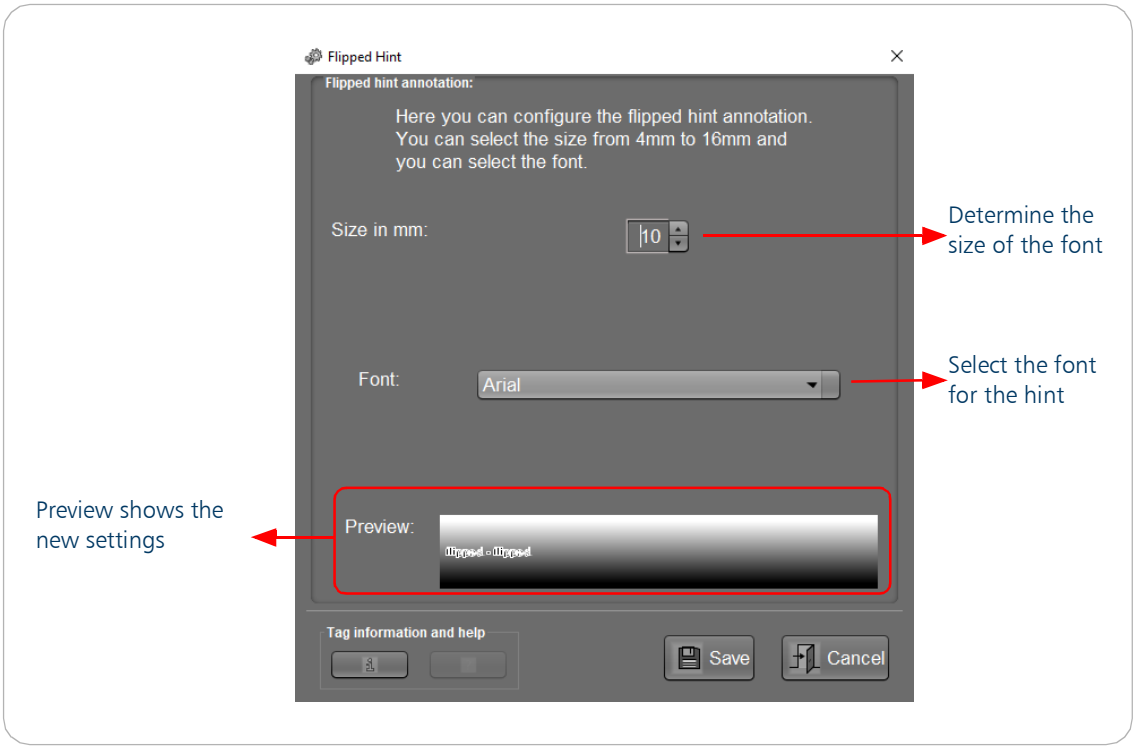


Figure 192. Configure the hint of a flipped image

4.12 Tool area turn / mirror

Figure 193. 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.

4.13 Tool area grid

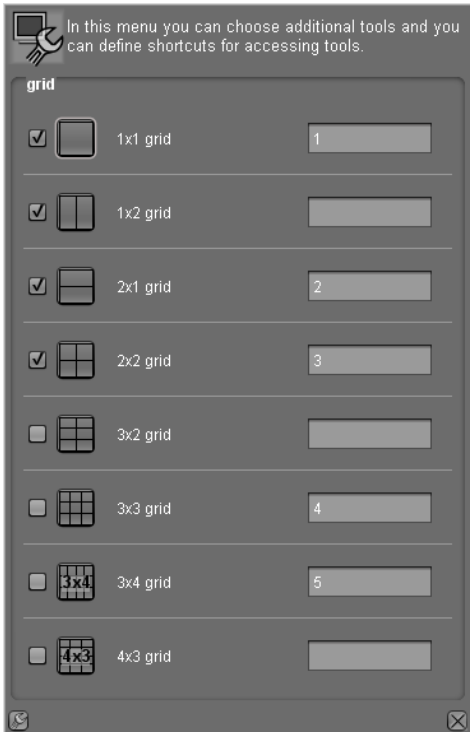


Figure 194. Grid

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.

4.13.1 Configuration dialogue 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.

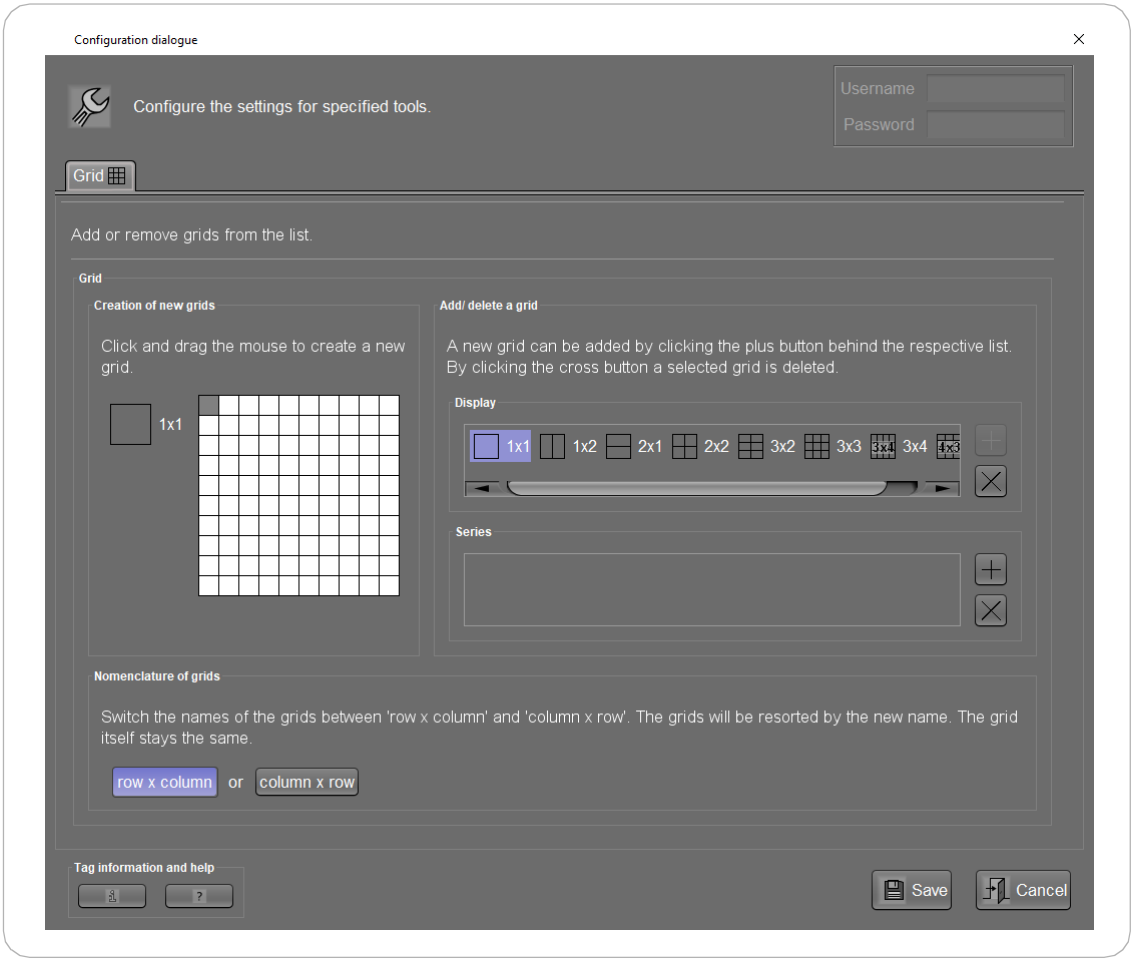


Figure 195. Create and configure grids

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.

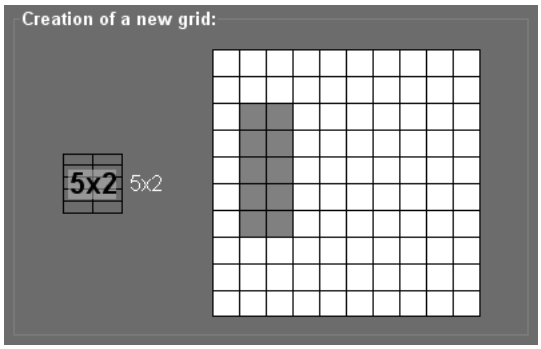


Figure 196. Draw a new grid

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).

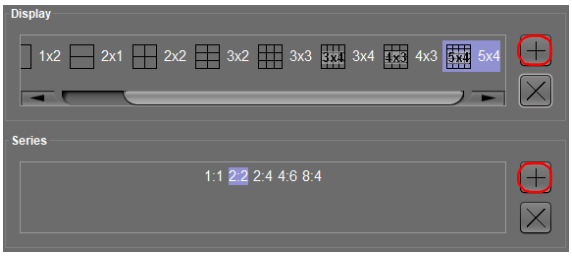


Figure 197. Add a new grid

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

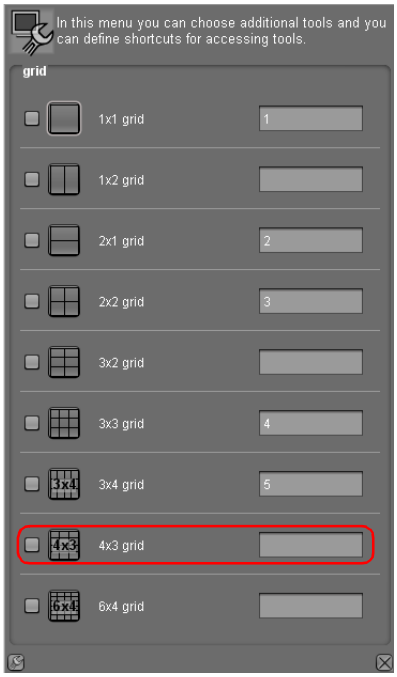


Figure 198. Toolbar menu of the grid section

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.

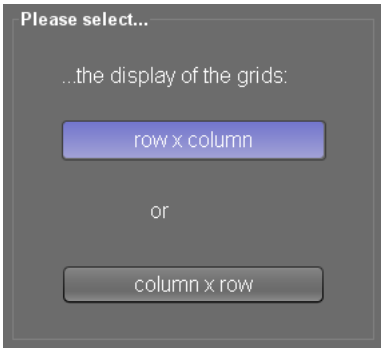


Figure 199. Configure the display option

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 200. Delete a grid

4.14 Tool area brightness

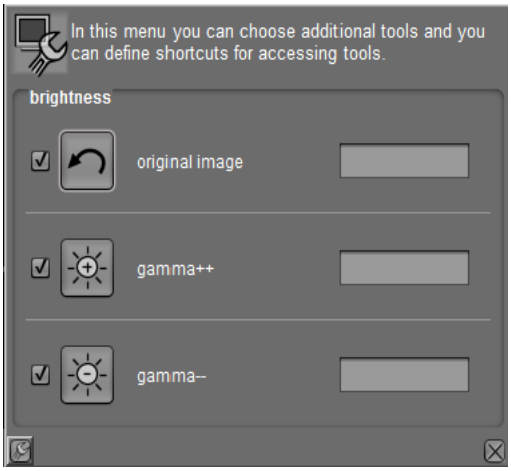


Figure 201. Brightness

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 177.

4.14.1 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.

4.14.2 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).

4.14.3 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 pre-set blue is the default setting and can be deactivated or configured in this dialogue. Therefor it is necessary to login to unlock the controls.

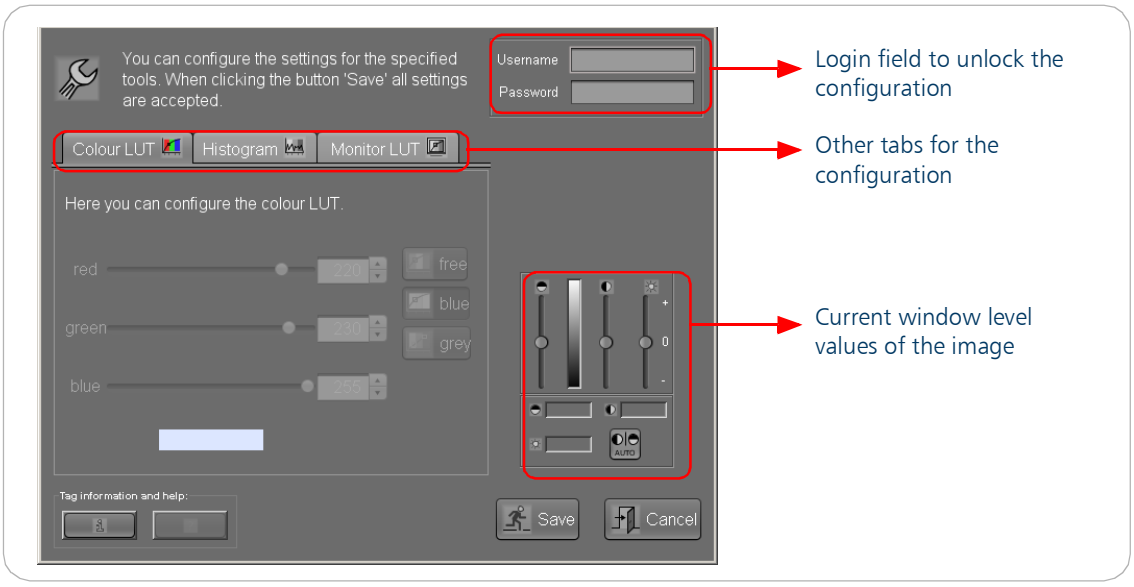


Figure 202. Colour LUT tab

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.

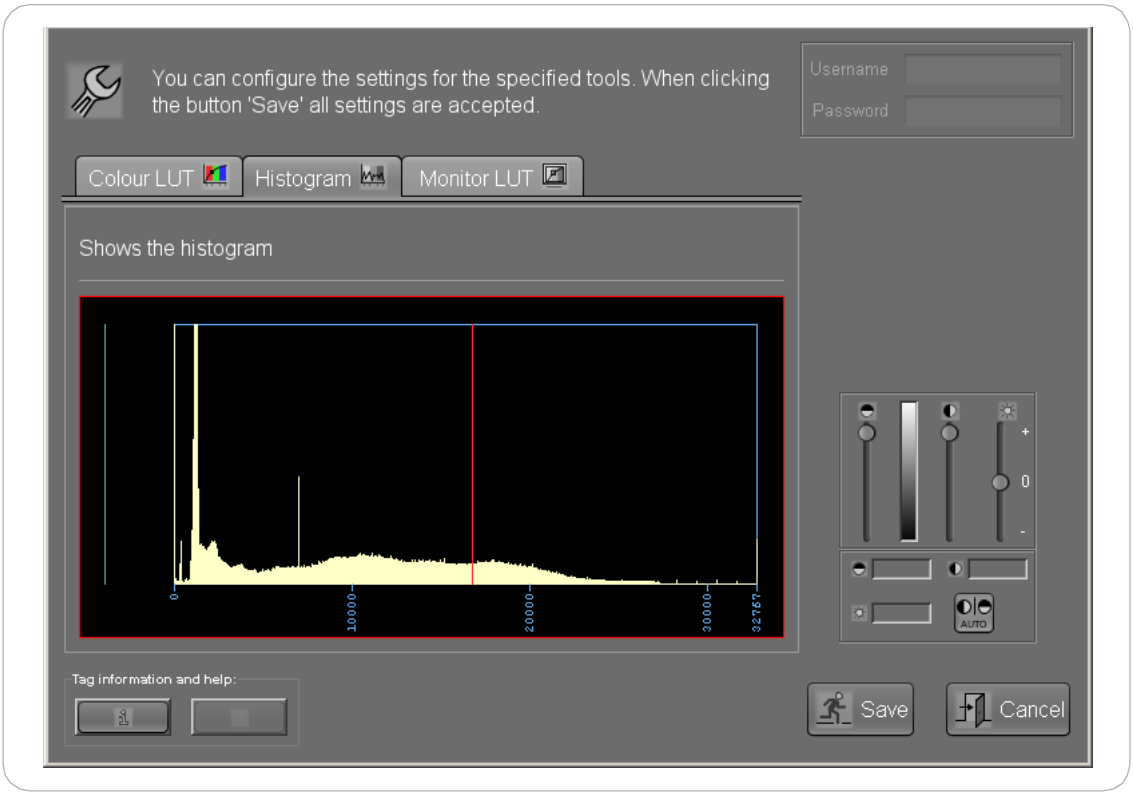


Figure 203. Histogram tab

Monitor LUT

The monitor LUT can be used to adapt the grey values of the monitor if it is not realized by the graphic card or the monitor directly. This can be done by a user having admin rights.

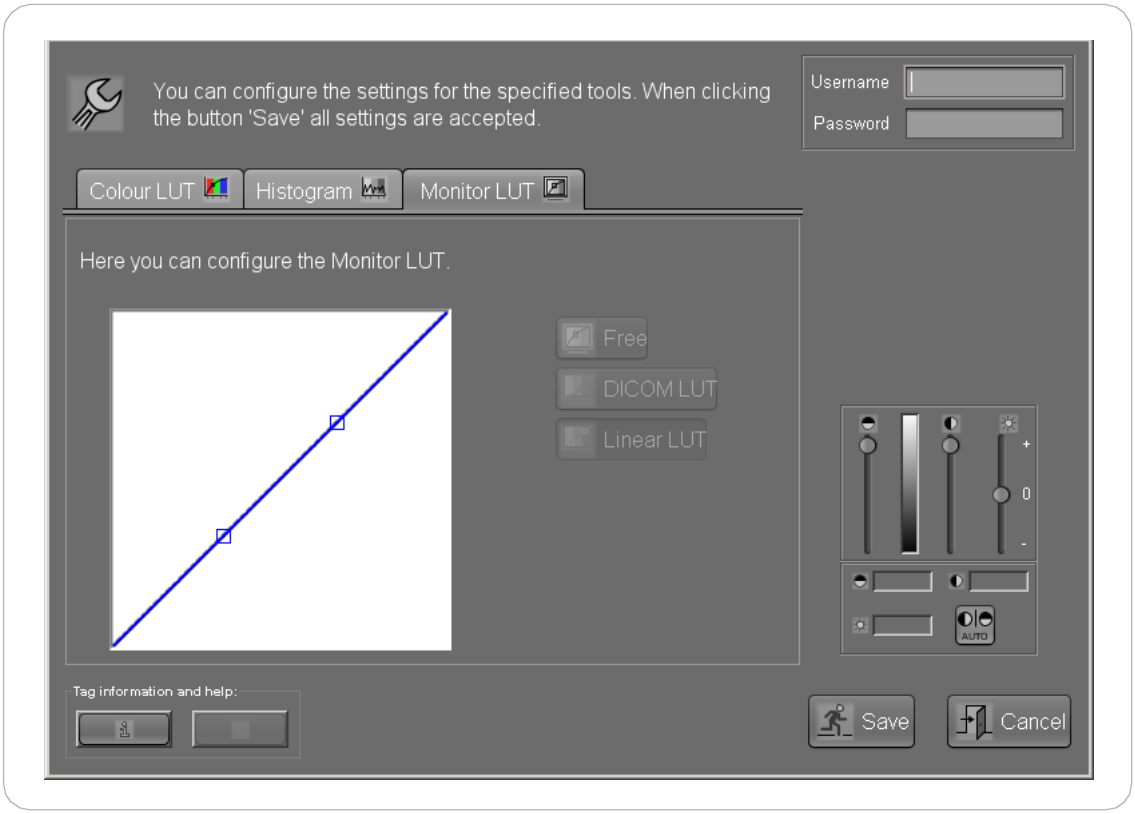


Figure 204. Monitor LUT tab

VOI-LUT

If VOI-LUT's are defined in the *dicomPACS®DX-R* image processing, these VOI-LUT's can be used in the viewer. . In the section "Brightness" the levelling can be done with pre-defined VOI-LUT's. Click on the button 

to choose the VOI-LUT that shall be applied to the image.

4.15 Tool area image selection

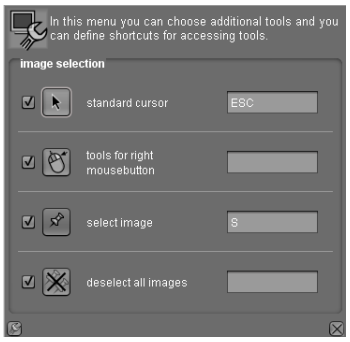
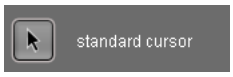


Figure 205. Image selection

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.

4.15.1 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".

4.15.2 Tools for right mouse button

The right mouse button can be used for three different functions:

- magnifying glass
- window levelling (brightness and contrast)
- zoom.

Each function can be selected from the configurator and in addition, the user may define keyboard shortcuts for the different functions.

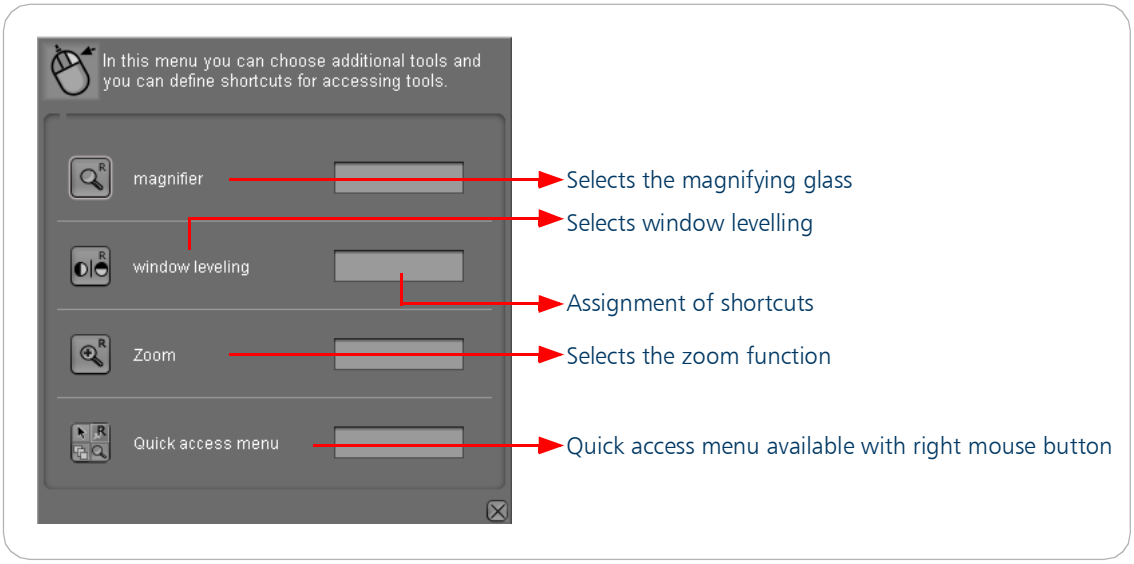


Figure 206. Tools for right mouse button

4.15.3 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 102. The display is convenient e.g. when burning CDs in order to know the size of the data.

4.15.4 Deselect all images - remove a selection

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

4.15.5 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.

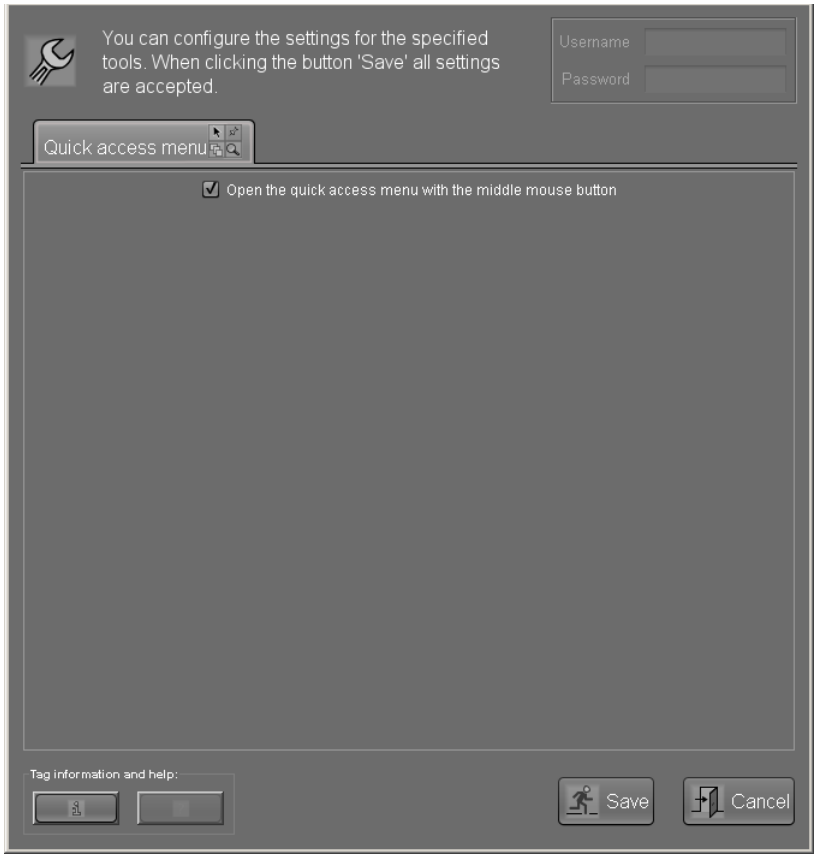


Figure 207. Configuration dialogue of quick access menu

4.16 Tool area magnifier / zoom

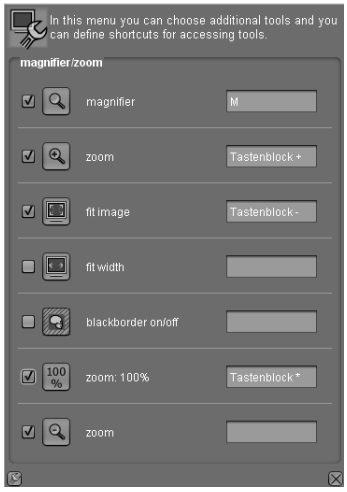


Figure 208. Magnifier / zoom

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.

4.16.1 Magnifier - mouse pointer as magnifier

The magnifying glass is activated by clicking on this button. The activation of the 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 209. Magnifier with selectable masking

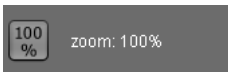
Note

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

PRACTICAL HINT

By default, 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.

4.16.2 Zoom: 100% - 100 percent representation of the image



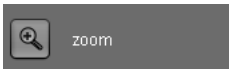
After activating this tool, the active image is set to its original resolution within its current grid area. This means that each pixel of the displayed image is displayed as exactly one pixel on the screen. The image is displayed in the original resolution, which means that the complete image information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

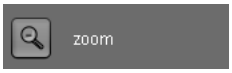
This tool is especially important for all images whose original resolution is greater than it can actually be displayed on a screen, e.g. digital X-ray images. These images are generally scaled down in order to display them as a whole, so that only part of the image information is shown. It is very important 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).

4.16.3 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.

4.16.4 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).

4.16.5 Fit width - fit an image to the grid width

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

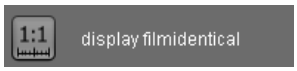
4.16.6 Black mask on/off - activate and deactivate the black mask

The digital X-ray process usually creates troublesome white borders around an image. By clicking on the black mask on/off button, a black mask frame can be activated and deactivated. If the black mask is activated, the white borders around the image are coloured black. When the black mask 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 mask is activated. If it is, the border is represented by hatching. If the black mask is deactivated, the image is shown as when it was taken.

4.16.7 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.

Monitor calibration is the process by which the pixel spacing of the monitor and the physical resolution of the monitor is determined. The viewer is thereby enabled to display calibrated images in the same size as they would appear on an exposed film.

CAUTION/ATTENTION!

EN: Please note that the basic principles of X-rays by necessity cause magnification of displayed subjects by a factor that is usually known. The *dicomPACS®DX-R* internal viewer displays the images at the same size as on a film, i.e. slightly magnified.

FR: Veuillez noter que les principes de base de la radiographie causent inévitablement l'agrandissement des objets affichés par un facteur qui est généralement connu. La visionneuse *dicomPACS®DX-R* affiche les images à la même taille que sur un film, c'est-à-dire légèrement agrandies.

In order to calibrate a monitor, it must satisfy the following preconditions:

- Pixel matrix at least 1024 x 1024
- Monitor size at least 25cm x 30cm
- Identical pixel spacing in the horizontal and vertical directions

In addition, the calibration ruler or some other measuring scale must be available.

The calibration ruler offers a simpler and easier control of line lengths. It provides a range of line templates allocated to letters, which allow reference lines to be measured without additional measuring equipment.

For the calibration, click on the 1:1 tool. You can also access the calibration dialogue via the little wrench icon of the tool group “Magnifier/Zoom“, tab “Display filmidentical“.
Now proceed as follows:

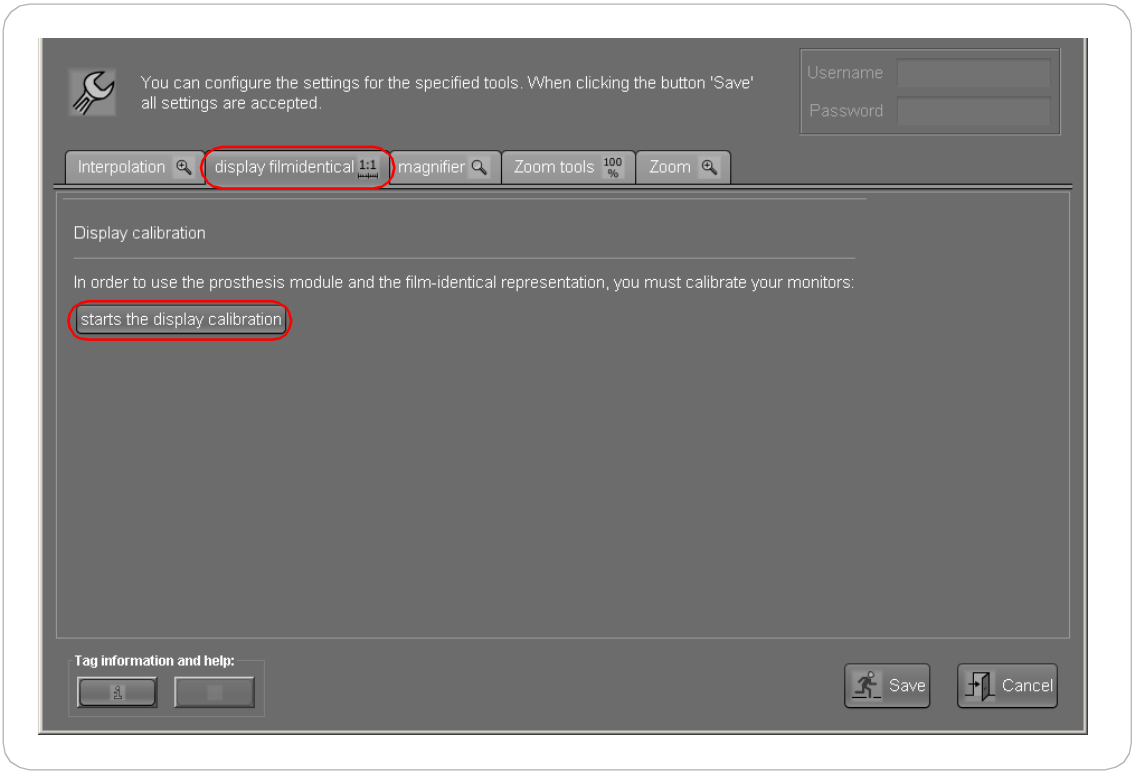


Figure 210. Configuration dialogue display filmidentical

Select the button “Start Monitor Calibration“ and a full-screen dialogue will appear.

Figure 211. Full screen dialogue

Perform the calibration as follows:

1. Select the monitor which shall be calibrated. If more than one monitor needs calibration, repeat step 1 and 2 for each monitor before clicking “Test“.
2. Direct measurement. Select measuring device (e.g. 200 mm ruler), place a calibrated ruler on the monitor and adjust the lines in the bottom part of the dialogue to the selected distance (e.g. 200 mm, depending on the ruler you chose). If you have got more than one monitor, change the position of the dialogue by clicking on the respective display, and adjusting the lines there as well.
3. Click “Test“ and measure the diagonal line. Select the length from the shown values, then click “Check“. When you have more than one monitor the calibration check will appear on each monitor.

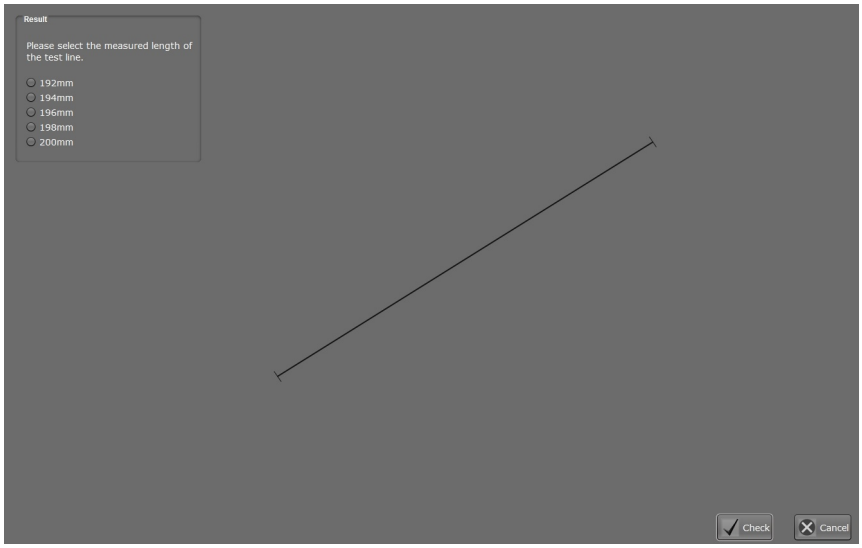


Figure 212. Calibration test

Confirm and store the calibration by selecting “save/store“.

If the calibration has succeeded, the corresponding monitor is identified as calibrated and can be used for 1:1 displays.

If “Perform regular check!“ is selected, each time the *dicomPACS®DX-R* internal viewer is started, the calibration must be checked. The quick calibration test is started at the first selection of the 1:1 function and is performed by the user with the help of a ruler.

Figure 213. Display filmidentical

4.16.8 Configuration dialogue 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.

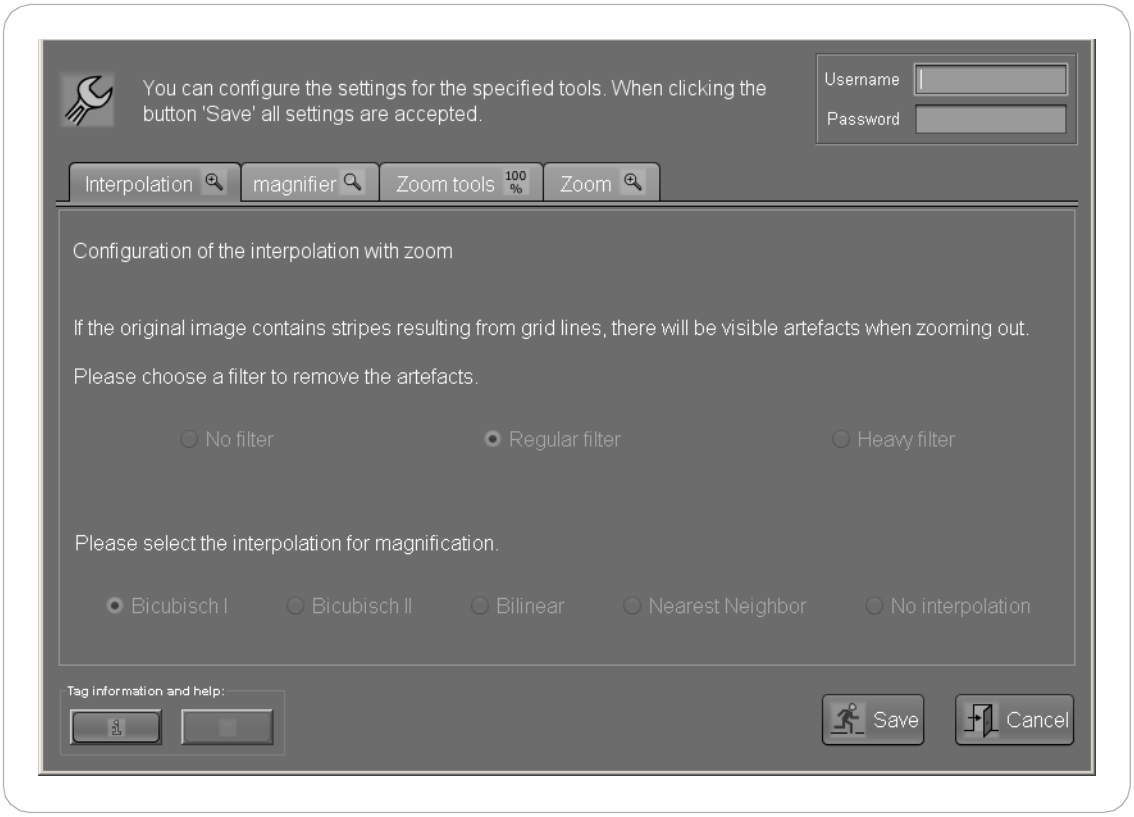


Figure 214. Configuration tab Interpolation

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

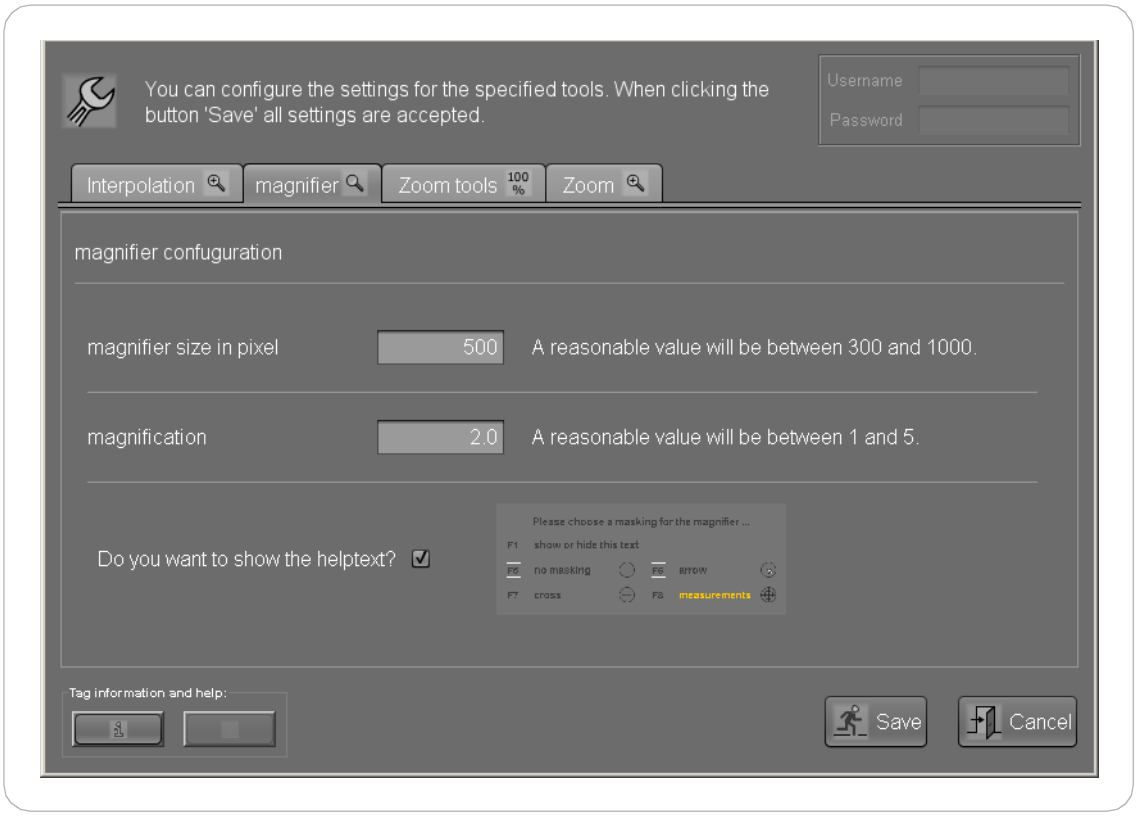


Figure 215. Configuration tab magnifier

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 individualize 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.

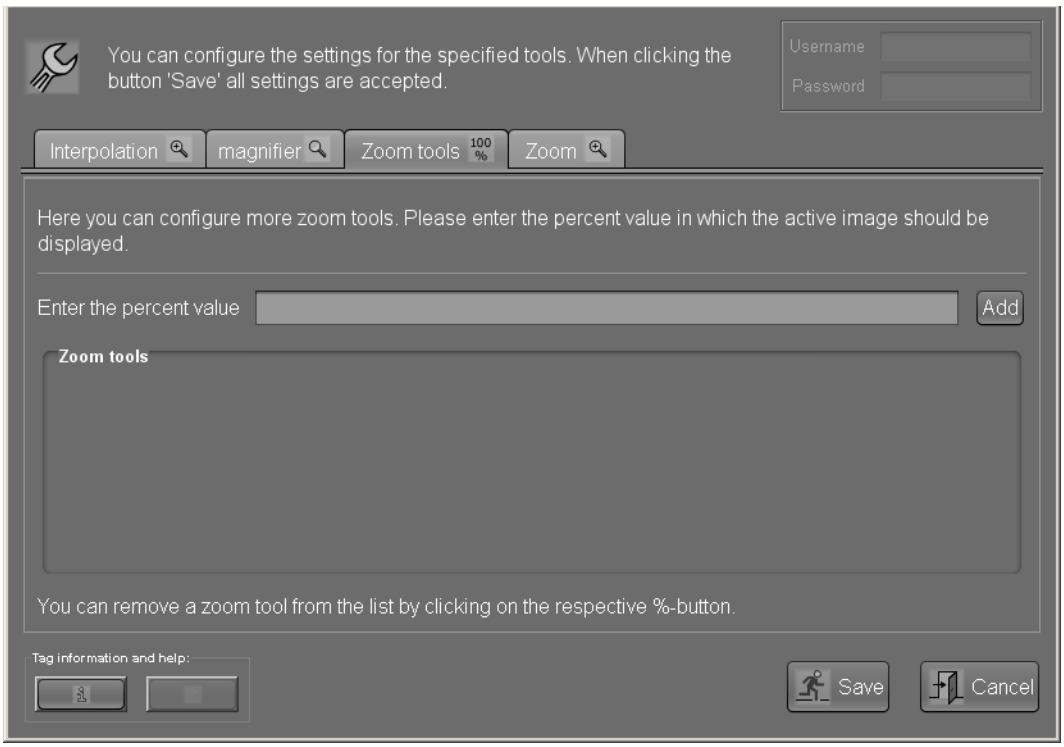


Figure 216. Configuration tab Zoom tools

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.

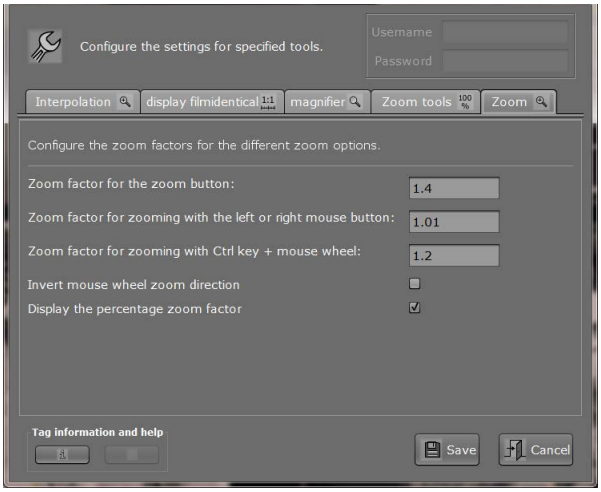


Figure 217. Configuration tab Zoom

The display of the percentage zoom factor can be configured individually. If the option is selected, the percentage zoom factor is displayed in the lower left work area as “Mag: xxx%”.

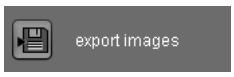
4.17 Tool area management

Figure 218. 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.

4.17.1 Export images



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

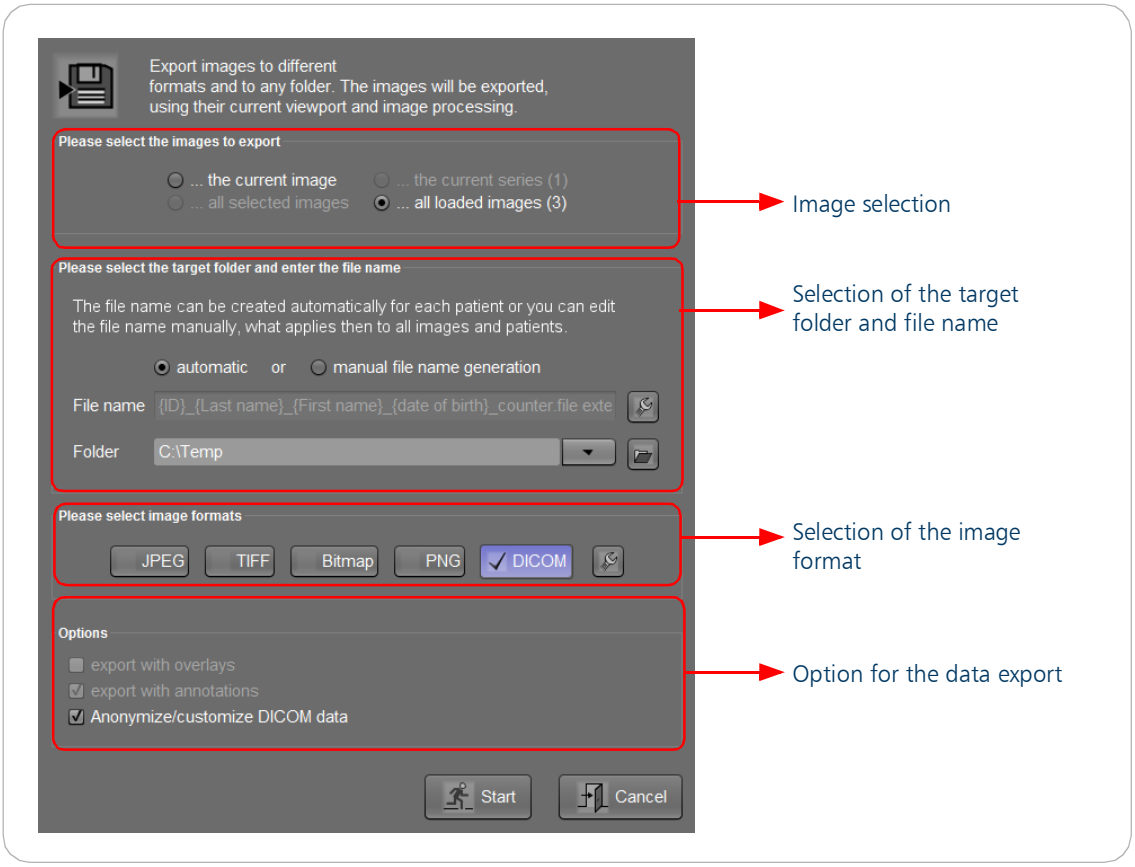


Figure 219. Export images

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 178), the current series or all loaded images.

The file name of the data to be exported can be individualized 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 customized 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

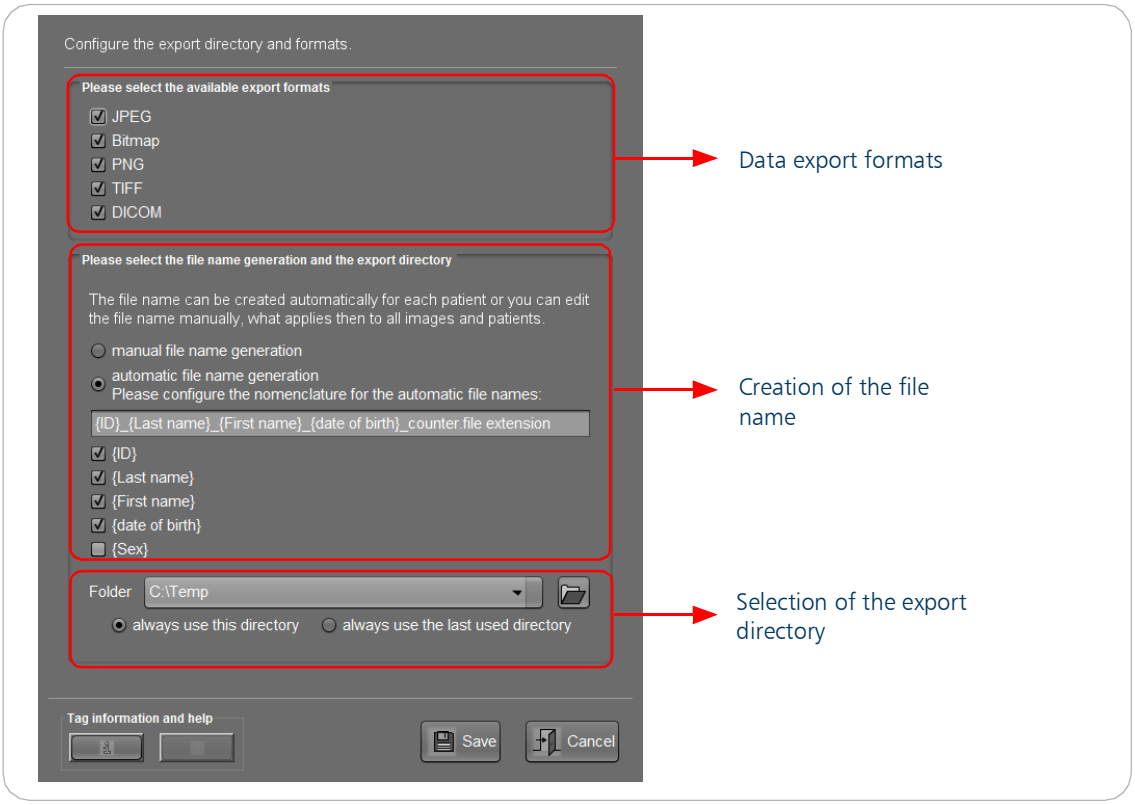


Figure 220. Configuration dialogue of exporting images

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)
- anonymise/customise DICOM data (image format DICOM must be selected, see page 227).

4.17.2 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 101).

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.

The images can be edited while the dialogue is opened. Brightness and window level changes are immediately applied to the dialogue.

Zoom, filter, LUT and inversed images are only applied if the corresponding options for printing are selected.

Note

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

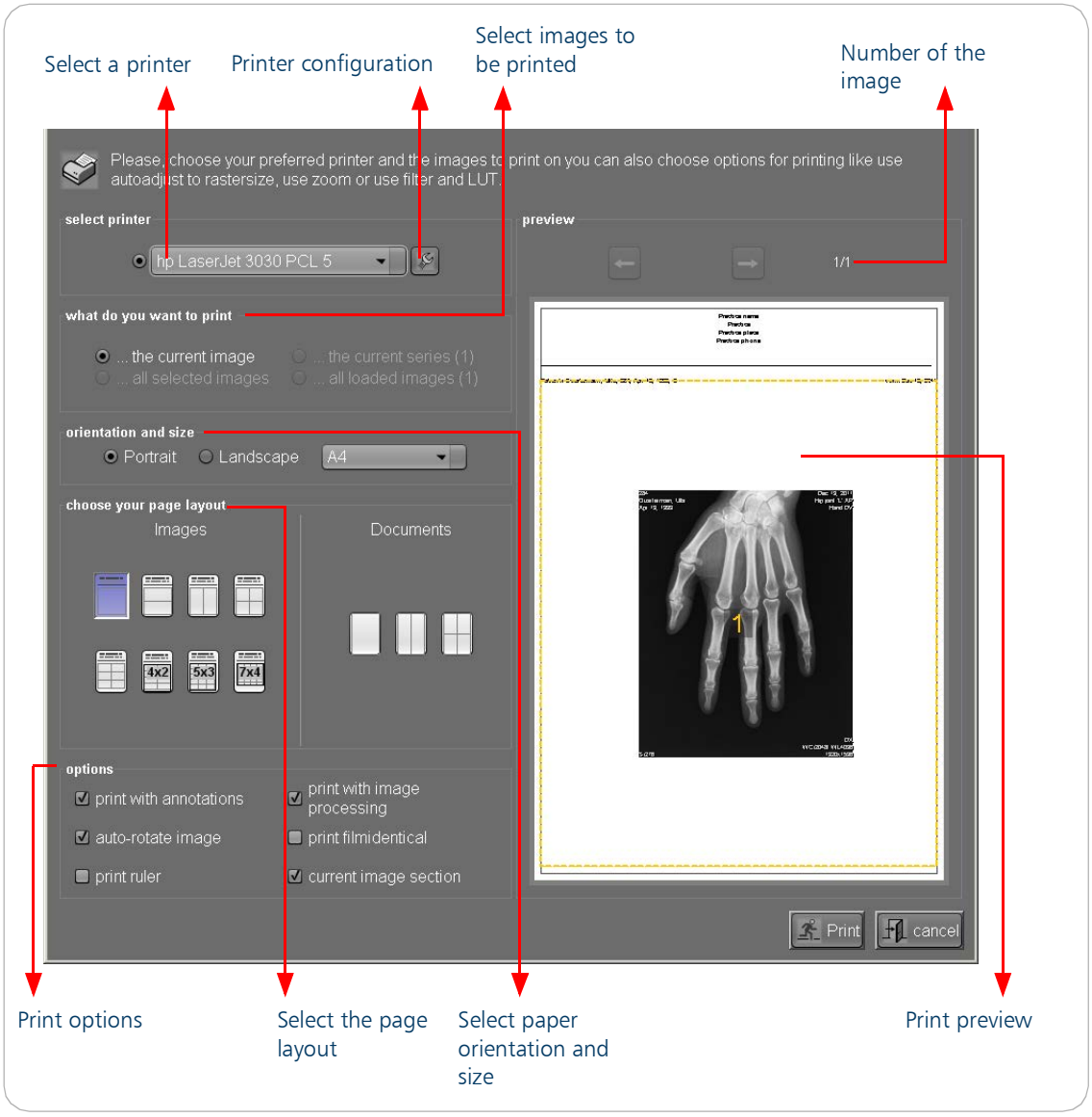


Figure 221. Print configuration dialogue

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 222. Page layout

If the images should 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. 35 x 43, 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 practice stamp at the bottom of the page
  The patient data and practice stamp are printed on the bottom of the page.
- Print ruler:
  A ruler to confirm e.g. a distance can be printed on the image.
- 5 cm grid as overlay
  Prints a 5 cm grid as overlay over the image, every field of the grid represents 5 cm on the X-ray film.

- Mamma print option
  Aligns the ruler to the outside and the images are not centered, if you use a grid (1x2, 2x2, 2x1), the images will be shown horizontally connected without distance.

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.

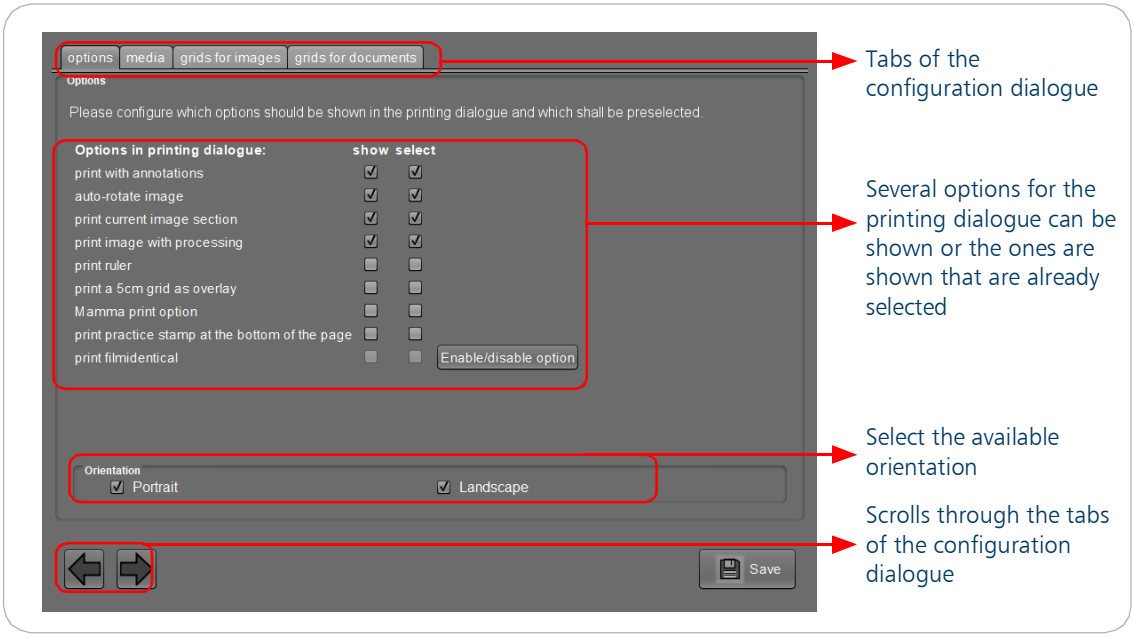


Figure 223. Printer configuration - options

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.

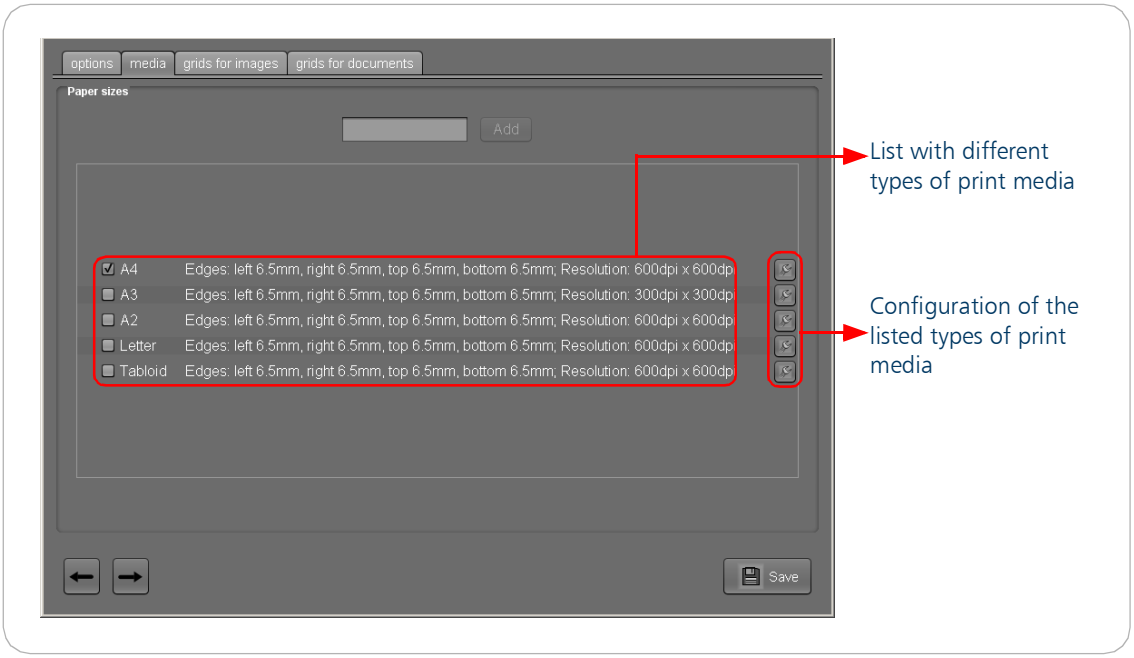


Figure 224. Printer configuration - media

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.

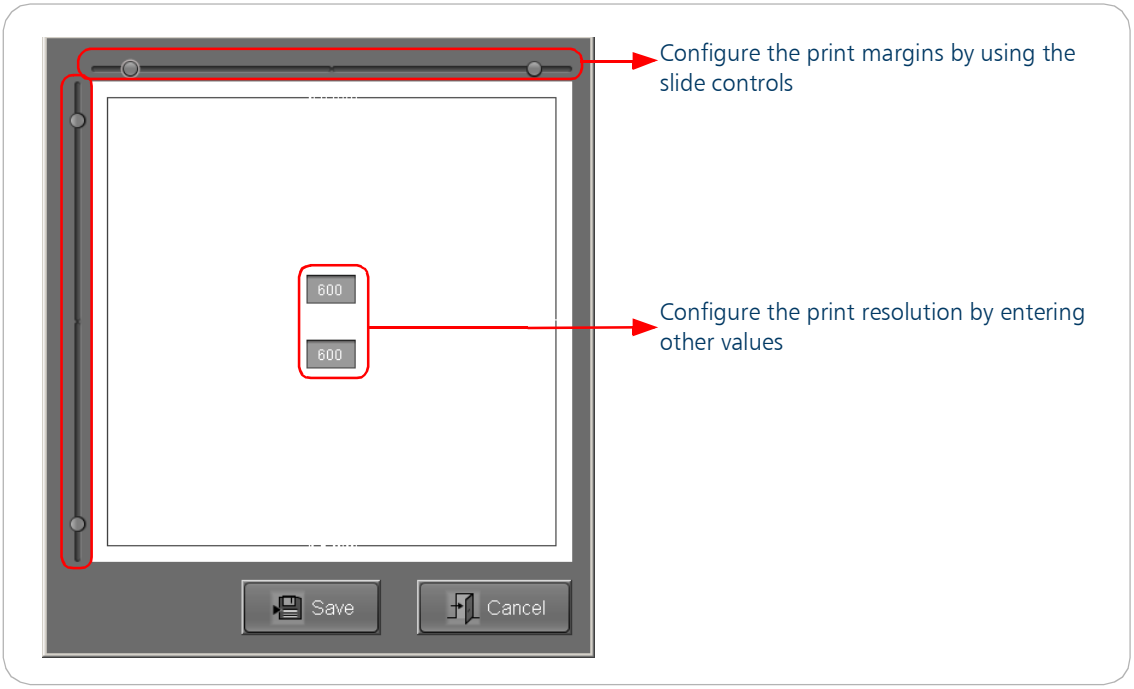


Figure 225. Configuration of the print media

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 side 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.

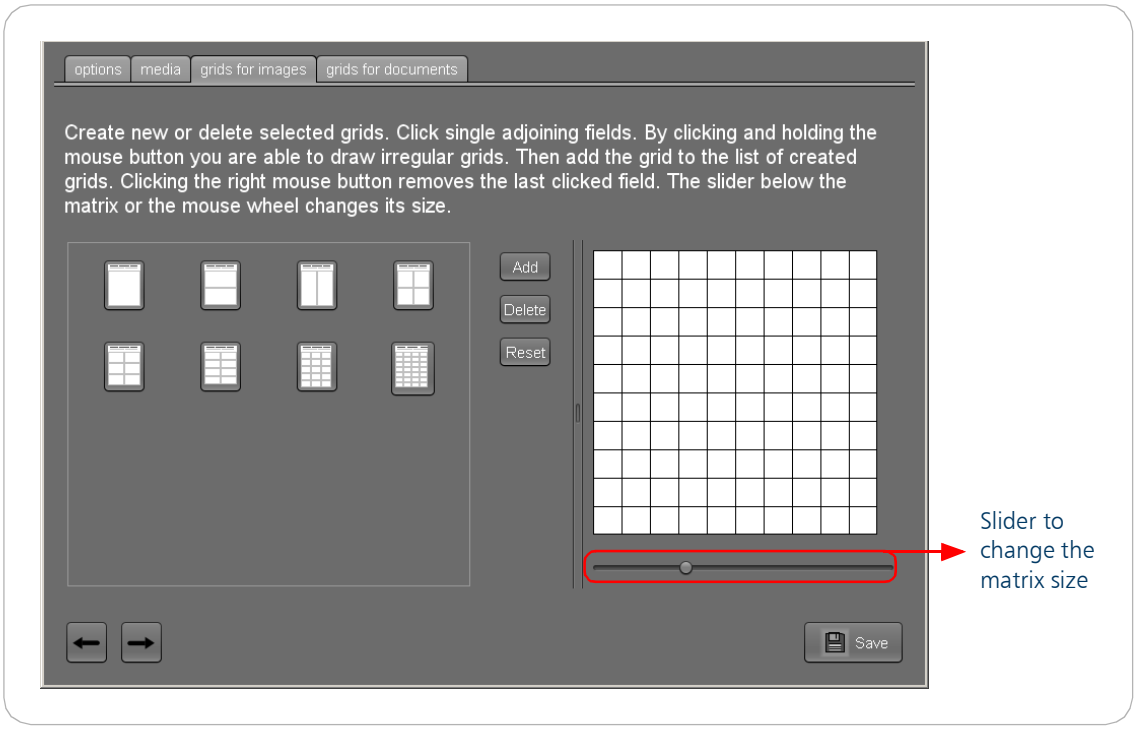
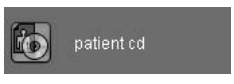


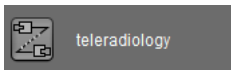
Figure 226. Printer configuration - grids for images

4.17.3 Patient CD - create patient CDs and memory sticks



This function copies all displayed or selected images to a CD/DVD or memory stick. For more information please see “G2003 Patient-CD module“ page 247.

4.17.4 Teleradiology



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.

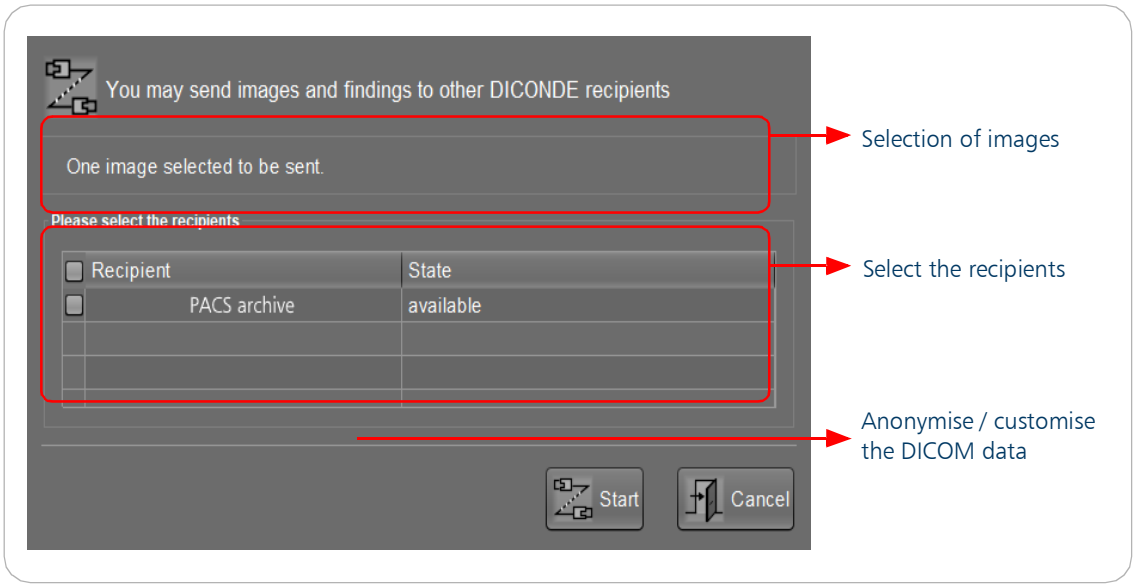


Figure 227. Teleradiology via DICOM Send

The same dialogue appears also in the lists view when clicking on the "Start" button to send images and findings to a DICOM recipient.

First the data must be selected that should be sent. The choice must be made whether the current image, the current series or all selected images or all loaded images should be sent. These can be sent with reports or only reports can be sent.

Then the intended recipient(s) must be selected from the list confirming the recipient by clicking on the far left of the list. If a checkmark appears in the box, the recipient was selected.

The status bar shows whether the respective recipient is ready to receive images or not. If the recipient is ready, images can be sent. The status bar then shows the status: "Sending". Failure to a transfer, is indicated in the status bar by "failed". Now the failed attempts are counted and the number of jobs that are still waiting. This may look like this: "1 ... n error | 2 jobs waiting | pause". Images will be attempted to be sent until the transmission succeeds. If the images were successfully transferred, "Ready" is displayed again in the status bar. Now the desired transfer quality is selected. Here, you can choose between "Default for imagetype", "Lossless", "High" or "Medium". Whereby, the higher the quality, the slower the transmission. The best result gives "Default for imagetype", since it is generally already set for each modality. "Lossless" provides the highest quality, since the compression runs completely lossless. A "High" quality it still gives you a relatively high result. Due to the compression, the image information is already lossy. But there is hardly any difference in comparison to "Lossless" images. The transfer is a bit faster.

"Medium" provides the lowest quality because the compression of all three options is the highest and some image information is lost. This transfer quality is well suited if a fast transmissions is desired. Also, the option "anonymise/customize DICOM data" can be selected. After clicking "Send" a dialogue appears that offers the processing of DICOM data.

If all relevant information has been selected, the data is sent by clicking on the "Start". The status bar indicates whether the transmission was successful or if it failed. Clicking "Cancel" closes the dialogue without any data being sent.

4.17.5 Web share

 Making images available via the internet (or intranet) is becoming a more important daily requirement in the medical practice. One purpose is the distribution of images or other documents in a larger clinic. Equally important is the integration of external referring parties (hospitals, medical practices) or home workstations.

The intention is always the same: faster, cheaper downloading of archived images and diagnoses via the internet or intranet, in diagnostic quality if possible, from every clinic or internet PC.

To accommodate as many requests as possible from the medical practice and hospital, we have developed our *dicomPACS®DX-R* Web Server in conjunction with respected doctors.
With this tool you can easily post images and findings on the internet and share it for selected users.

Depending on the configuration *ORCA® Share*  or web share  will be used.

First of all login with your login data.

4.17.5.1 ORCA® Share

 With *ORCA® Share* you can share DICOM images, findings and files of any format with colleagues and patients. *ORCA View* is the integrated online viewer for viewing and secondary diagnosis of DICOM images.

In the log in dialogue you can log in or create a new account.

After the login, the user has the option to share files with colleagues or patients via *ORCA® Share*, the virtual patient CD or Diagnostic Service. The password can be saved, so that it does not have to be entered again.

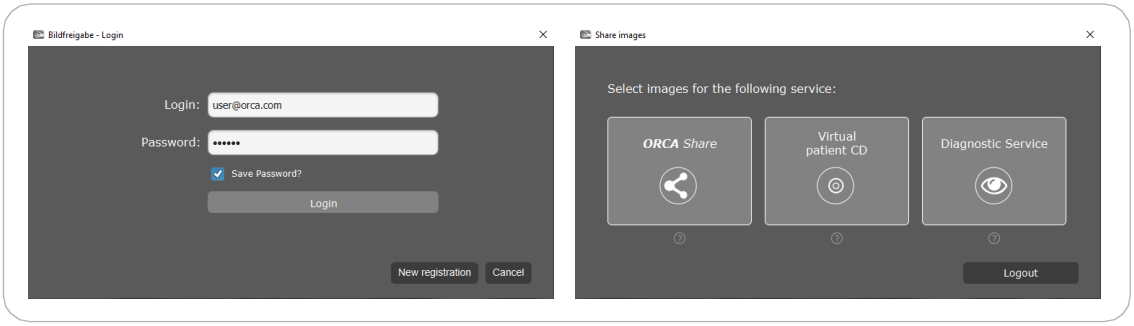


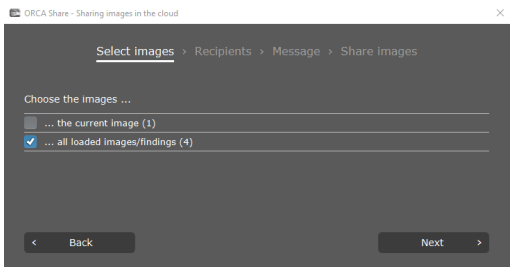
Figure 228. *ORCA® Share* login and select service

Via "Logout" in the dialogue, a user can log out again if desired.

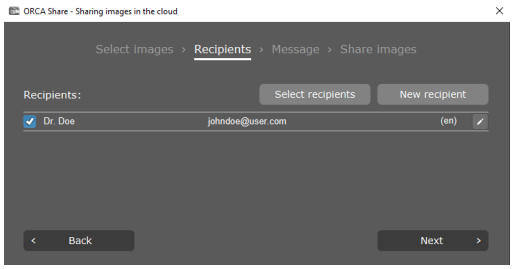
Share images directly with *ORCA® Share*

Single dialogues guide the user step by step through the sharing process and offer the following overview and options:

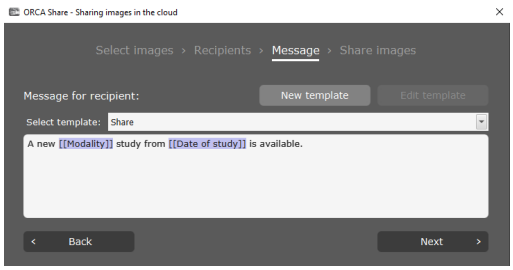
- Select images to share
- Select recipient or enter recipient
- Select a text template for sharing or create a new one
- Select the period the study is available for the recipient
- Anonymise images
- Block further sharing of the shared content by recipient



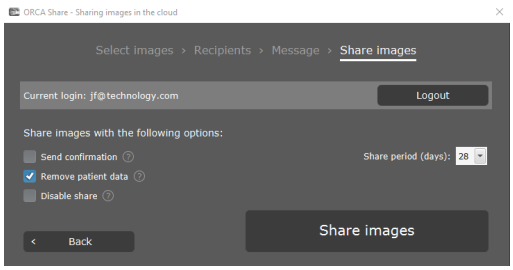
Select the images to be shared



Select recipient. Several recipients can be selected. New recipients can be entered.



Choose a message for the recipient. Either use a template or write your own message. "New template" created a new text message that can always be reused.



Share selected images with the selected recipient. A confirmation email can be sent to the sender. Set the share period (max. 28 days). Further sharing by the recipient can be blocked.

Figure 229. *ORCA® Share* dialogue

With *ORCA®* it is also possible to display images automatically in *dicomPACS®*. The images are always loaded in DICOM format without unloading the viewer.

Virtual patient CD

With the virtual patient CD, images can be shared directly with the patient without burning a CD or requiring an additional *ORCA® Share* account for the patient. The patient only needs access to the internet, has to go to an *ORCA®* website and after entering his patient data he can easily, conveniently and securely access his virtual patient CD.

To create a virtual patient CD, the images must be selected in the dialogue that opens.

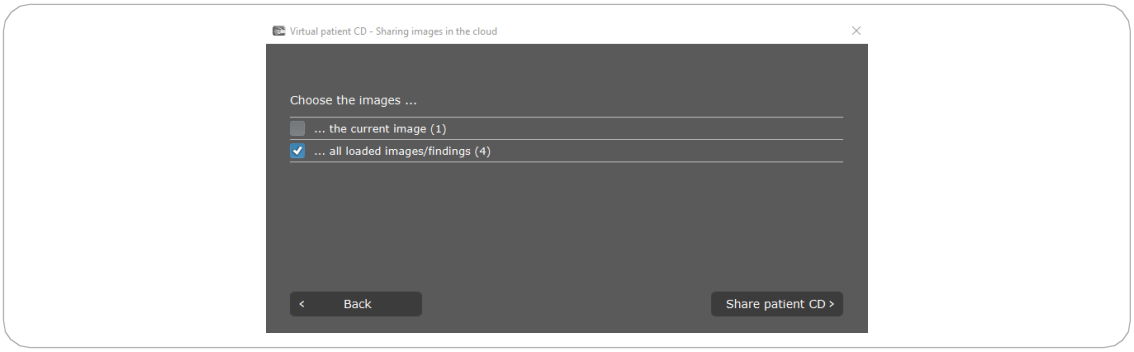


Figure 230. Select the images for the virtual patient CD

After the image selection, a code is generated with "Share patient CD". The code is displayed in a new dialogue together with the patient data (name and date of birth) and the release period.

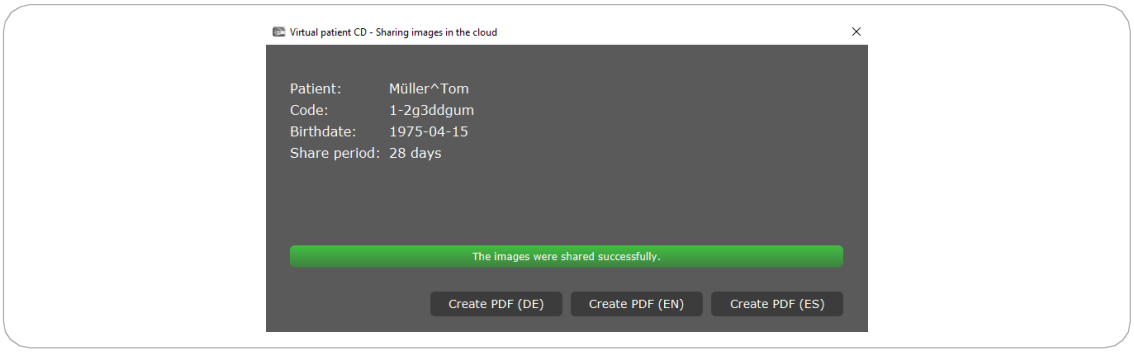


Figure 231. Create virtual patient CD

The virtual patient CD is now ready to be viewed by the patient. Using "Create PDF", a PDF is generated which contains the most important data for the images just shared. The PDF serves as a handout for the patient to quickly call up the virtual patient CD. It contains the link to call up the website and the access data to view the images. This PDF can be generated in three languages (German, English, Spanish).

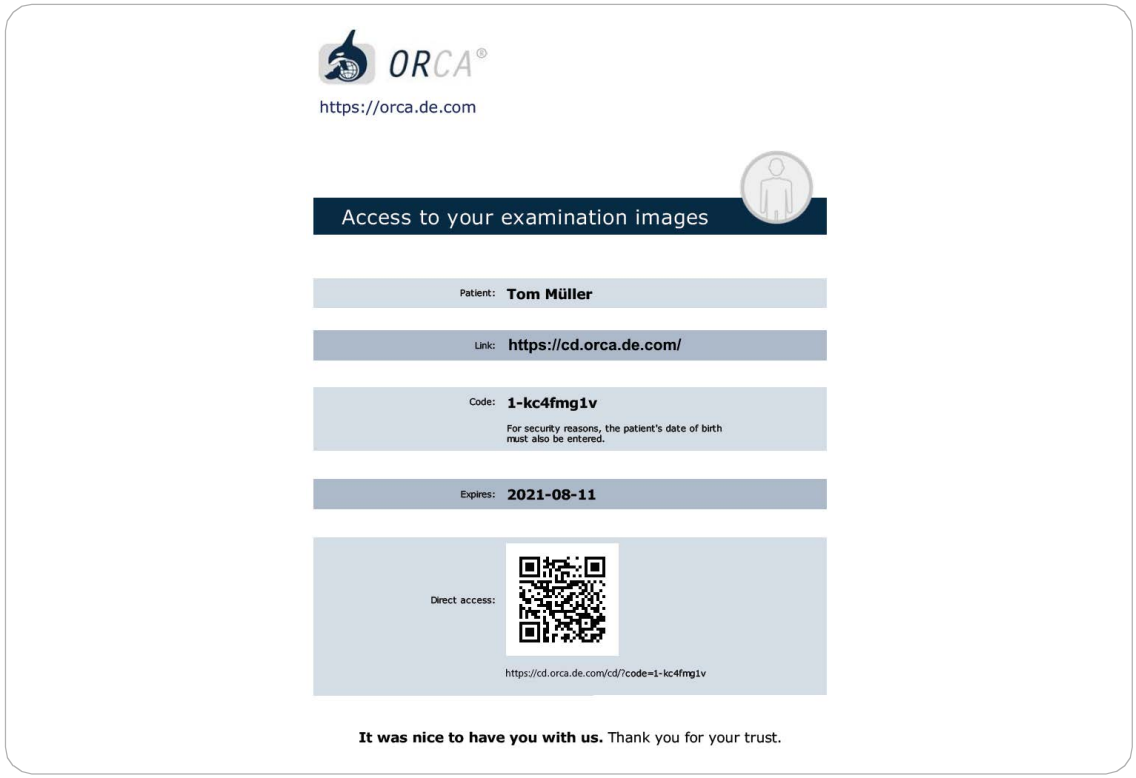


Figure 232. Printout with the access data for retrieving the virtual patient CD

To view the images just shared for the virtual patient CD, go to the following website:

- https://cd.orca.de.com/

The access code is entered there to view the images for the virtual patient CD. Alternatively, the QR code on the printout leads directly to the shared images.

When calling up the virtual patient CD, a distinction is made between whether the *ORCA®* account used to create the virtual patient CD is used in the human or veterinary area. For images that were shared in the human area, the patient's date of birth is required in addition to entering the access code.

Figure 233. Enter the code to view the shared images

In addition to calling call up the website by entering the data in the browser, alternatively the QR code on the printout can be scanned. To view the patient CD an additional query of the date of birth in the format YYYYMMDD is made after entering the access code.

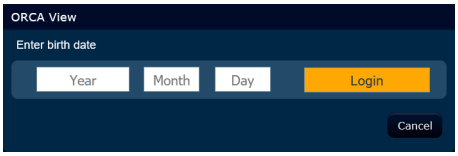


Figure 234. Security query for patient CD in the human area

The virtual patient CD can be accessed for 28 days. All patients can use the export button to save the images on the virtual patient CD locally on their PC so that they are still available after the 28 days have expired.

A new access code is generated for each virtual patient CD. This is displayed to the physician who created the virtual patient CD in the *ORCA®* main page.

Figure 235. Access code for the patient CD in *ORCA®* main page

4.18 Diagnostic Service

With the Diagnostic Service, a simple exchange with various external services has been integrated.

Note

For more information on connecting a Diagnostic Service, please contact info@or-technology.com

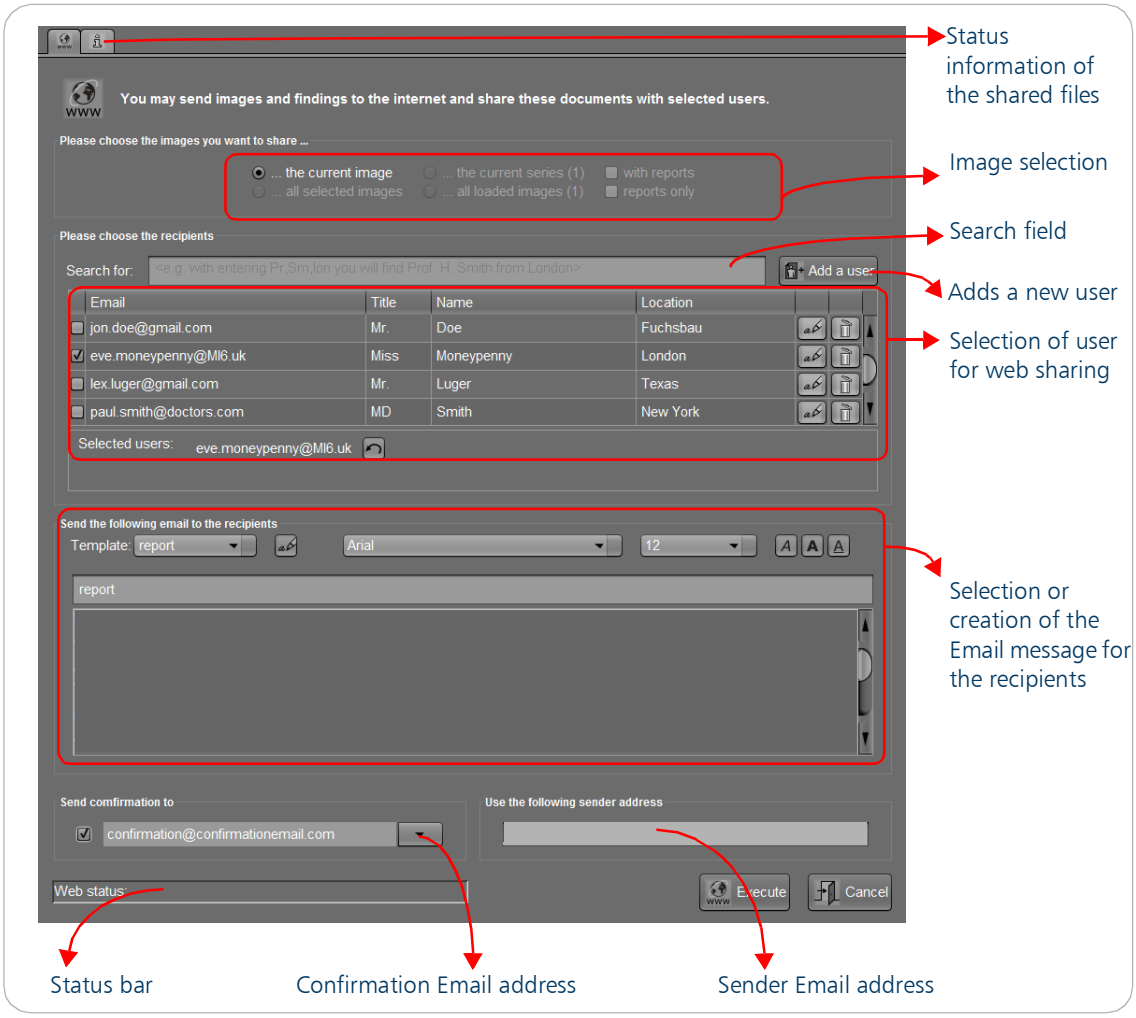


Figure 236. Webshare tool

Search field

Various search words can be entered into the search field in order to find an user. When searching for a name, parts of the name can be used. For example when looking for a patient named „Prof. H. Smith from London“, you can enter either the whole name or just “Pr“, “Sm“, “lon“ or “Sm“. With “Sm, lon“ all users whose surnames begin with “Sm“ and whose location begins with “lon“ are indicated.

Add new user

By clicking on the button “Add a user“, you can enter a new user and add them to the selection box.

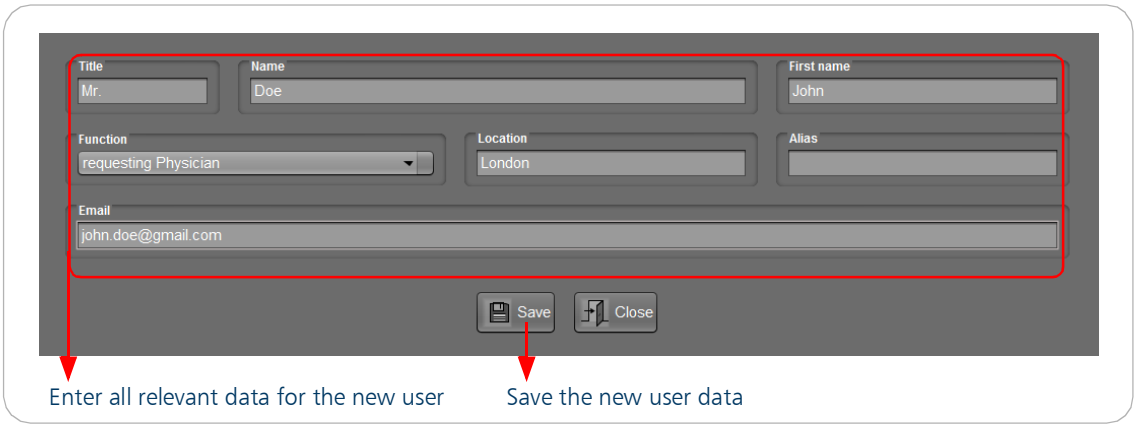


Figure 237. Enter user data

In the field "alias" you can enter for instance the specialisation of the doctor. Then you can search for the term entered here in the table of users, along with Email, title, name, location, see the search field description.

All doctors with the entered specialisation will then be displayed.
In the field "2nd eMail" you can enter a second Email for a user. However, only the first Email will be used for sharing images and findings.

User selection

Select the users whose images and findings will be shared here. The user is selected by clicking on the small box in the first column of the table. It is possible to sort the table e.g. by name or location. Therefore just click on the according head of the according column.

The user is deselected by re-clicking in the box or by clicking the icon  next to the Email address below the table. An unlimited number of users can be selected for web sharing. The user data can be edited by clicking on the icon  in the table. The dialogue for creating new user appears.

The user can be deleted by clicking on the bin button  in the table.

Selection or creation of the Email message

Use these fields to select, create or edit the Email which users will receive once the images and findings are available on the Web server.

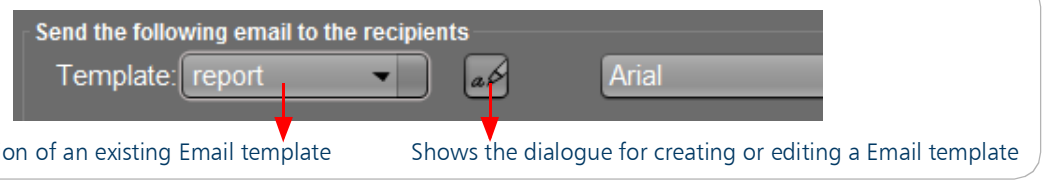


Figure 238. Email configuration

The following dialogue is used for editing Email templates. All functions are similar to those in WordPad or MS Word. You can for instance edit existing templates, create new templates and change fonts.

Use a right click in the document to select a wildcard whose content will later be read from the Web server and filled with the correct values.

Figure 239. Tools of the template builder

 Saves Email messages:

- all changes to a selected Email message are saved,
- for a new Email message a small window appears in which a name for the new message must entered

Confirmation Email address

Optionally, you can enter a confirmation Email address. If the box left of the Email selection is not ticked, no confirmation Email is sent. If the box is ticked, a confirmation Email is sent to the selected address.

Sender Email address

The sender address can be edited by the configuration dialogue or can be edited in this dialogue if the according function is activated. In this case the sender address can be changed by entering a new one.

PRACTICAL HINT

For Web sharing you must enter a sender Email address. Only if an Email address has been entered will the "Execute" button be activated.

Status bar

The status bar shows if the respective recipient is ready to receive images or not. If the status bar reads "available", the images and findings can be shared. The status bar then reads "sending". If the transfer fails the status bar reads "error". All failed attempts and the number of waiting jobs are displayed as follows: "1… n error(s) | 2 job(s) waiting | pause". The images and findings are re-sent until the transfer has been successful. When the images have been transferred, the status bar displays "available".

Status information

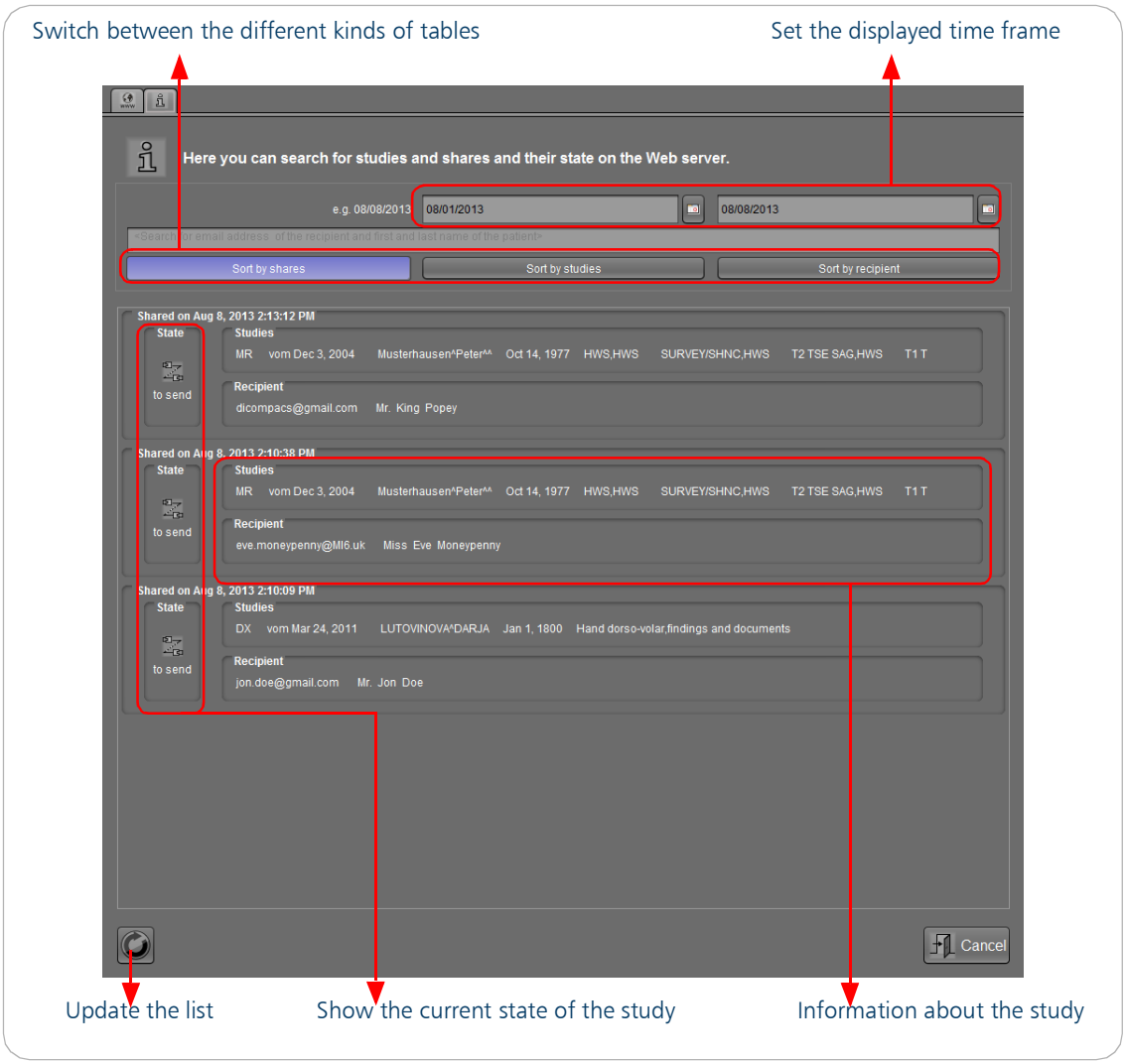
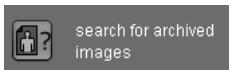


Figure 240. Status information

This dialogue displays the status of each study and share in the Web server.
Three tables are available which were differently sorted like sort by shares, sort by studies and sort by recipient.
The state of each entry can be “to send”, “released”, “deleted” and “seen”.

Webshares can be deleted directly from *dicomPACS®DX-R*. It is thus possible to cut off the access via the web interface to selected studies. By pressing the Delete button the study is no longer available to the Recipient. The communication is carried our directly from the workstation with the webserver, that means an internet connection is required.

4.18.1 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.

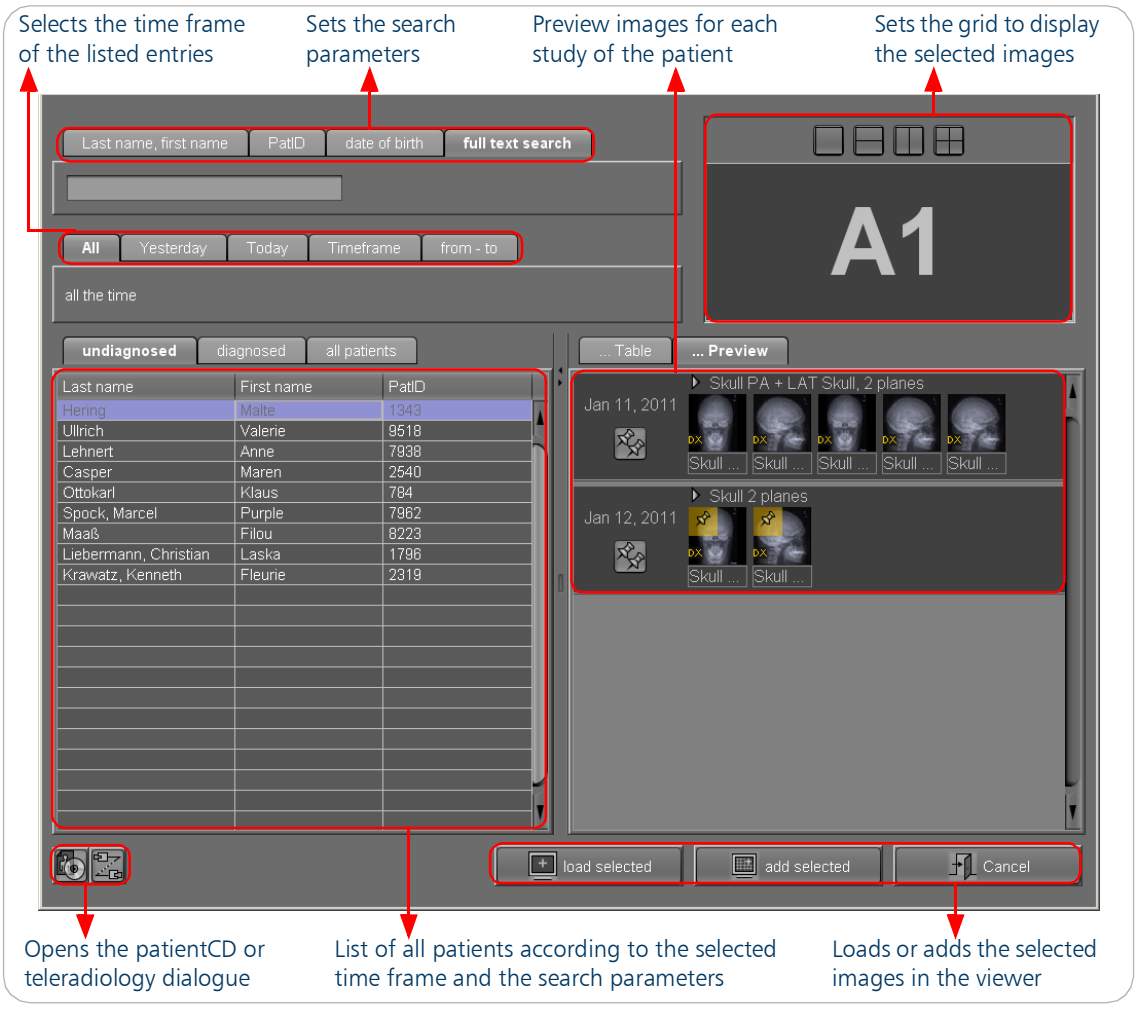


Figure 241. Patient management with preview images

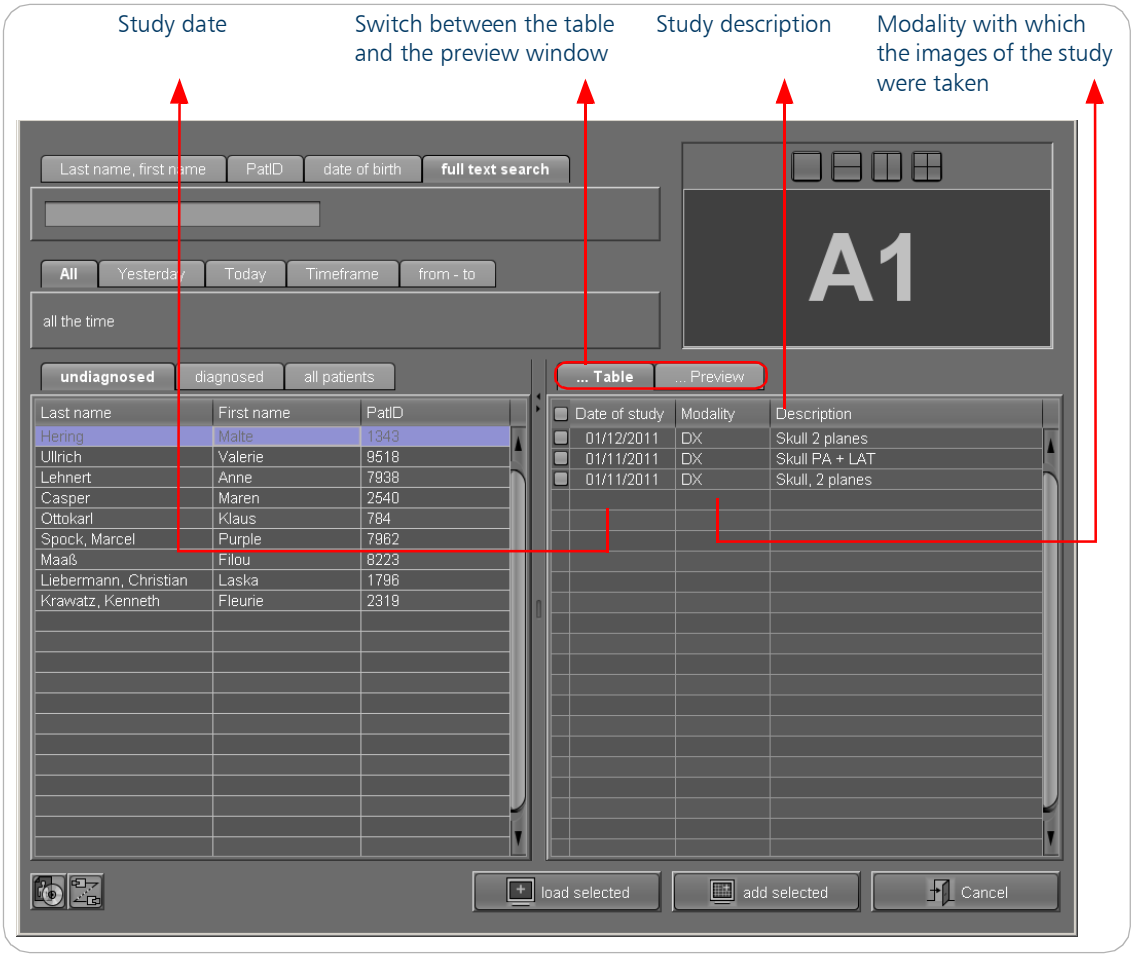
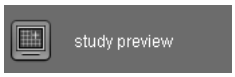


Figure 242. Patient management with table view

4.18.2 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.

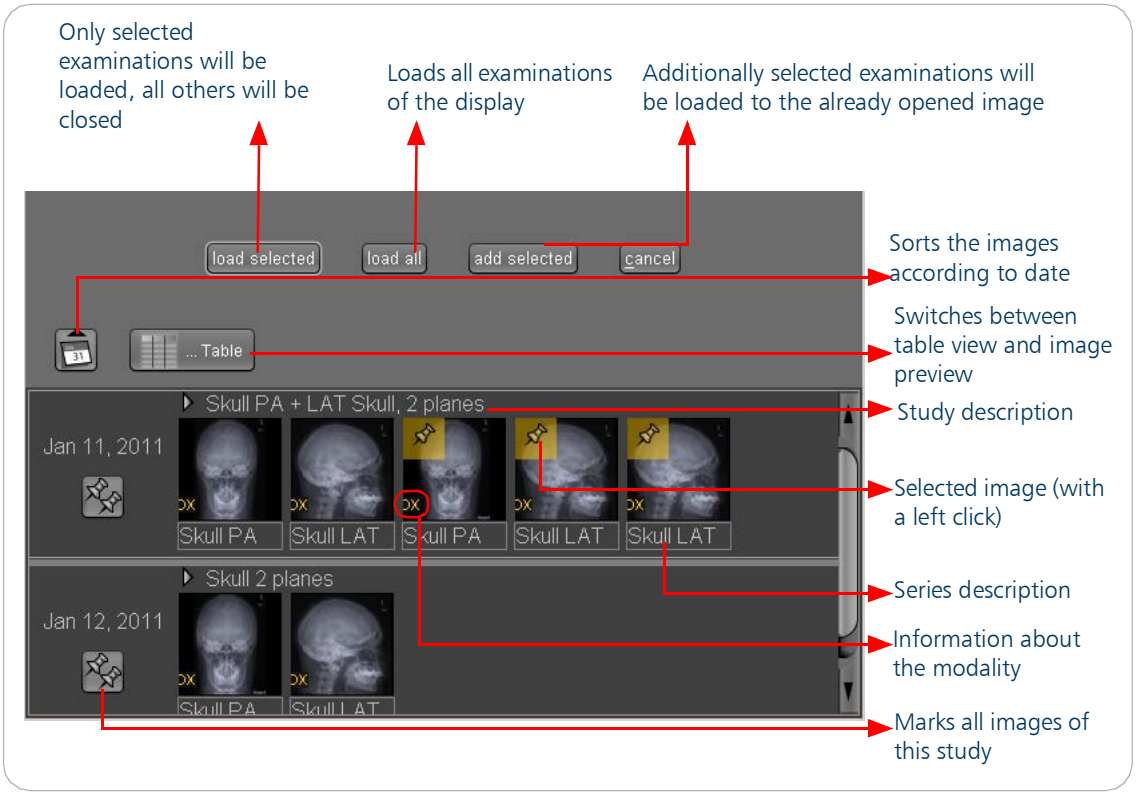


Figure 243. Study preview

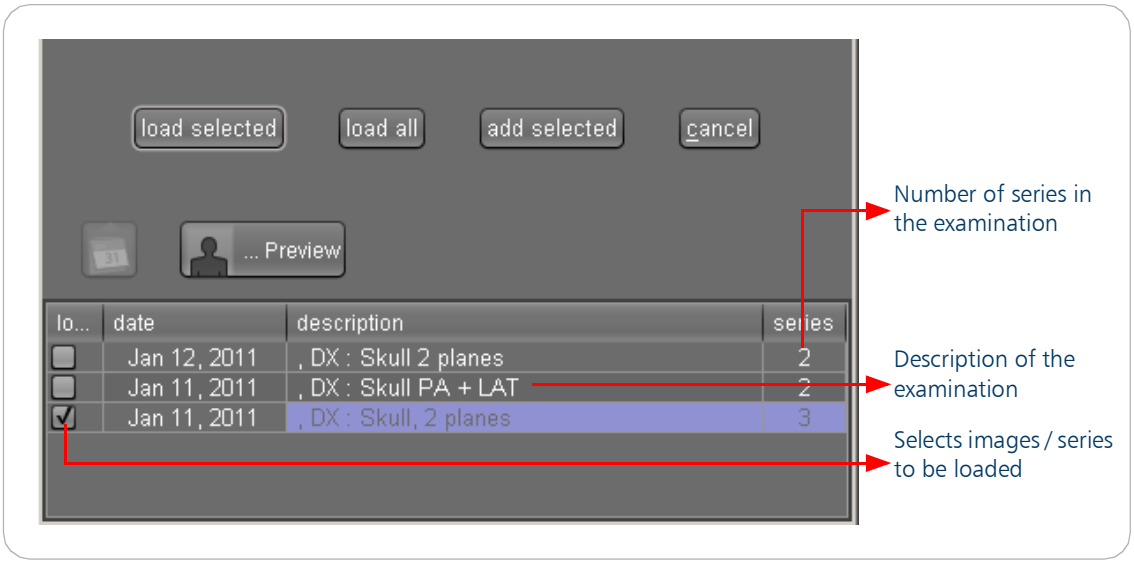


Figure 244. Study preview - table view

4.18.3 Archive snapshot

 With this tool, you can e.g. create documentation for prostheses planning. Thereby the current image is archived with all annotations (prostheses, etc.) as new image to the study. The annotations cannot be edited after archiving. The image is used purely for documentation purposes.

By clicking on the icon the archiving is started immediately. During archiving, the image is marked by the archive icon centred at the top of the image. After archiving the icon disappears.

After archiving, the image is available in the same study as a planning image. The patient has to be loaded again in the viewer to display the archived snapshot in the navigation bar.

Figure 245. Archive snapshot

4.18.4 Create a finding

 You can create, sign and review findings.

The dialogue is used with teleradiology. The following scenario is assumed: Image recordings of a patient are made in a hospital over a weekend and the images sent to a doctor in another hospital. The doctor diagnoses the images with the help of the "create findings" dialogue and returns the result back to the hospital by teleradiology.

Findings, including attached documents, which were created in the web share or ORCA (OR Cloud Archiving with Share function) are automatically displayed in *dicomPACS®DX-R*.

The “create a finding” dialogue looks like the following:

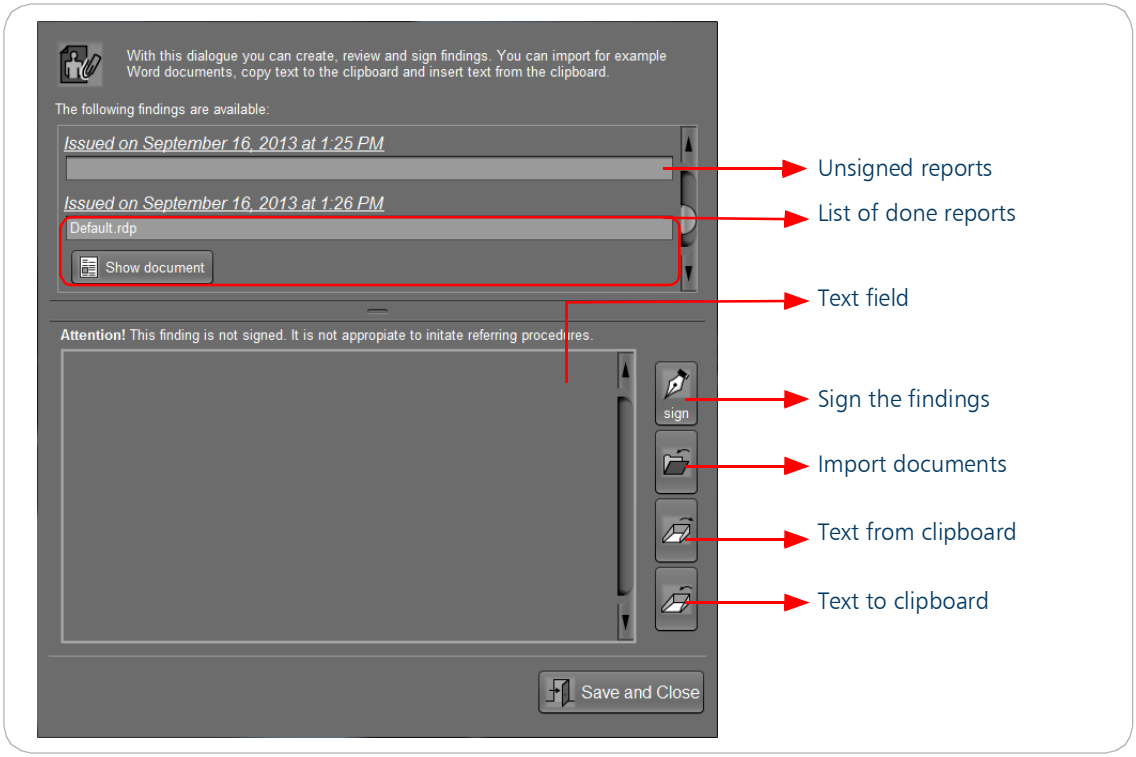


Figure 246. Create a finding

List of done findings

If a finding was created and archived, then the finding is indicated here and can be called up from here. The finding is identified by its creation date and time of day. By a click on “Show document” Microsoft Word starts automatically and the finding is indicated.

Unsigned finding

If no signed findings are available, this is displayed. Otherwise findings already signed are assigned to the patient last attended with details of the creation date and time of day.

Text field

The finding is entered into this text field. Because this finding is not signed, an “Attention” warning appears above the text field. This warning is always there, because a finding can’t be processed and signed at the same time.

Sign the findings

Once the finding has been written, it can be signed by a click on the icon 

. It is then signed and assigned to the finding list with the creation date and time.

Import of documents

You can also append a Word document to a finding by clicking on the icon  . A typical Windows dialogue box appears and you click on the "Open" icon for the required document. Documents are automatically signed after the import and the document is displayed immediately. If no text is inserted, the document name is used as text and the finding is signed.

Text from clipboard

With the help of this icon  any text for the finding can be copied from the clipboard into the text field.

Text to clipboard

Where existing written text is to be copied from the text field to the clipboard, the text is simply defined with the right mouse button and by clicking on the icon  . In this way the text is further available on the clipboard (until new text is copied into the clipboard). Where nothing is defined in the text field and the icon is clicked on, all signed examinations of the current examination are saved in the clipboard with creation date and clock time.

If any findings have been created, these are also shown in the navigation bar and while loading images in the image preview. At a left mouse click on the icon "create a finding", the dialogue opens.

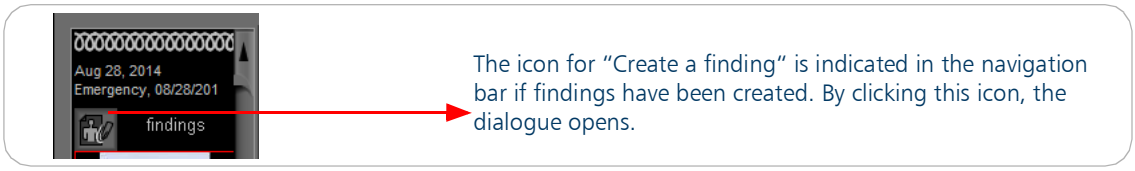


Figure 247. Icon in the navigation bar

In the lists view the clip symbol next to the "i" displays whether a signed finding was created for this study.

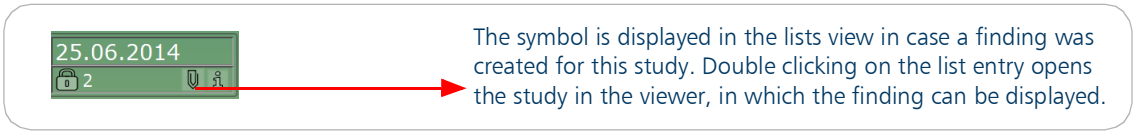
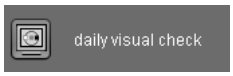


Figure 248. Available finding is displayed in the lists view

If there is an available internet connection, also the findings, that were created with *dicomPACS®MobileView* are loaded and are identified by the clip symbol.

All available signed findings can be opened in the viewer.

4.18.5 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/ATTENTION!

EN: 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.

FR: Après un test d'acceptation réussi, certaines valeurs doivent être vérifiées par l'opérateur à des intervalles définis. L'affichage précis des niveaux de gris doit être vérifié visuellement au moins une fois par jour.

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 *dicomPACS®DX-R*. The test can be done immediately or later. If the test is to be conducted later, the dialogue keeps reappearing during the work with *dicomPACS®DX-R*.

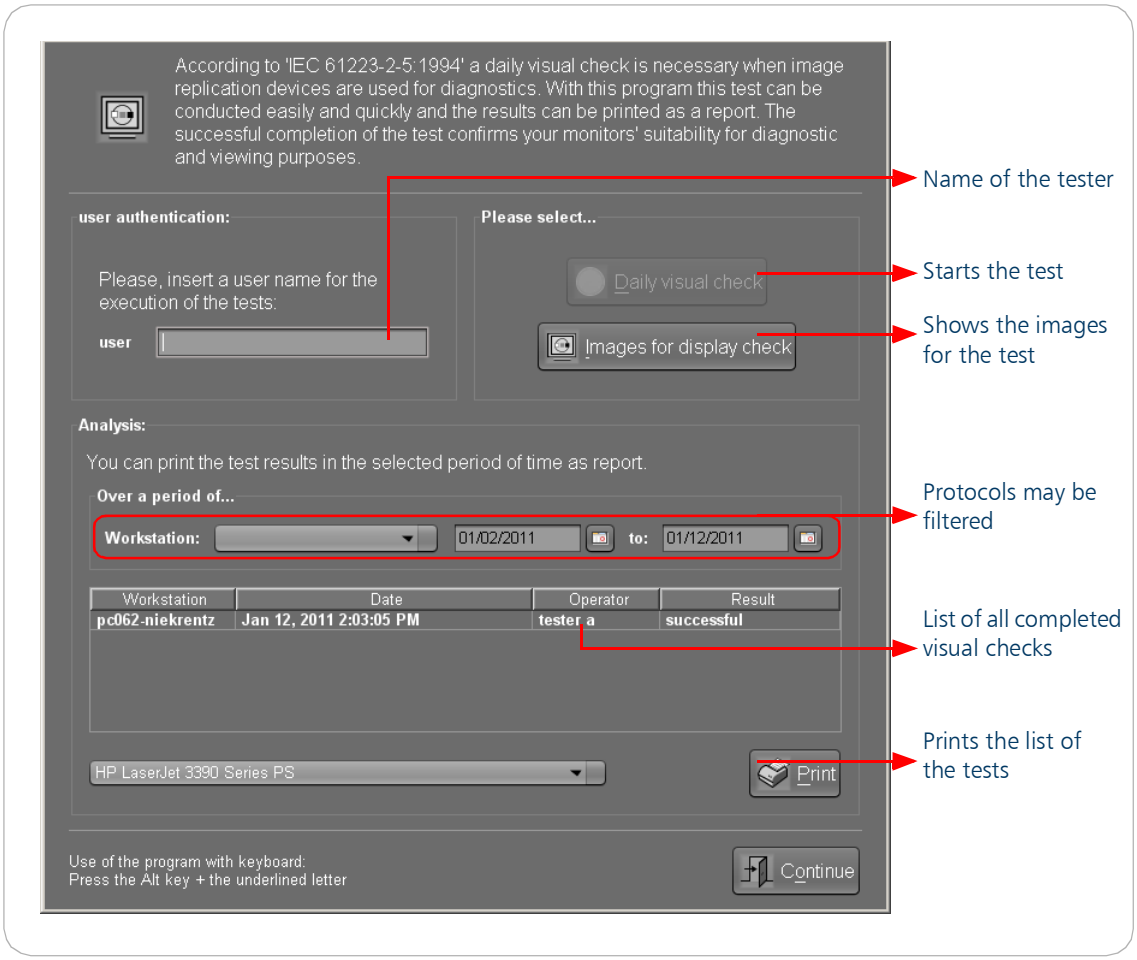


Figure 249. Daily visual check

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

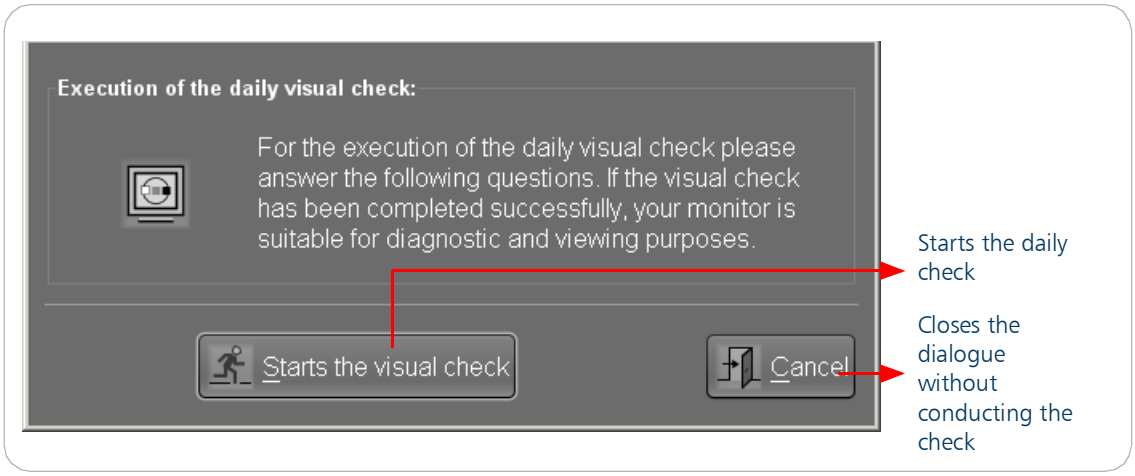


Figure 250. Start the daily visual check

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.

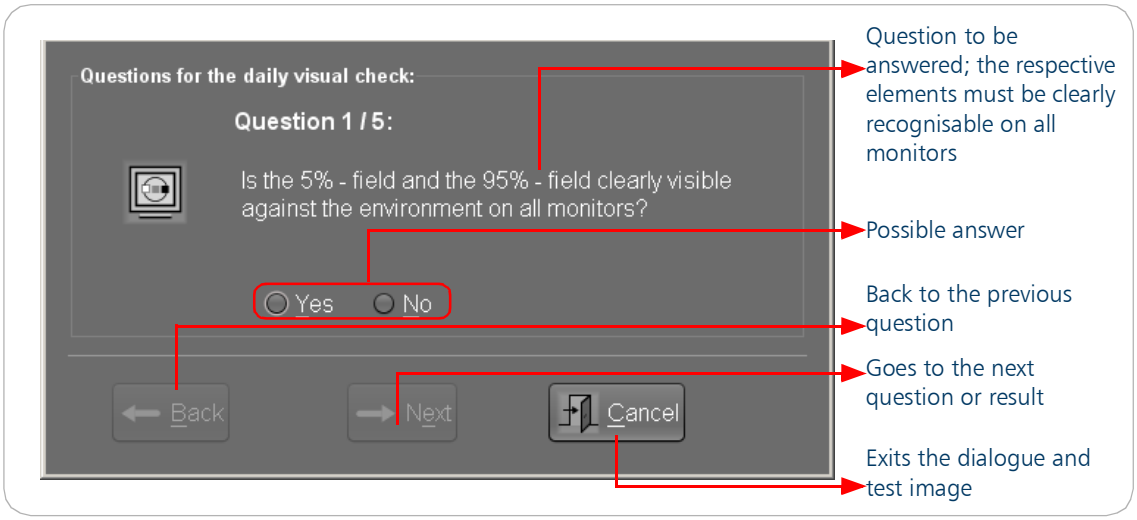


Figure 251. dialogue box - daily visual check

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.

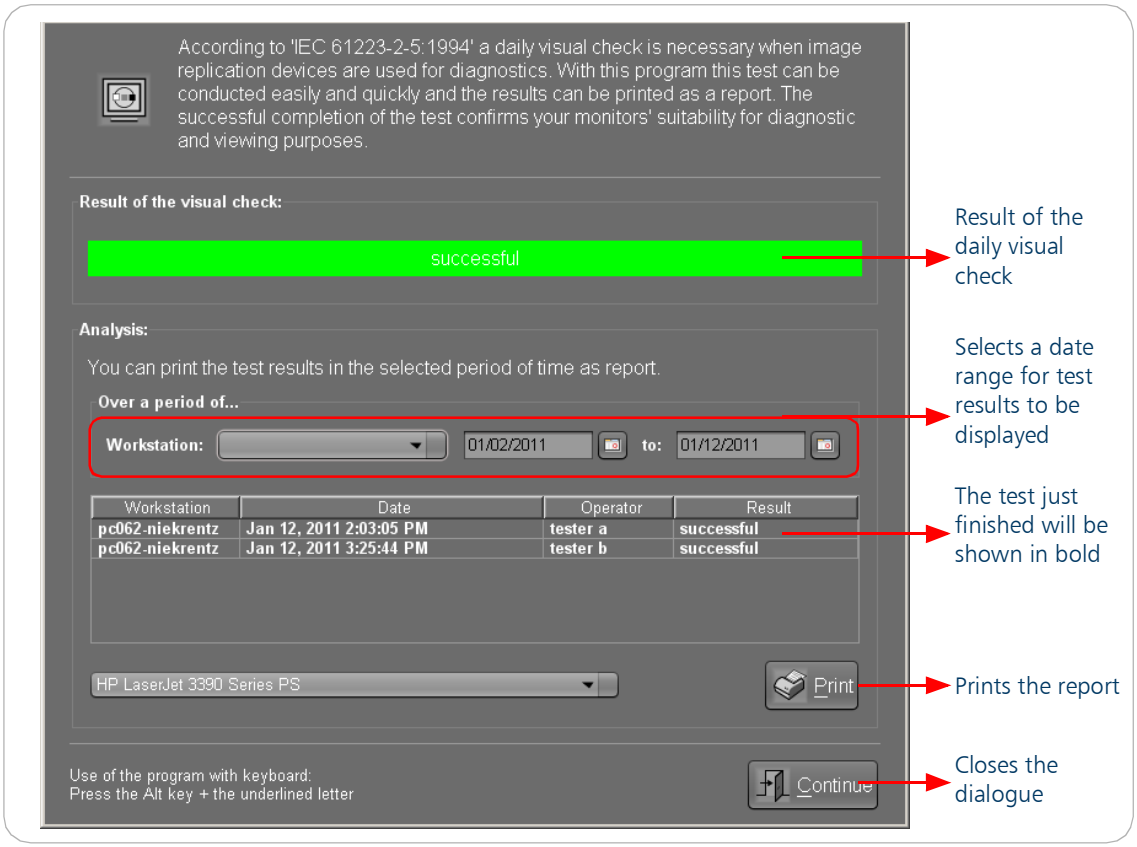


Figure 252. Result of the daily visual check

CAUTION/ATTENTION!

EN: 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.

FR: Si le résultat du test est un « échec » et que les images sont chargées dans la visionneuse, un triangle d'avertissement apparaît. Il est possible de répéter le test mais en cas de nouvel échec, les écrans ne sont pas adaptés à des fins de diagnostic et de visionnage. Les écrans doivent être vérifiés par un ingénieur et réajustés si nécessaire.

4.18.6 Sending Emails

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

Note

If no encryption is used (e.g. when sending unencrypted Emails), there is a warning when you click on "Send".

To call up the email dialogue, an image must first be loaded.

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

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

Note

The option anonymise/customize DICOM data can only be selected when the image format “DICOM” is chosen.

For more information on anonymising DICOM data, please see page 227.

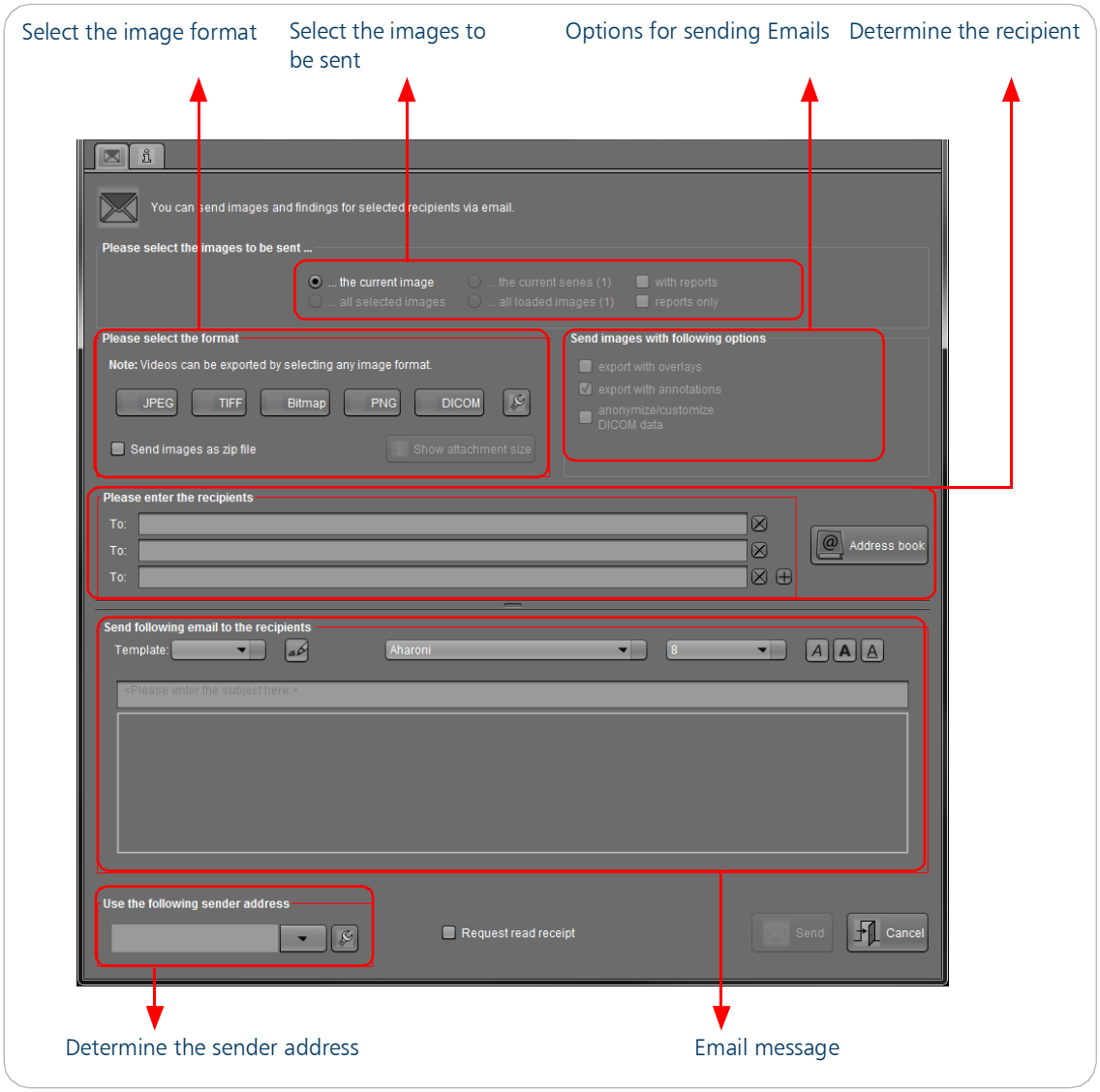


Figure 253. Sending email

Select image format

In the Email dialogue 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 in the section "Please select the format".

Figure 254. 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 send the data as 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.

Settings for export of images

The following options are selectable when emailing image data:

- export with overlays
- export with annotations
- anonymise / customise 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

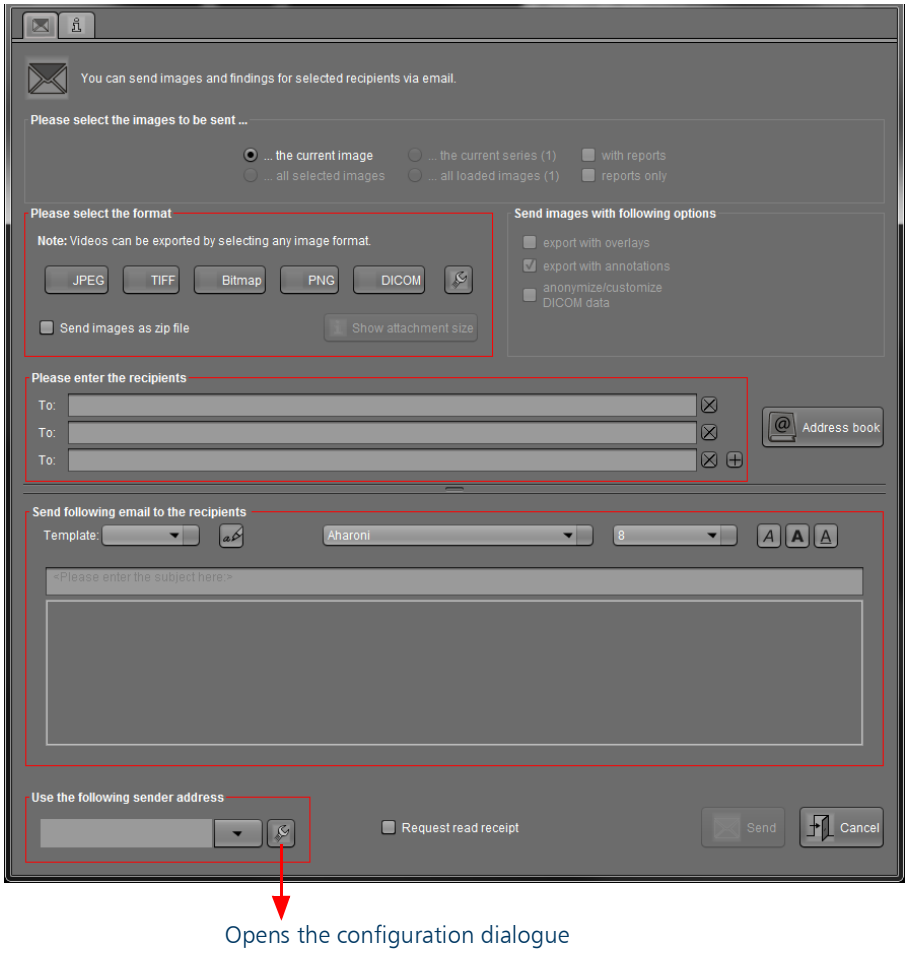


Figure 255. Sending email dialogue

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

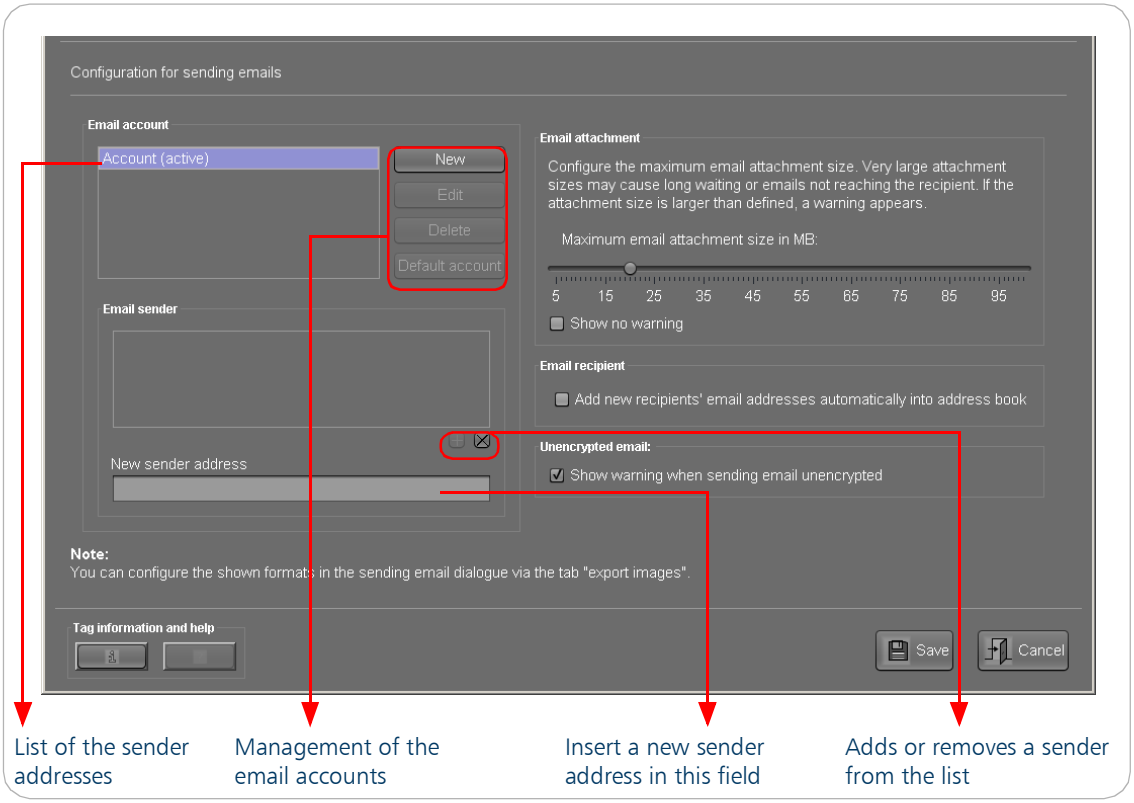


Figure 256. Configuration dialogue

- Select "New" to configure a new email account
- The following dialogue indicates the data to be inserted:

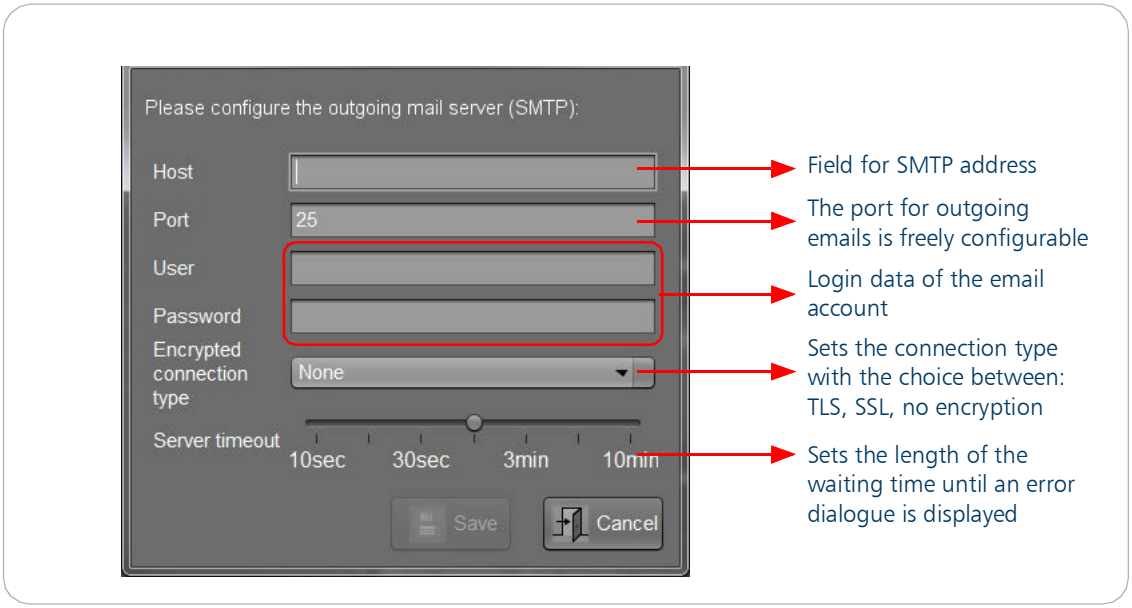


Figure 257. Data for the email account

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" dialogue by clicking on the respective button
- Open the address book by clicking on the respective button 

- To add a new recipient, click on 

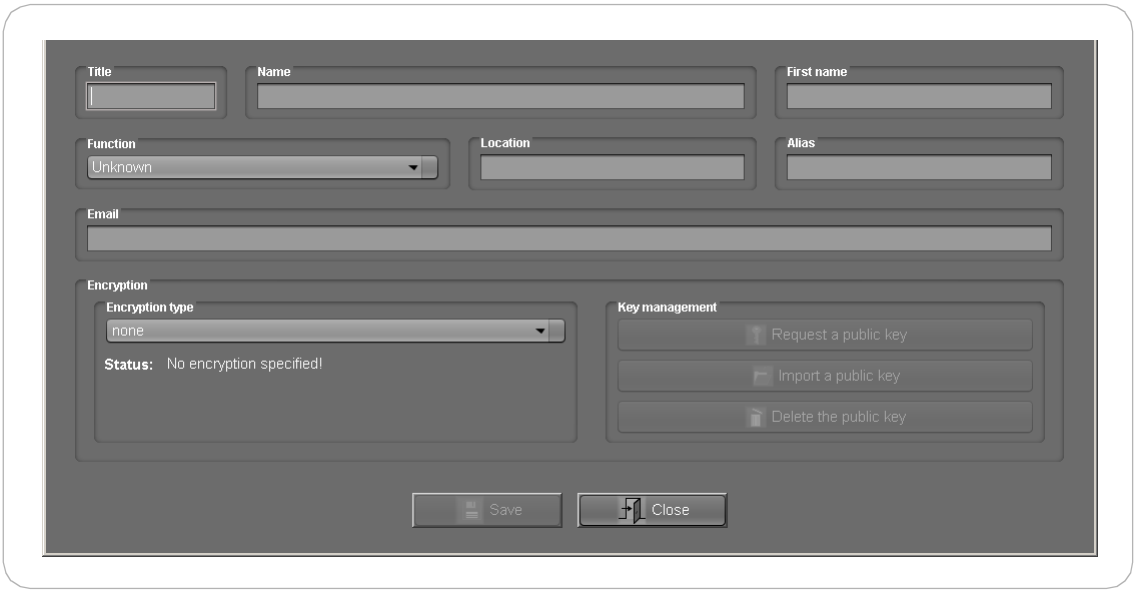


Figure 258. Create a new recipient

- 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.

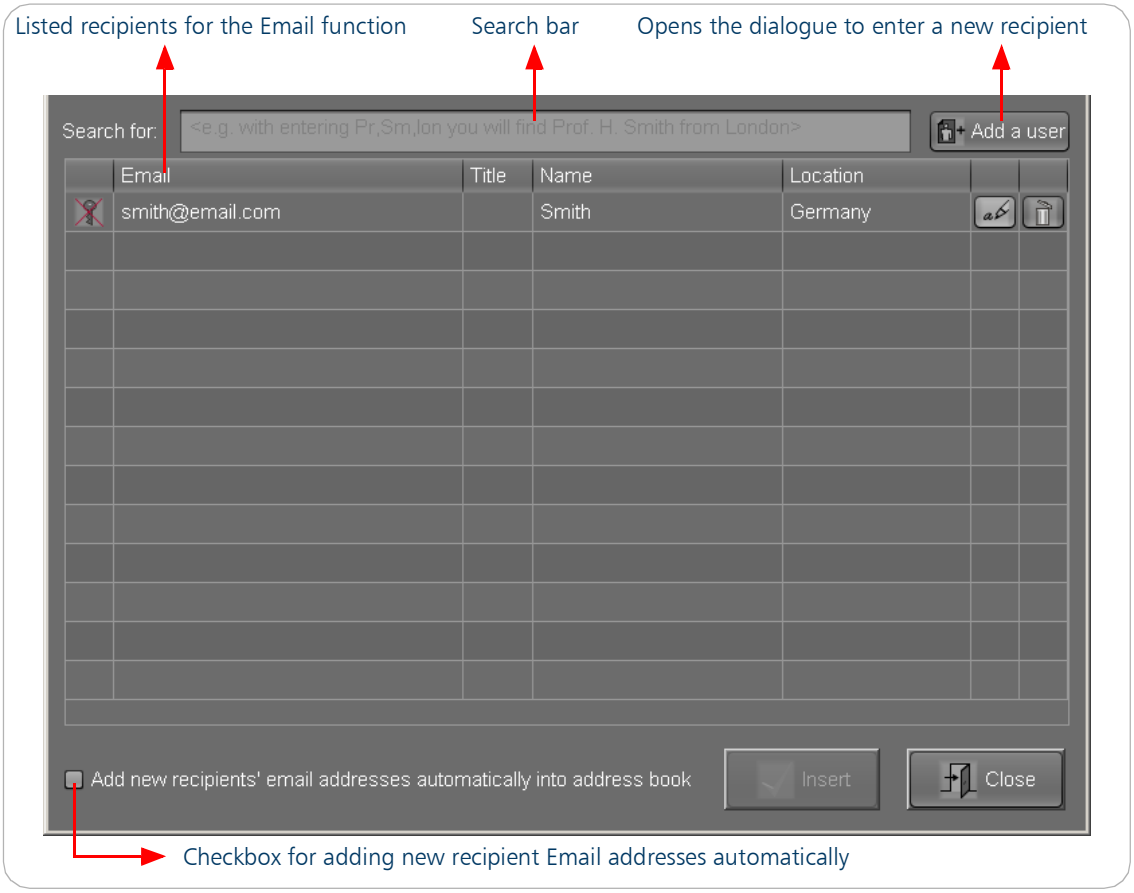


Figure 259. Address book

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”.

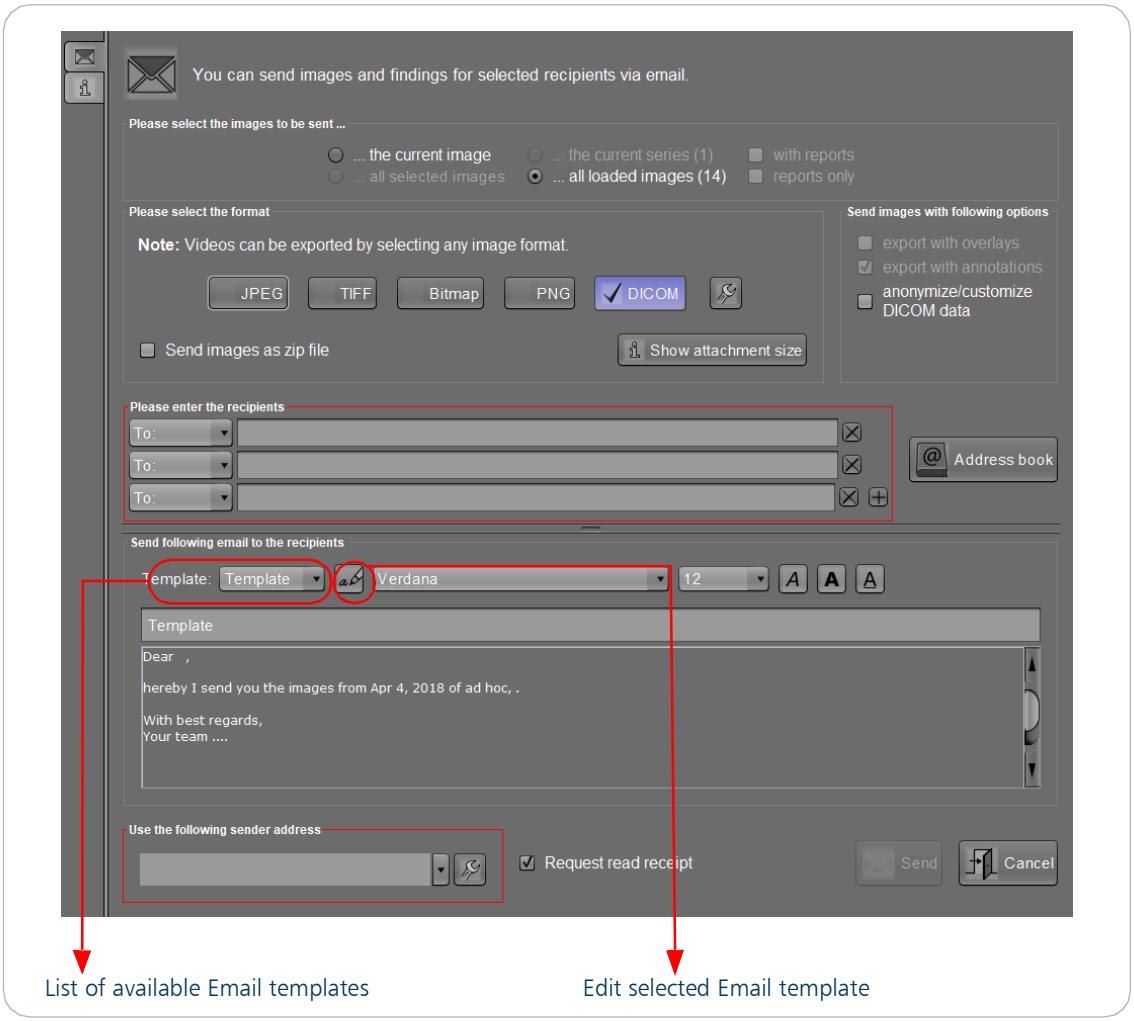


Figure 260. Send an Email

- 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 261. 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.

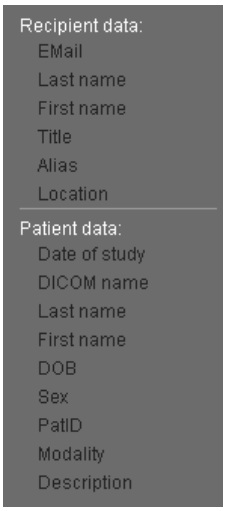


Figure 262. Selection of wild-cards

- 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 template 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 *dicomPACS®DX-R*.

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 *dicomPACS®DX-R* to ensure the transmission of encrypted Emails.

CAUTION/ATTENTION!

EN: 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 add-on "Enigmail"). MS Outlook 2010 does not support encryption.

FR: Pour chaque destinataire d'e-mails cryptés, une PublicKey doit être demandée. Le destinataire doit avoir un programme de messagerie électronique compatible (MS Outlook 2003, 2007 ou un logiciel gratuit comme Thunderbird avec l'add-on « Enigmail »). MS Outlook 2010 ne prend pas en charge le chiffrement.

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 263. Select the encryption

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

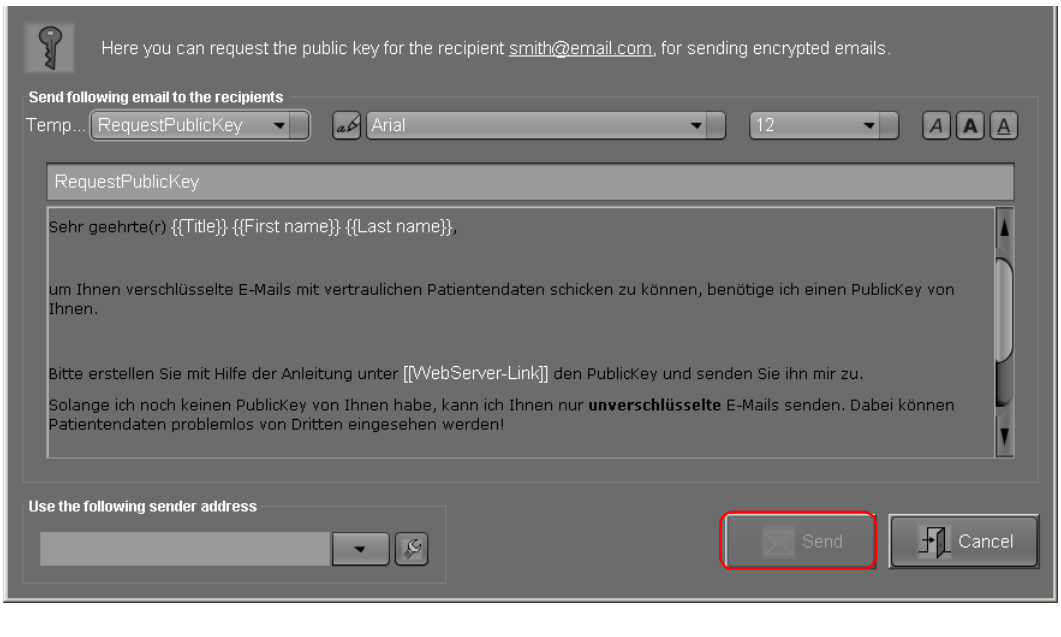


Figure 264. Sending the request of the public key

- 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.

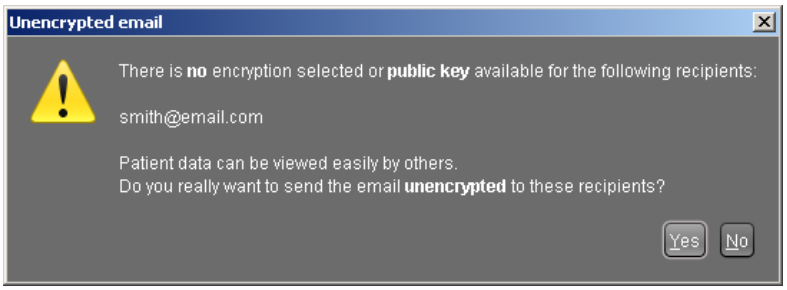


Figure 265. Warning message

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.

dicomPACS®DX-R copies the DICOM files and replaces or removes all data fields that are required according to the configurable profiles and desired changes.

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

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

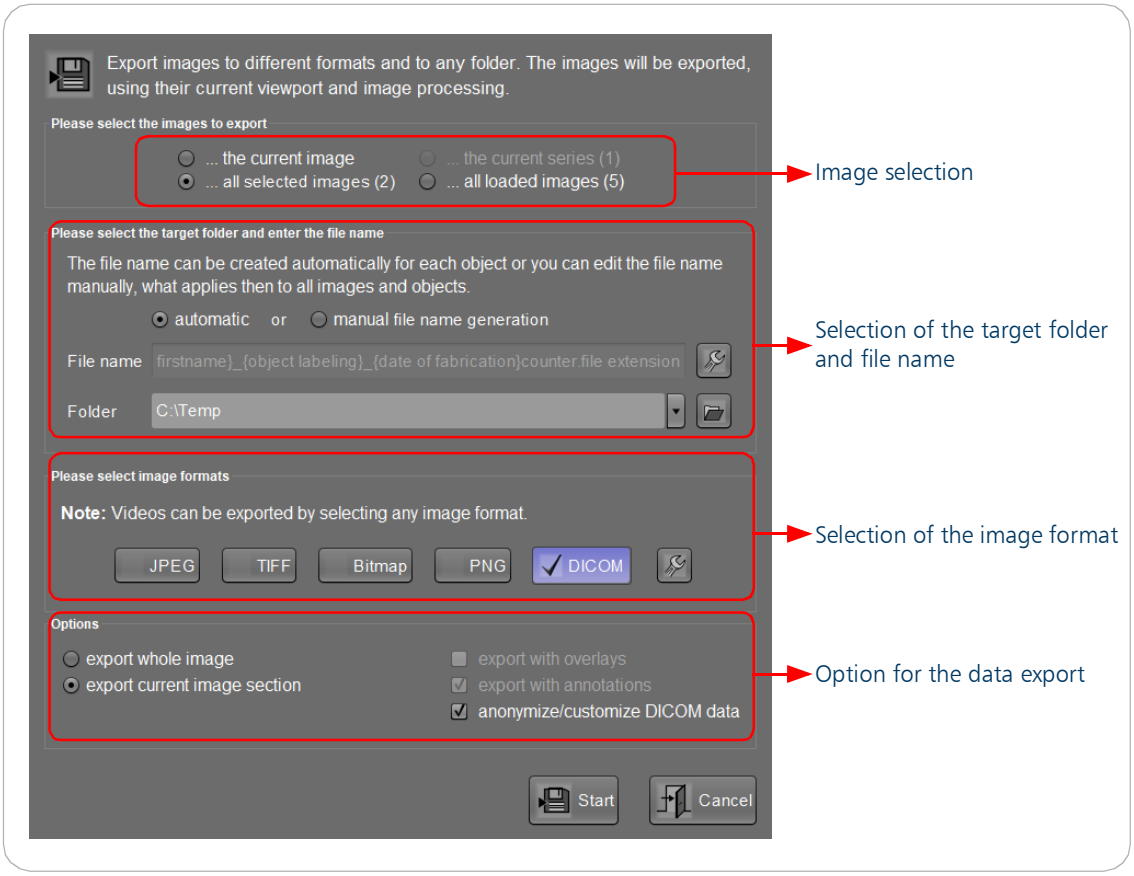


Figure 266. Configuration of file name and image formats

Some 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, date of birth, address, IDs, etc.
- Use random data - to alienate the data, random names, dates and IDs are used for random values

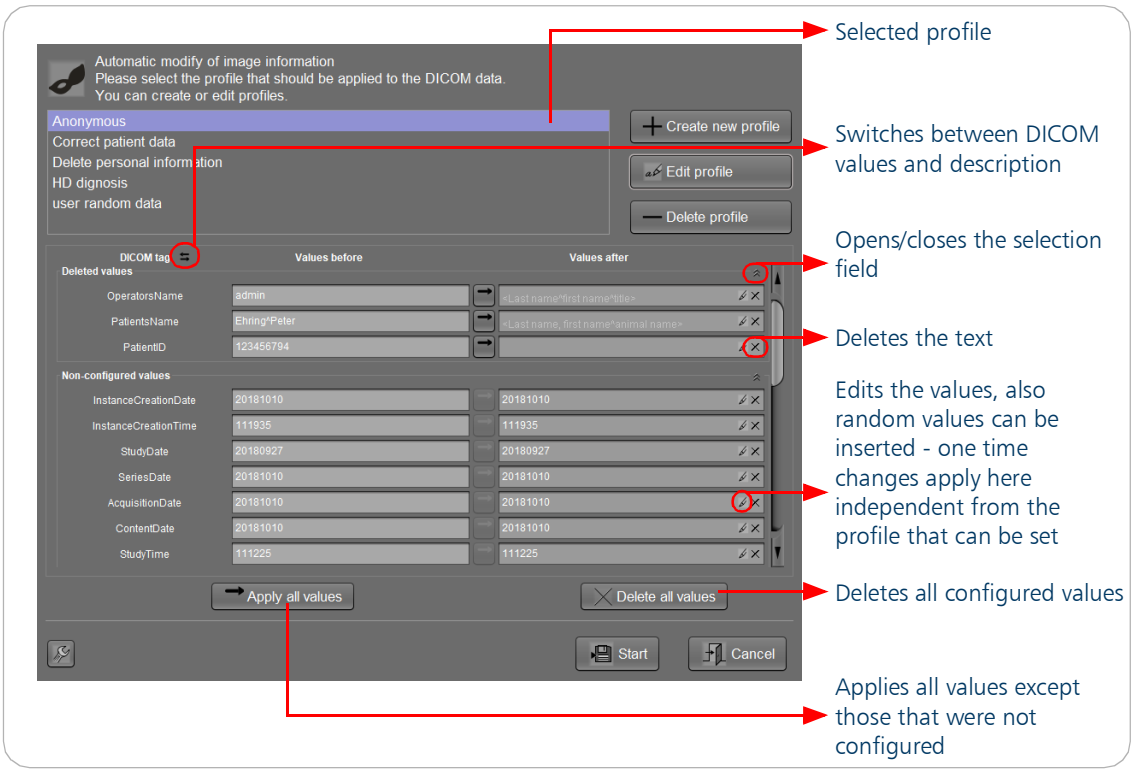


Figure 267. Anonymising profiles

Note

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.

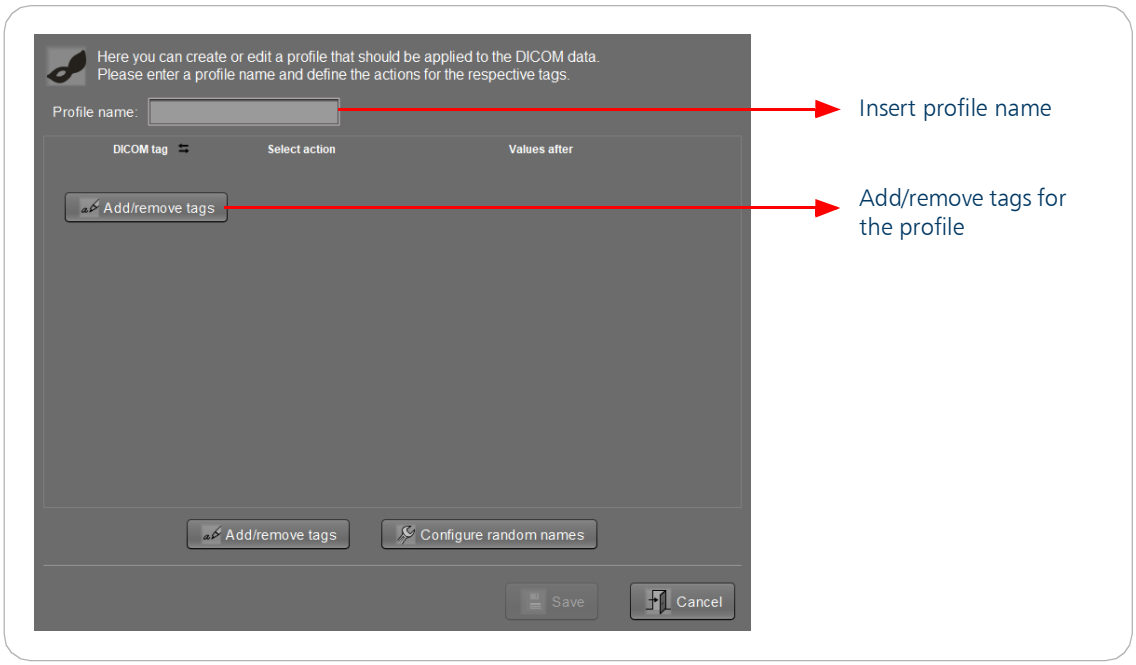


Figure 268. Create new profile

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".

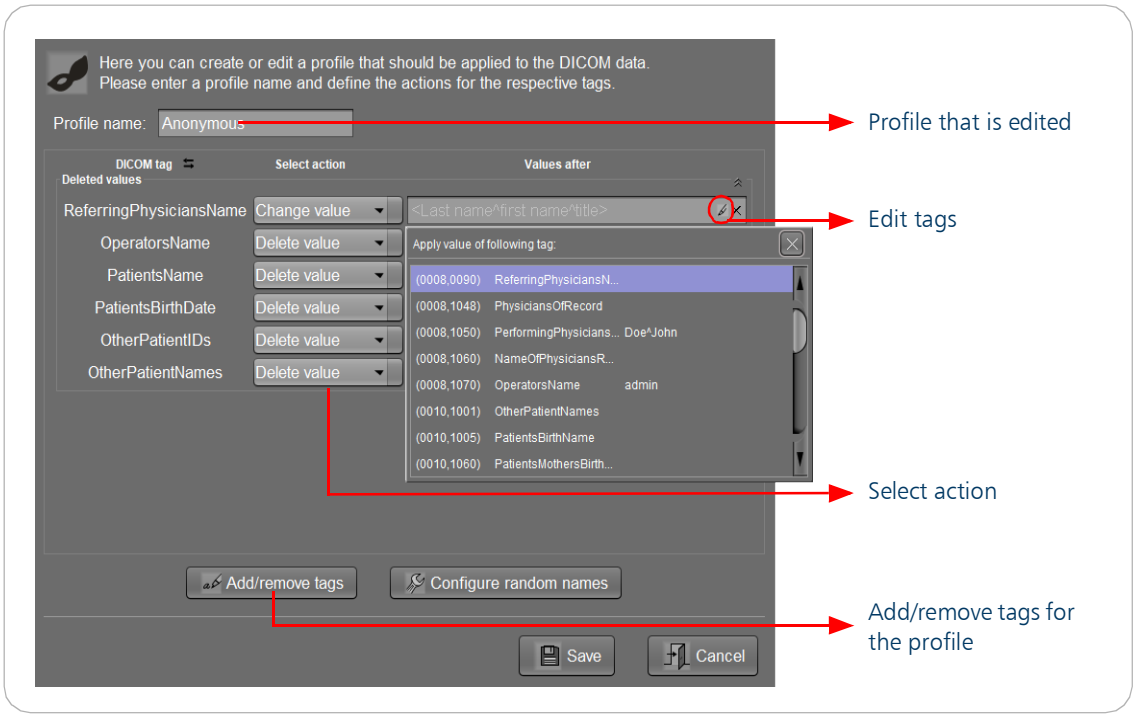


Figure 269. Edit profile

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.

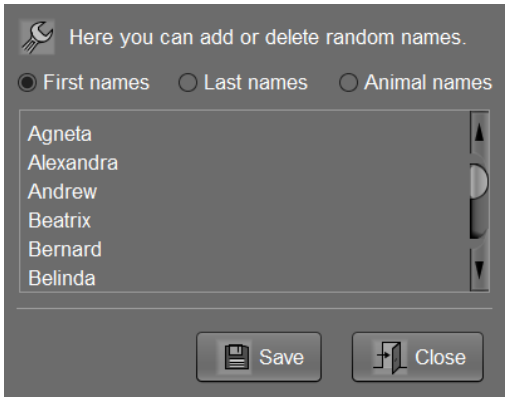


Figure 270. Edit random names

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

However, *dicomPACS® DX-R* 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 which will 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.

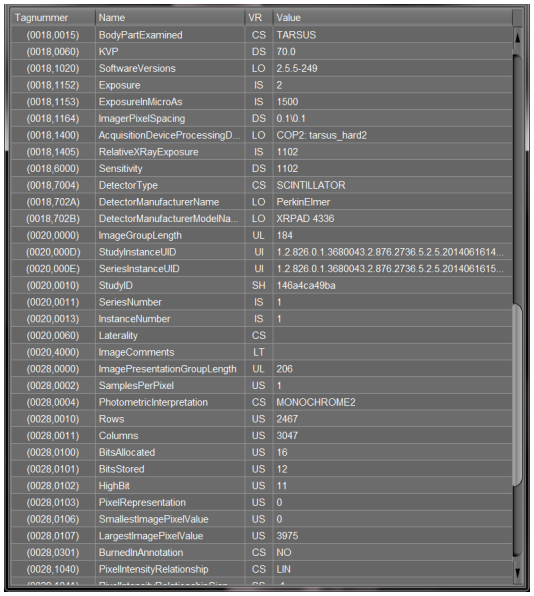
Note

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.

4.18.7 DICOM information

DICOM information DICOM information indicates technical information relevant to the image. For DICOM images the DICOM header is displayed with corresponding tag numbers.



Tagnummer	Name	VR	Value
(0018,0015)	BodyPartExamined	CS	TARSUS
(0018,0060)	KVP	DS	70.0
(0018,1020)	SoftwareVersions	LO	2.5.5-249
(0018,1152)	Exposure	IS	2
(0018,1153)	ExposureInMicroAs	IS	1500
(0018,1164)	ImagerPixelSpacing	DS	0.1\0.1
(0018,1400)	AcquisitionDeviceProcessingD...	LO	COP2: tarsus_hard2
(0018,1405)	RelativeXRayExposure	IS	1102
(0018,6000)	Sensitivity	DS	1102
(0018,7004)	DetectorType	CS	SCINTILLATOR
(0018,702A)	DetectorManufacturerName	LO	PerkinElmer
(0018,702B)	DetectorManufacturerModelNa...	LO	XRPAD 4336
(0020,0000)	ImageGroupLength	UL	184
(0020,000D)	StudyInstanceUID	UI	1.2.826.0.1.3680043.2.876.2736.5.2.5.2014061614...
(0020,000E)	SeriesInstanceUID	UI	1.2.826.0.1.3680043.2.876.2736.5.2.5.2014061615...
(0020,0010)	StudyID	SH	146a4ca49ba
(0020,0011)	SeriesNumber	IS	1
(0020,0013)	InstanceNumber	IS	1
(0020,0060)	Laterality	CS	
(0020,4000)	ImageComments	LT	
(0028,0000)	ImagePresentationGroupLength	UL	206
(0028,0002)	SamplesPerPixel	US	1
(0028,0004)	PhotometricInterpretation	CS	MONOCHROME2
(0028,0010)	Rows	US	2467
(0028,0011)	Columns	US	3047
(0028,0100)	BitsAllocated	US	16
(0028,0101)	BitsStored	US	12
(0028,0102)	HighBit	US	11
(0028,0103)	PixelRepresentation	US	0
(0028,0106)	SmallestImagePixelValue	US	0
(0028,0107)	LargestImagePixelValue	US	3975
(0028,0301)	BurnedInAnnotation	CS	NO
(0028,1040)	PixelIntensityRelationship	CS	LIN

Figure 271. DICOM header information

4.18.8 Stitching

See page 251

4.18.9 Configuration dialogue 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.

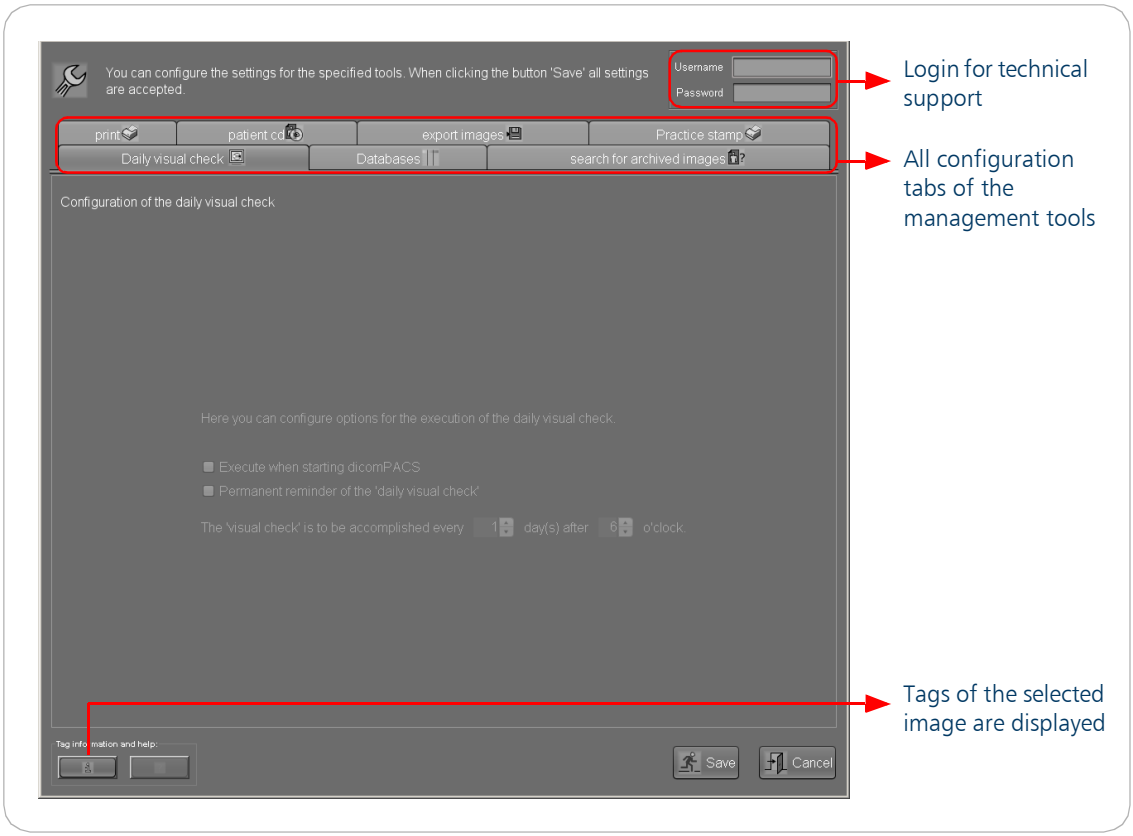


Figure 272. Configuration of the management tools

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.

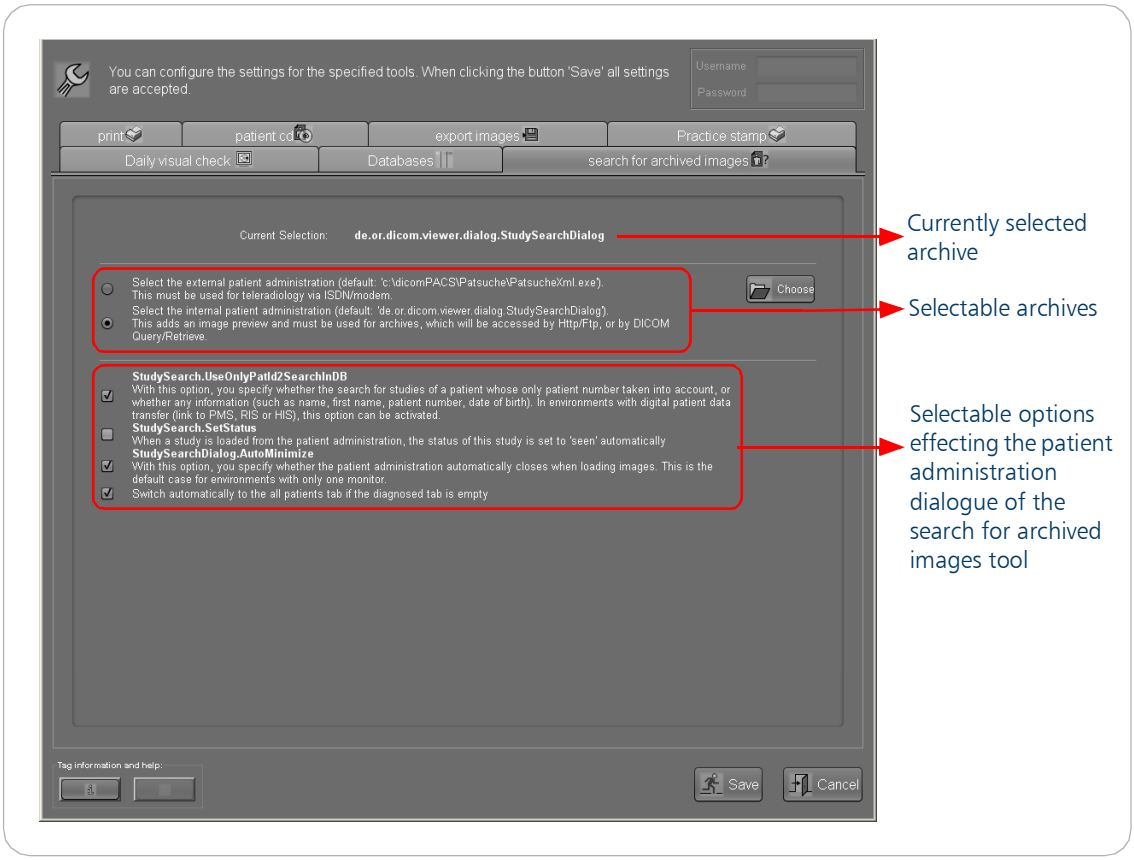


Figure 273. Search for archived images - configuration

Print

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.

Furthermore, it is possible to print the magnification factor on film and paper. It is only printed if the option "print with annotations" is selected in the "Print" dialogue. The magnification factor refers to the magnification on the printout and not to the magnification of the image in the internal viewer at the time of printing.

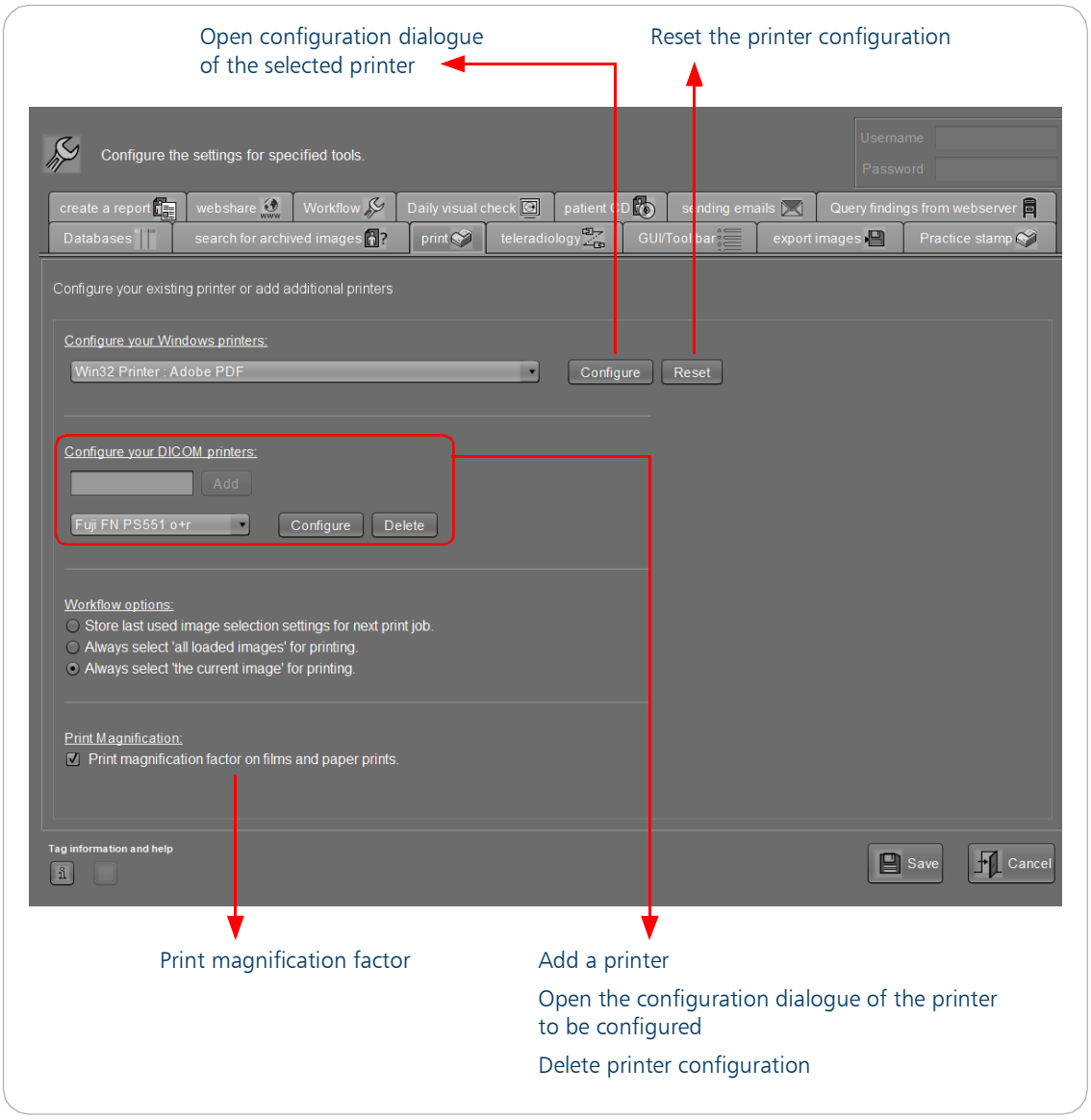


Figure 274. Print tool - configuration

Patient CD

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.

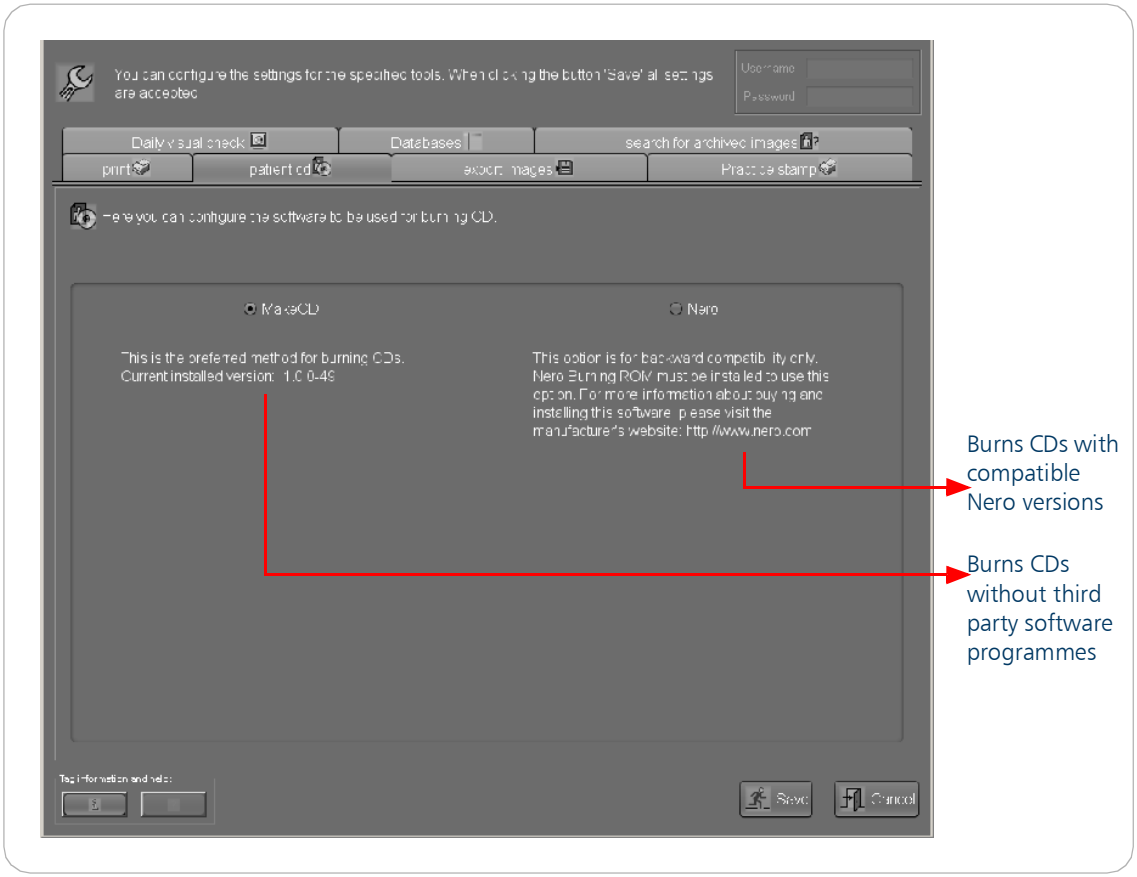


Figure 275. Patient CD - configuration

In the tab export images, the user may configure the preferred export formats and the export directory for the images.

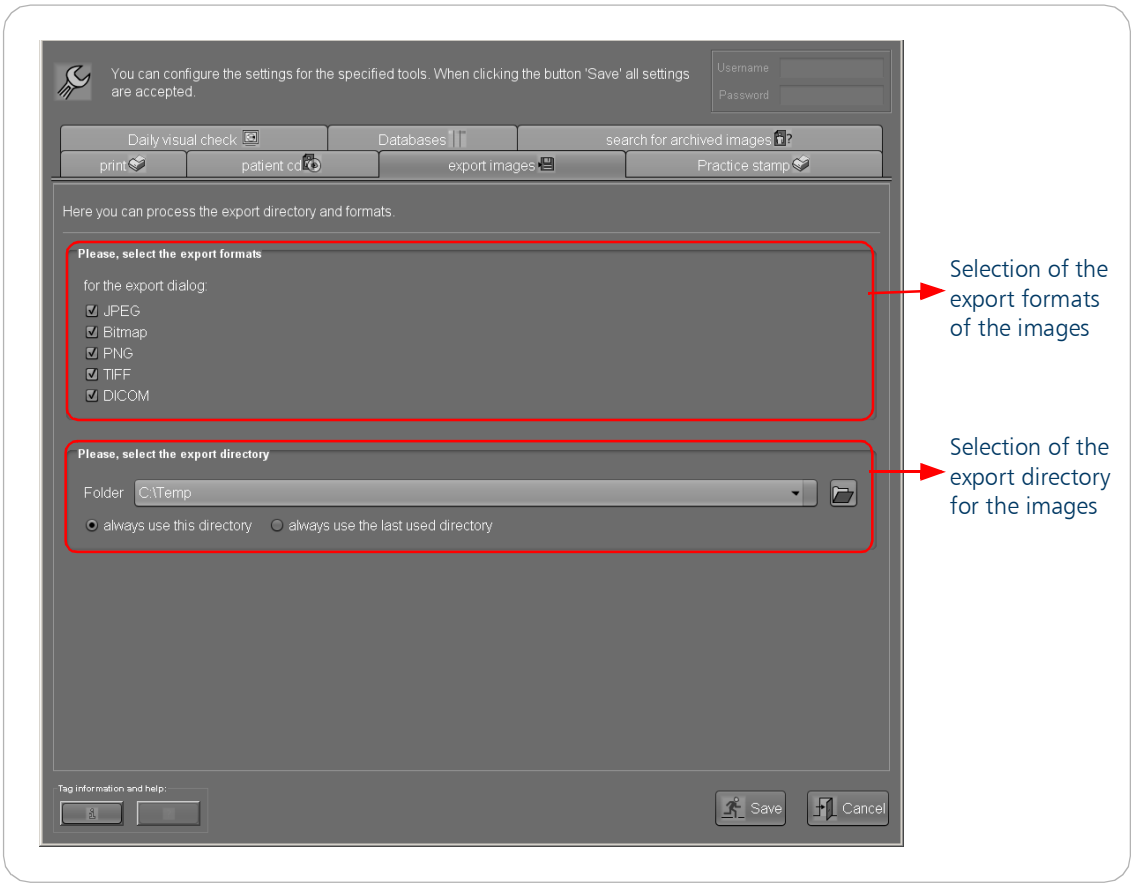


Figure 276. Export images - configuration

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.

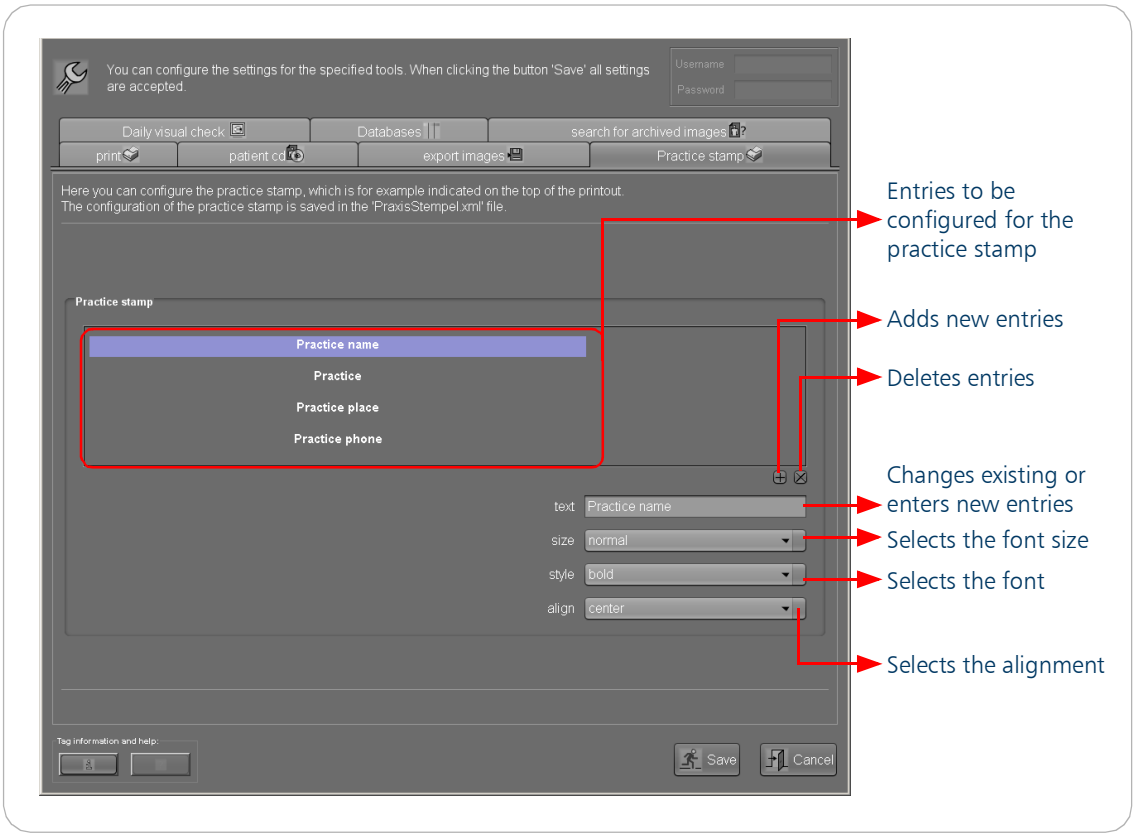


Figure 277. Practice stamp - configuration

Any changes that are applied to the practice data are immediately displayed in the list of entries.

4.19 Extended tools

CAUTION/ATTENTION!

EN: 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.

FR: Pour utiliser des outils étendus, qui sont des outils optionnels, avec un clavier virtuel, il est nécessaire de connecter une souris au PC pour ajuster le niveau de la fenêtre.

4.20 Tool area Filter / dynamic

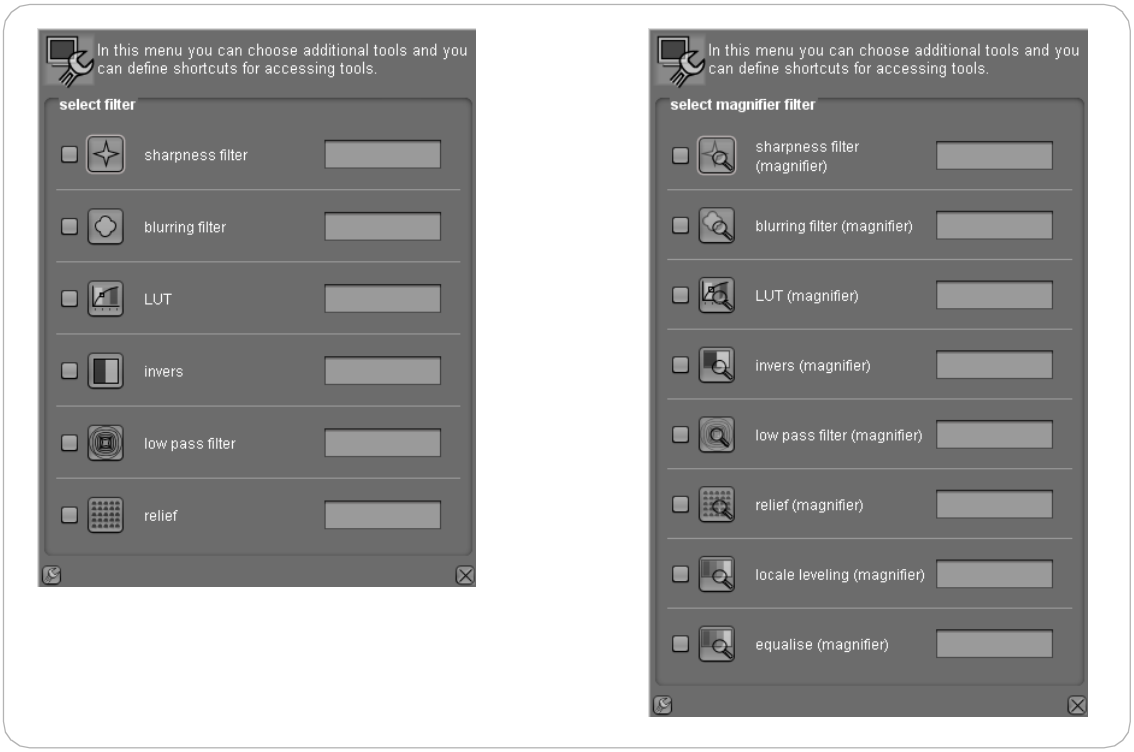


Figure 278. Filter / dynamic

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.

4.20.1 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.

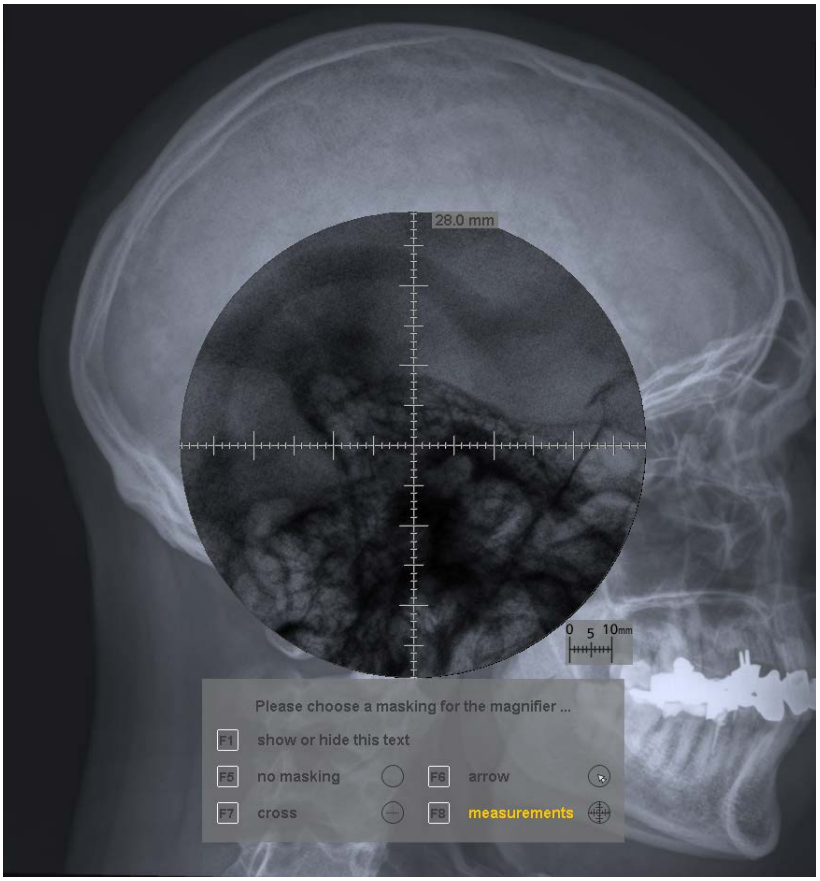


Figure 279. Magnifying glass with filter

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.

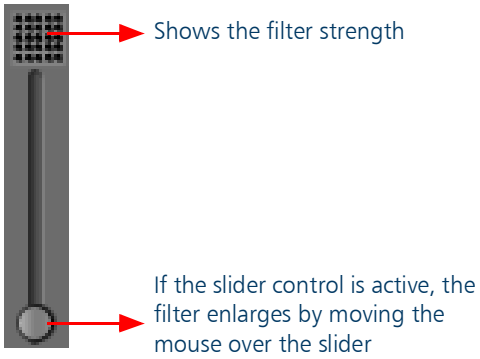


Figure 280. Slider

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 10. Available types of filter

4.20.2 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.

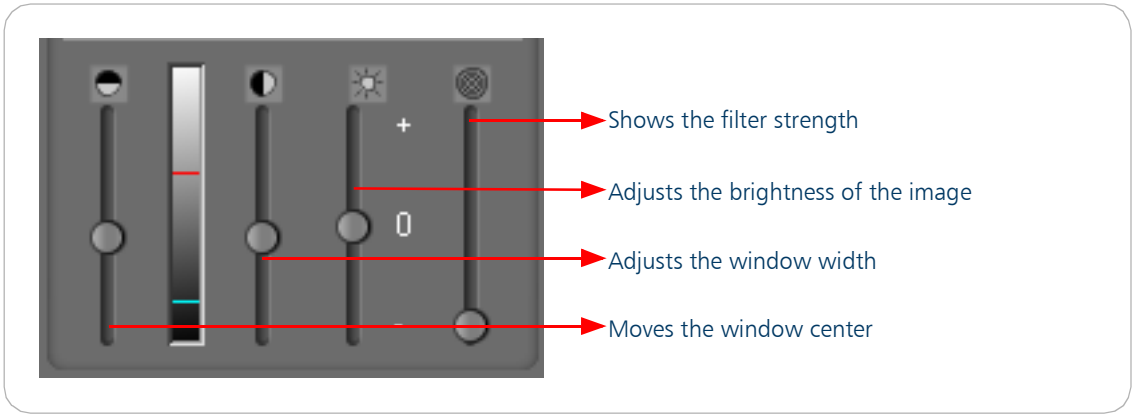


Figure 281. Dynamics

4.20.3 Configuration dialogue 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.

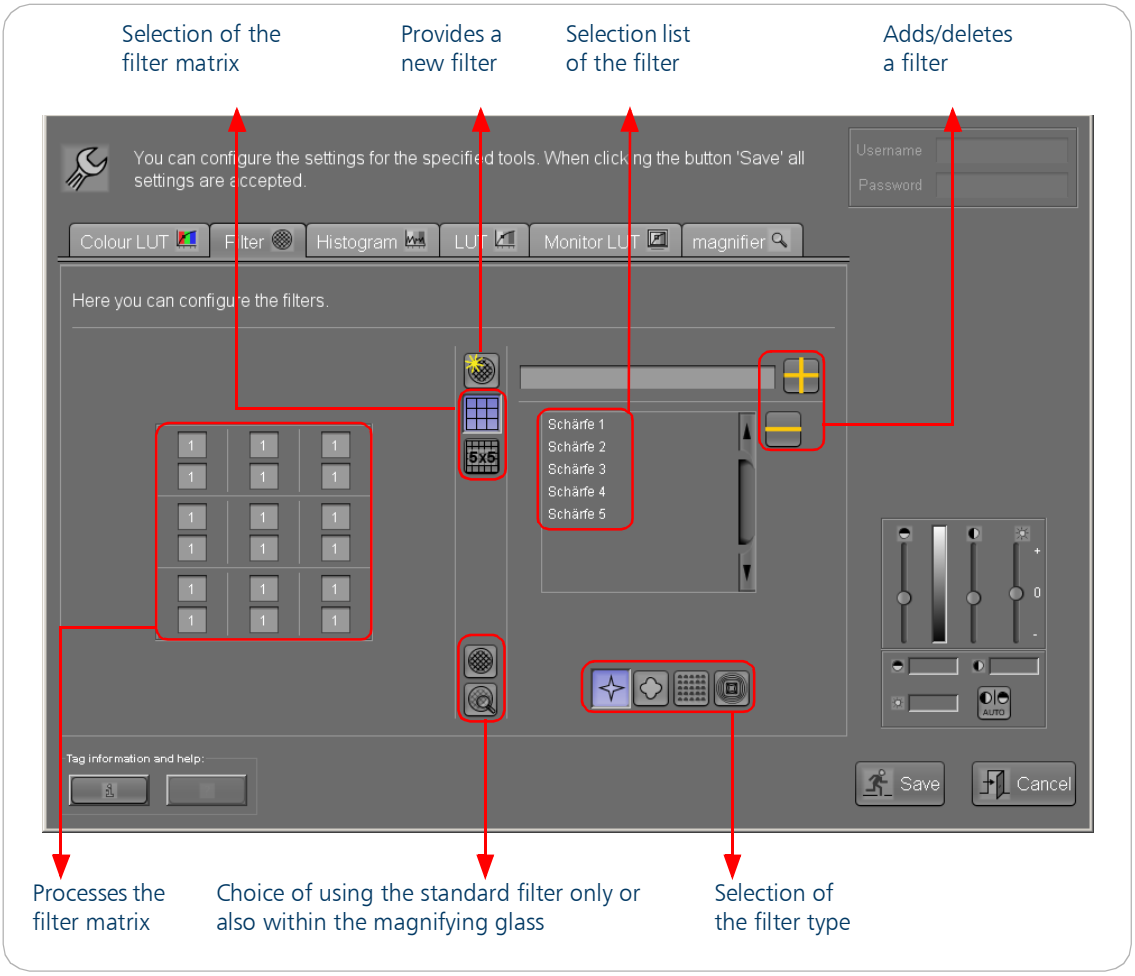


Figure 282. Filter configuration

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.

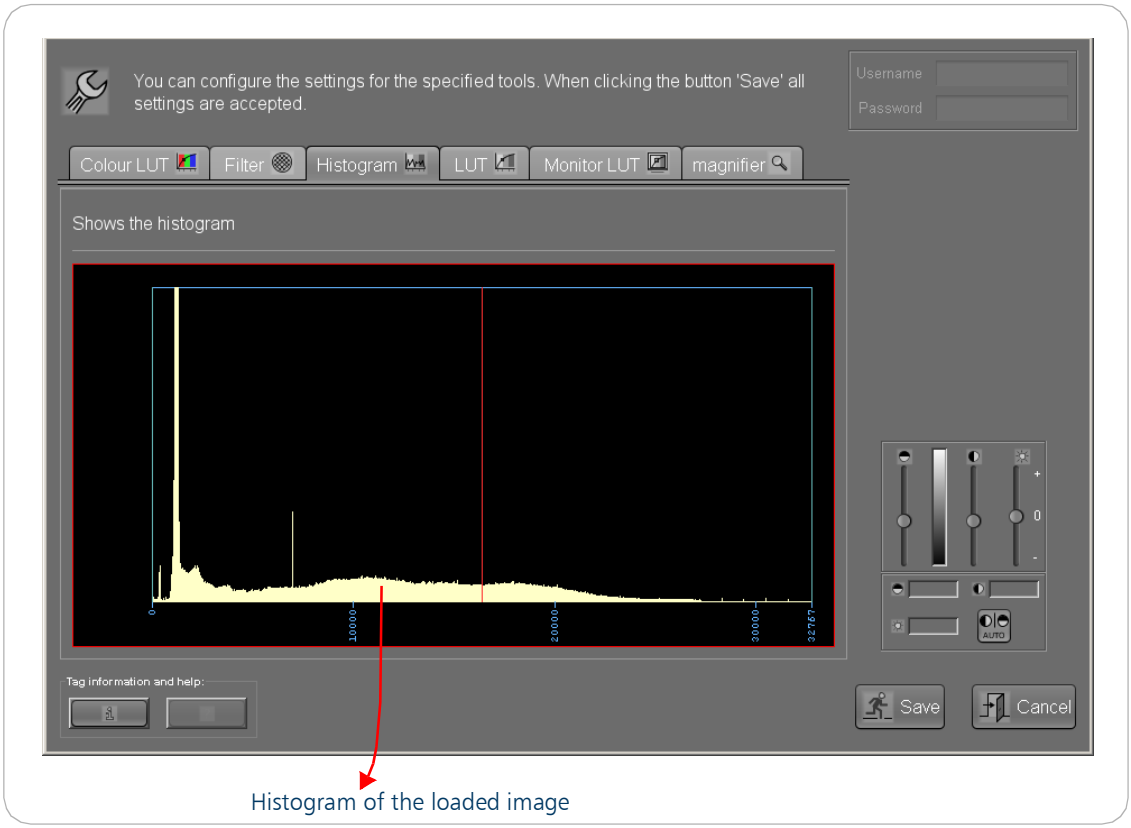


Figure 283. Image histogram configuration

To provide and add new LUTs and to revise or delete existing LUTs the below configuration dialogue is used.

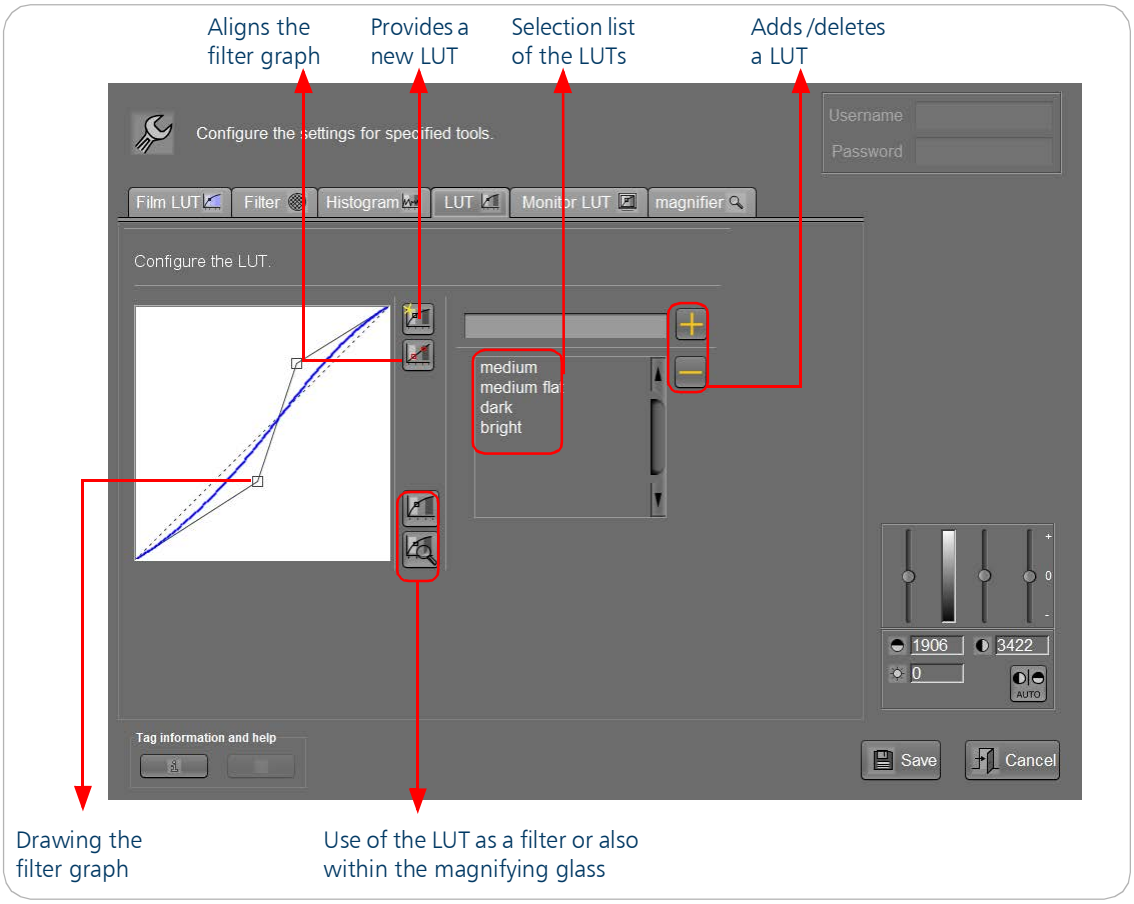


Figure 284. Configuration of the LUT

To add a new LUT or filter, type in the name of the LUT. Then press  . To delete a LUT, the LUT must be selected. Then press  .

The below window is only displayed in the configuration dialogue of the filter inside the magnifying glass.

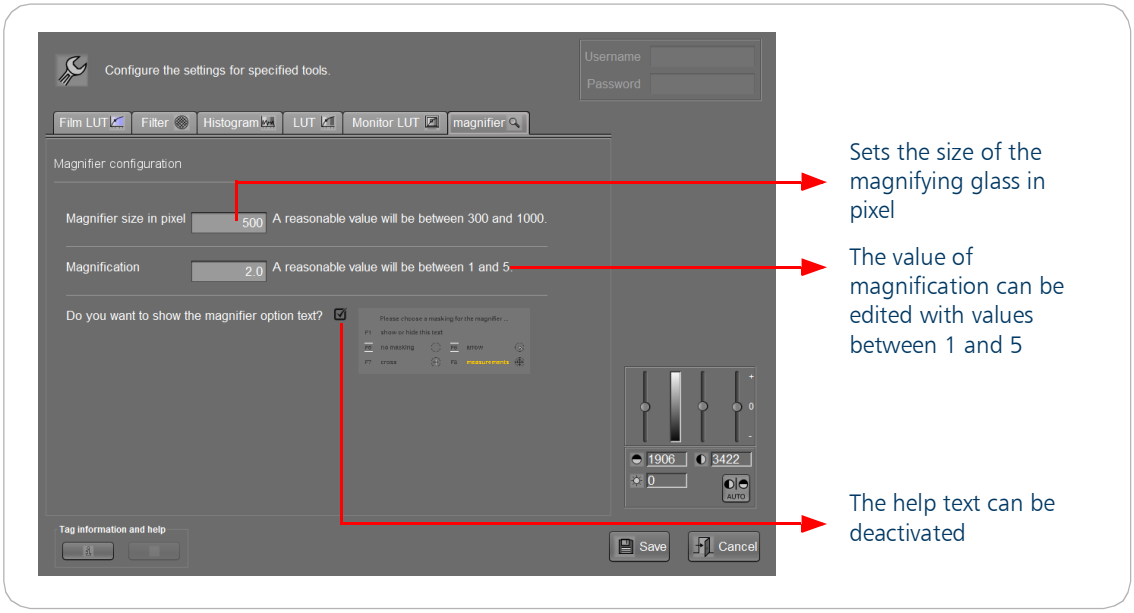


Figure 285. Configuration of the magnifier

Chapter 5. Special modules

5.1 G2003 Patient-CD module

This function copies all displayed or selected images to a CD or memory stick. A free version of an X-ray image viewer will be copied to the CD/DVD or memory stick to view the images.

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 a dialogue.

By default, a simple patient CD dialogue is displayed. It contains only the selection of the content to be exported and the final destination of the export.
The user has two dialogues to choose from:

- simple patient CD dialogue
- extended patient CD dialogue

The last used dialogue will always be displayed.
Both dialogues show which images shall be copied to CD/DVD or USB stick:

- the current image
- all loaded images
- selected images
- current series

The number of selected images and the complete number of loaded images are displayed in brackets. Alternatively, all images from the current export list can be exported directly to CD/DVD or USB stick.

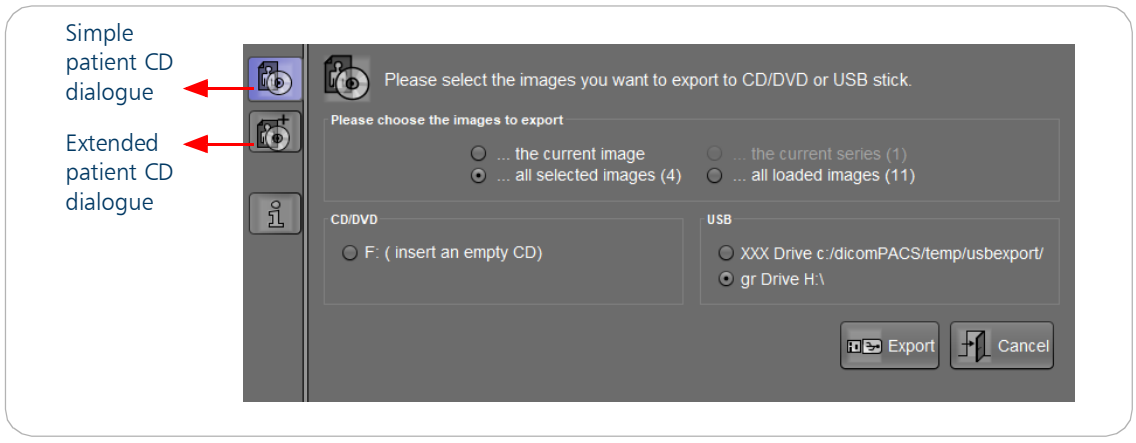


Figure 286. Simple patient CD dialogue

An information dialogue displays the current status and a list of all CDs created in this location.

The extended patient CD dialogue facilitates to save a list of images for copying it at a later stage or to save a list of images on a CD, DVD or a memory stick. Existing list entries can be deleted from the image list.

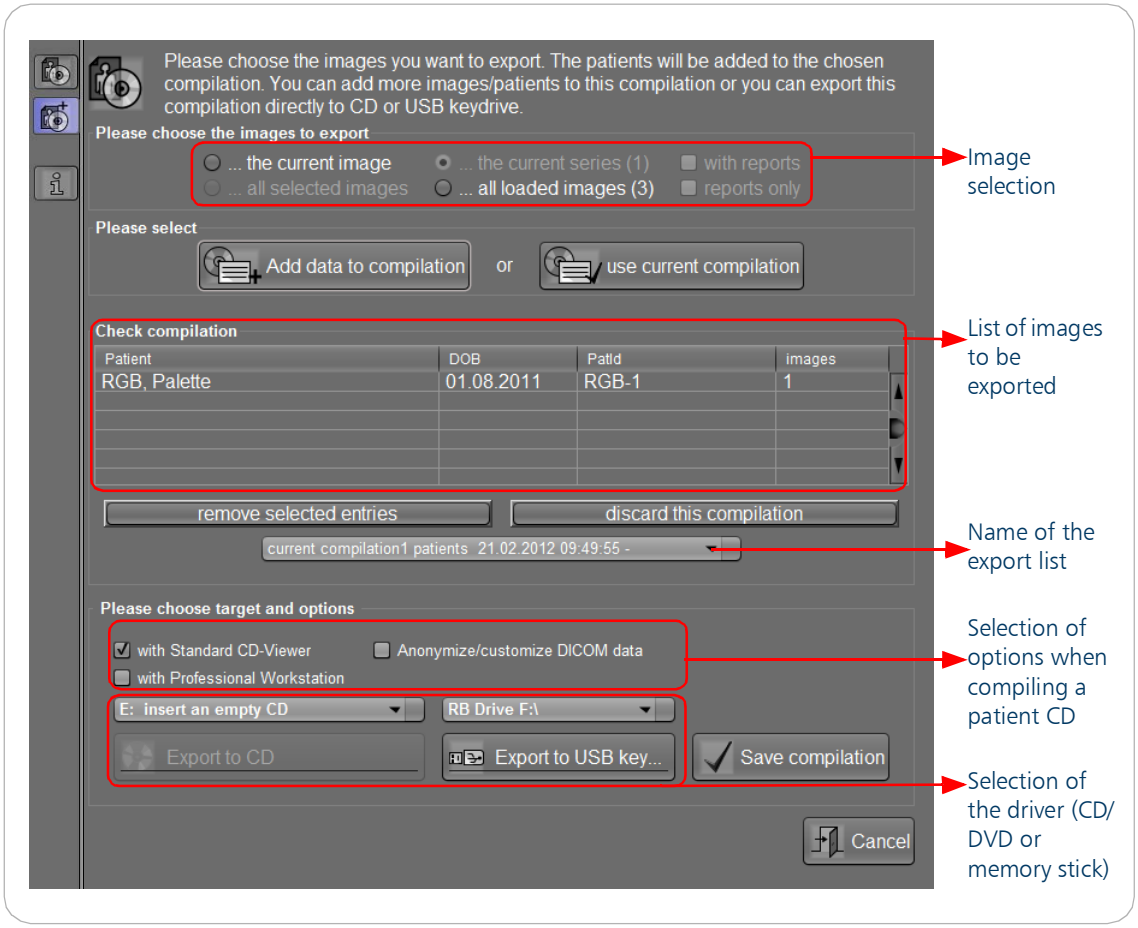


Figure 287. Extended patient CD dialogue

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

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 a dialogue.

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 288. 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.

- the Standard CD-Viewer (HTML Viewer)
- 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 displayed

Table 11. 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.

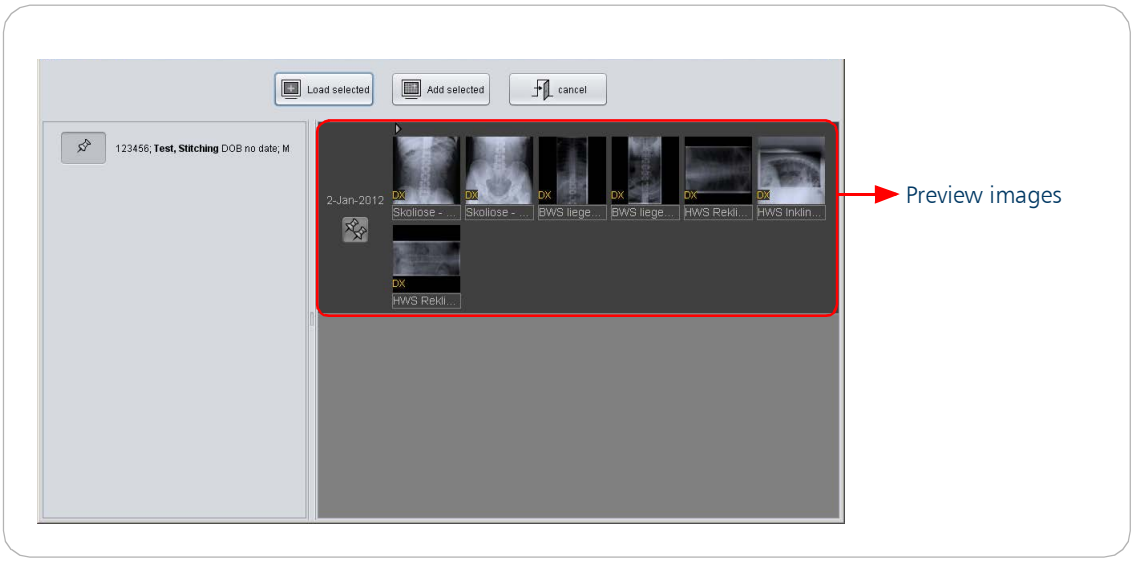


Figure 289. Patient CD with the Professional Workstation - select patient with preview images

Furthermore it is possible to "Anonymise/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 anonymise and customize the DICOM data.

For more information on anonymising DICOM data, please see "Teleradiology" on page 198.

5.2 W1010/G2017 Stitching

By means of the stitching function, individual images are simply combined to one overall image. 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. The stitching tool is located in the management section.

Figure 290. Stitching applied

⚠ CAUTION/ATTENTION!

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

FR: Les outils d'assemblage ont été développés exclusivement pour la fonction d'assemblage et doivent être appliqués uniquement avec les images créées dans ce but.

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.

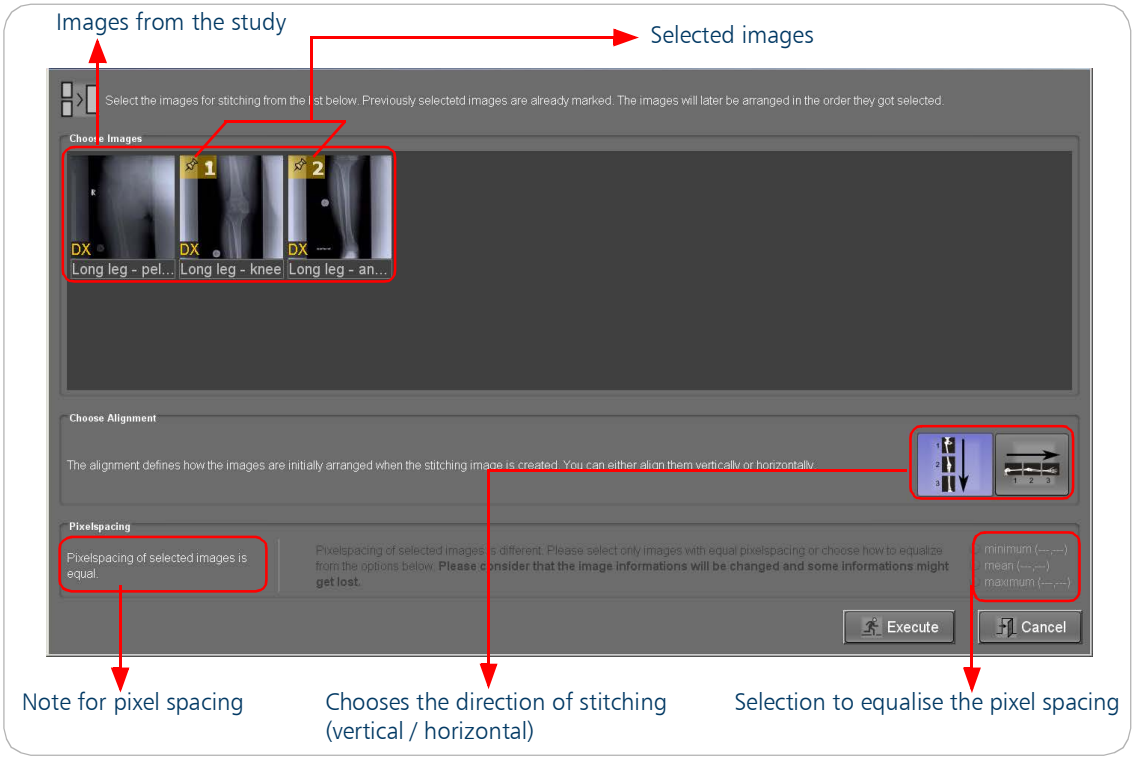


Figure 291. Image selection for stitching

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 which closes the dialogue box.

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

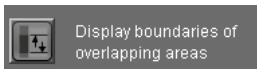
Figure 292. Export stitching

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

Figure 293. 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 294. 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/ATTENTION!

EN: The functionality "Delete Subimage" is not reversible.

FR: La fonctionnalité « Effacer subimage » n'est pas réversible.

The tool "(de-)activate flickermode" allows to compare the position of the images. 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.

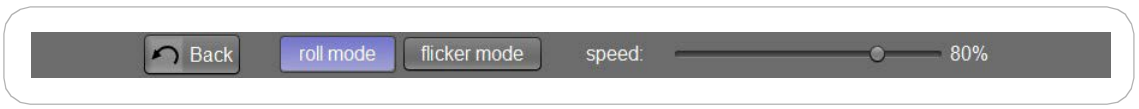
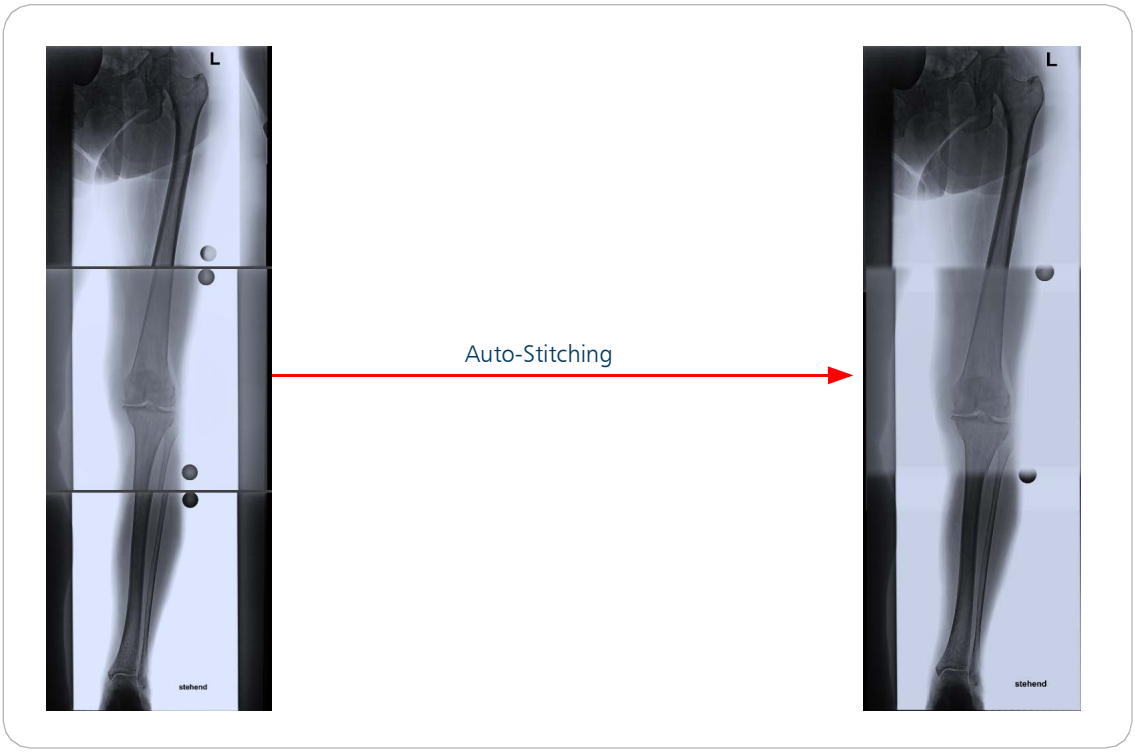


Figure 295. Activated flickermode

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.

5.3 AZ1101 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 to an editable stitching image - 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.



Three single images are 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 63). 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.

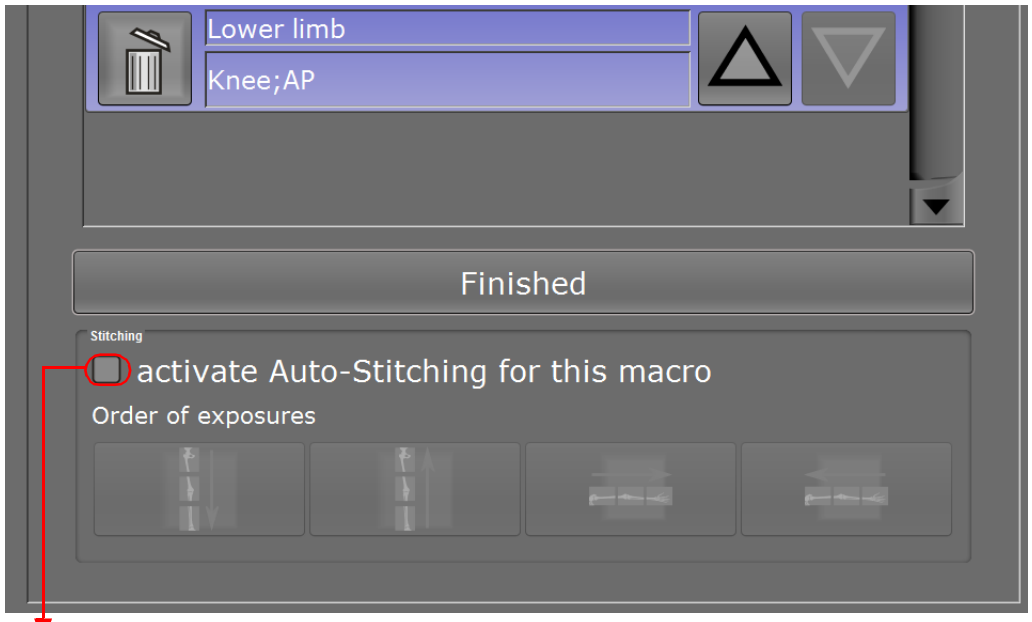


Figure 296. Activate the Auto-Stitching function for the selected macro

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.

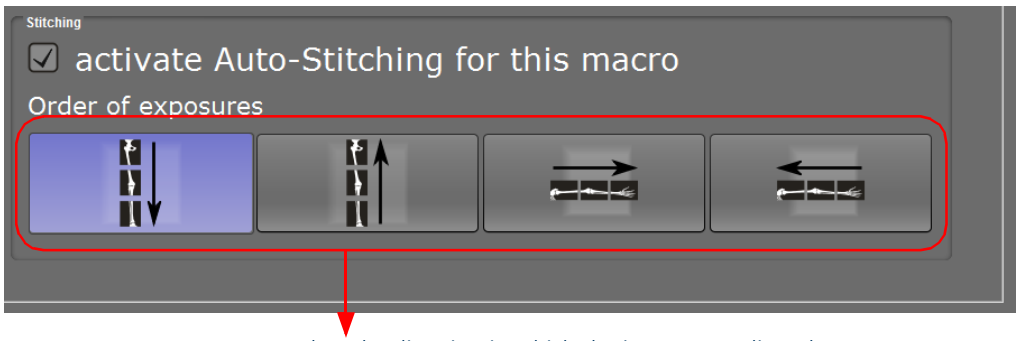


Figure 297. Order of exposures

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.

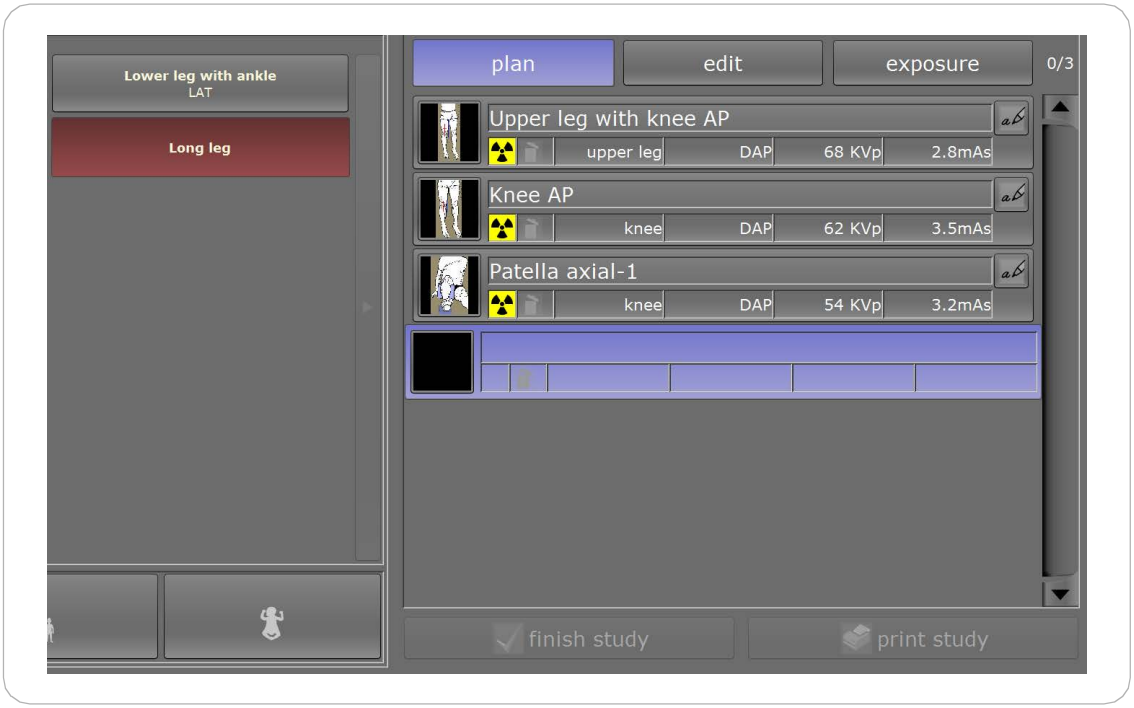


Figure 298. examination ready to expose the images

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.

In case images for more than one macro with auto-stitching are acquired, the stitching images are created when switching to the internal viewer. The user only has to adjust the images and accept the stitching.

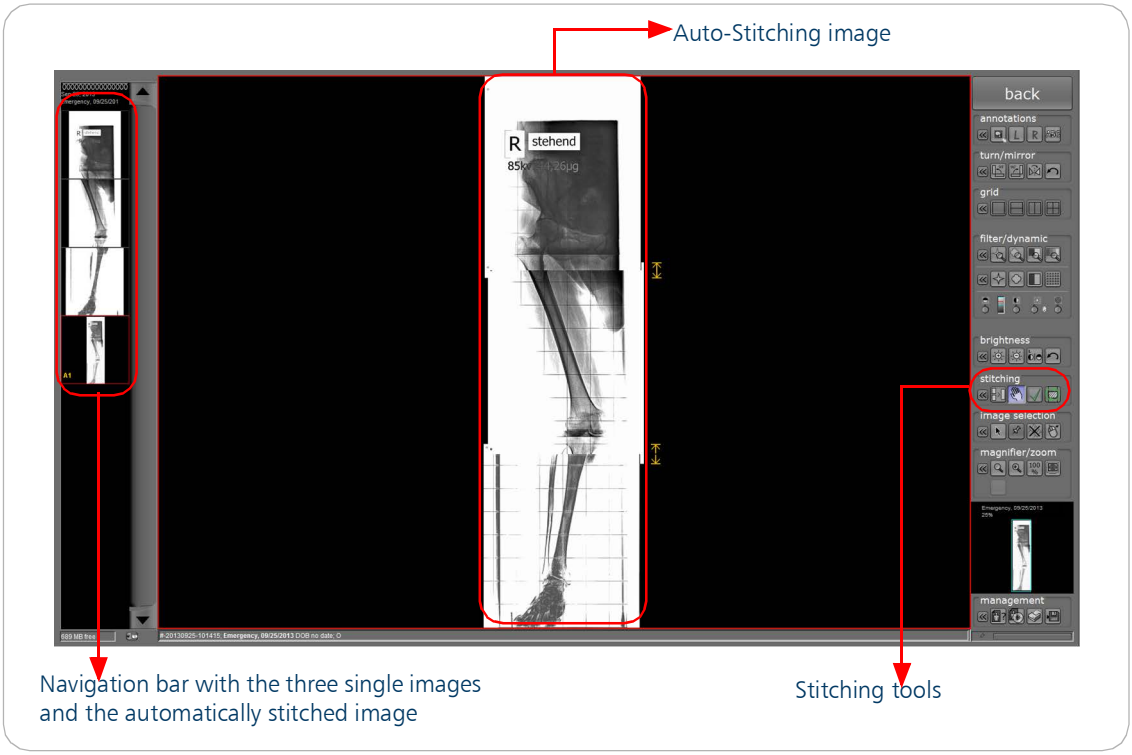


Figure 299. Viewer with three single images and one overall image in the navigation bar

As described in section "W1010/G2017 Stitching" on page 251 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 4.10 "Annotations - edit" page 152). 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.

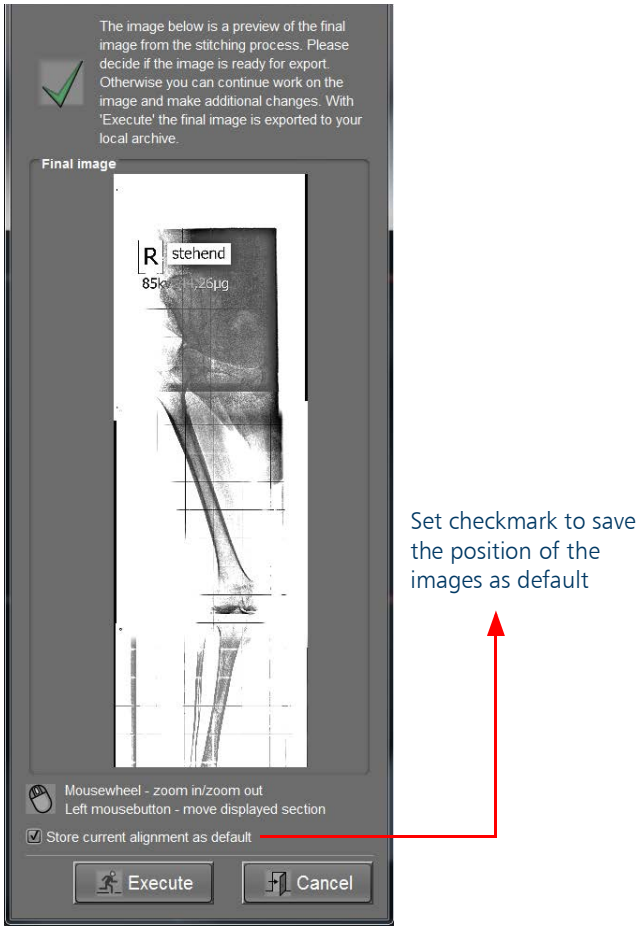


Figure 300. Execute stitching and store current alignment as default

If the checkbox is active, a click on the "Execute" button opens an additional dialogue, 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 dialogue "Input for stitching" opens.

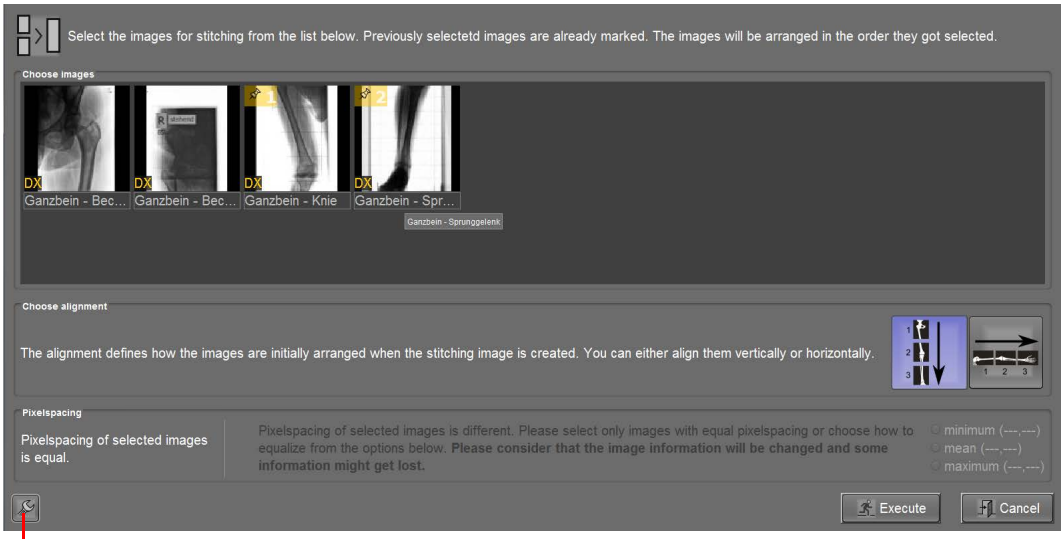


Figure 301. Input for stitching dialogue

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

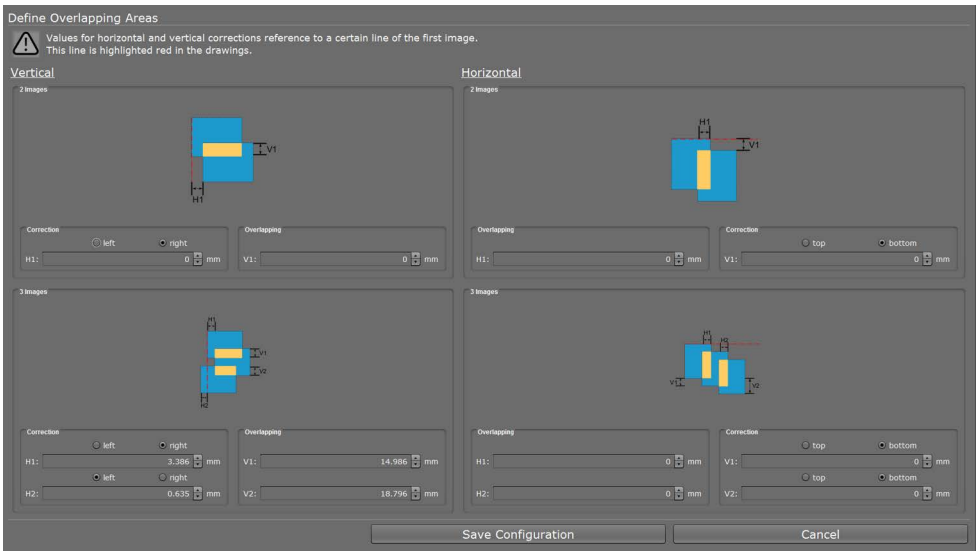


Figure 302. Define Overlapping Areas dialogue

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

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

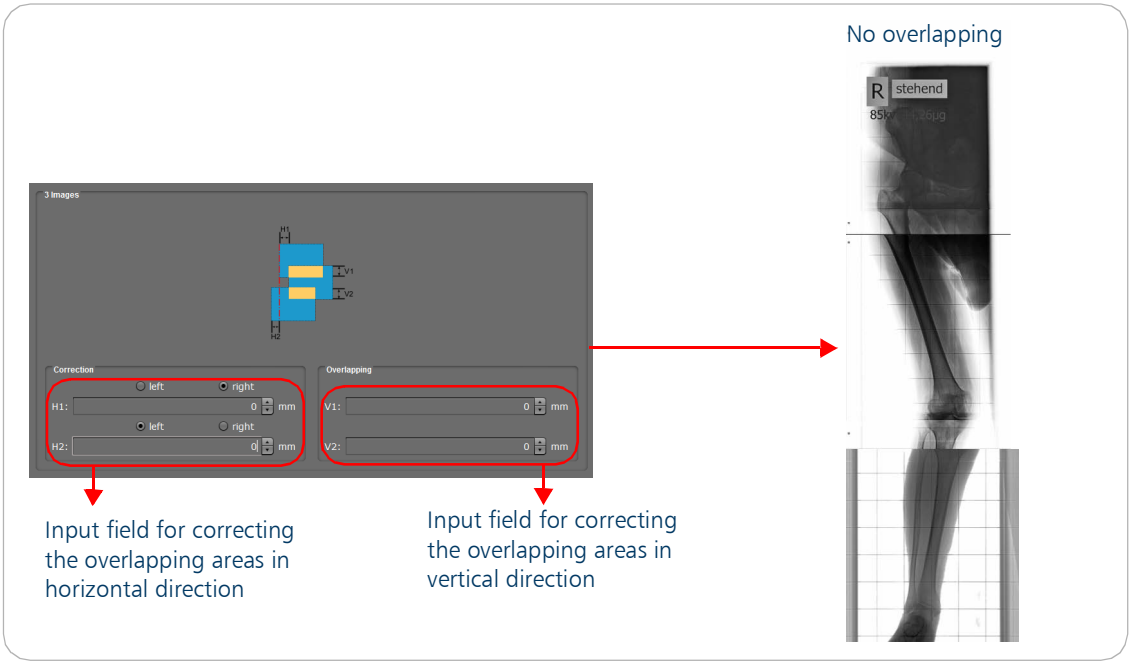


Figure 303. An example of a value of 0 results in no overlapping

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).

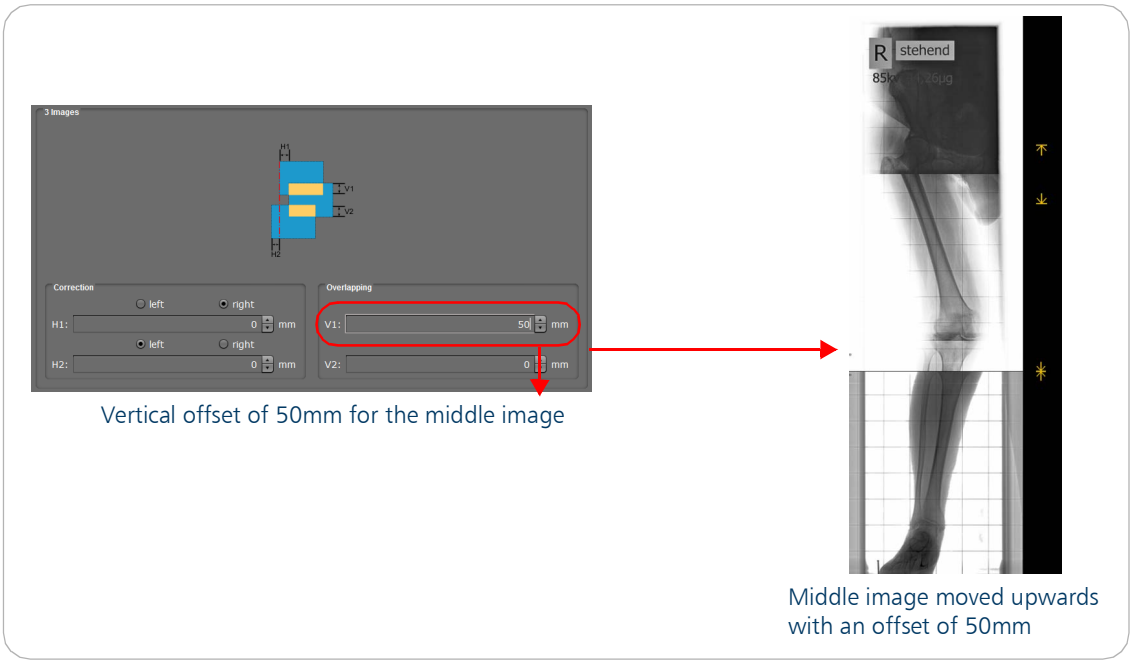


Figure 304. An example of a value of 50 for vertical position V1 results in a movement upwards

5.4 Dynamic X-ray

Dynamic X-ray enables fluoroscopic examinations in *dicomPACS® DX-R*.

Requirements

- wired XRpad2
- pulsed CPI generator
- synchronisation between IPU and generator (via syncbox)
- a licence for using dynamic X-ray

In order to use dynamic X-ray, the exposure mode "dynamic X-ray" must be stored for an examination. The exposure mode can be set in the configuration of macros/examinations, which can be called up via "Configuration" in the start screen. After selecting the organ tree and body region, a list of existing examinations can be adjusted and new examinations can be created. For fluoroscopic examinations the exposure mode "dynamic X-ray" must be selected in the tab "Examination Data".

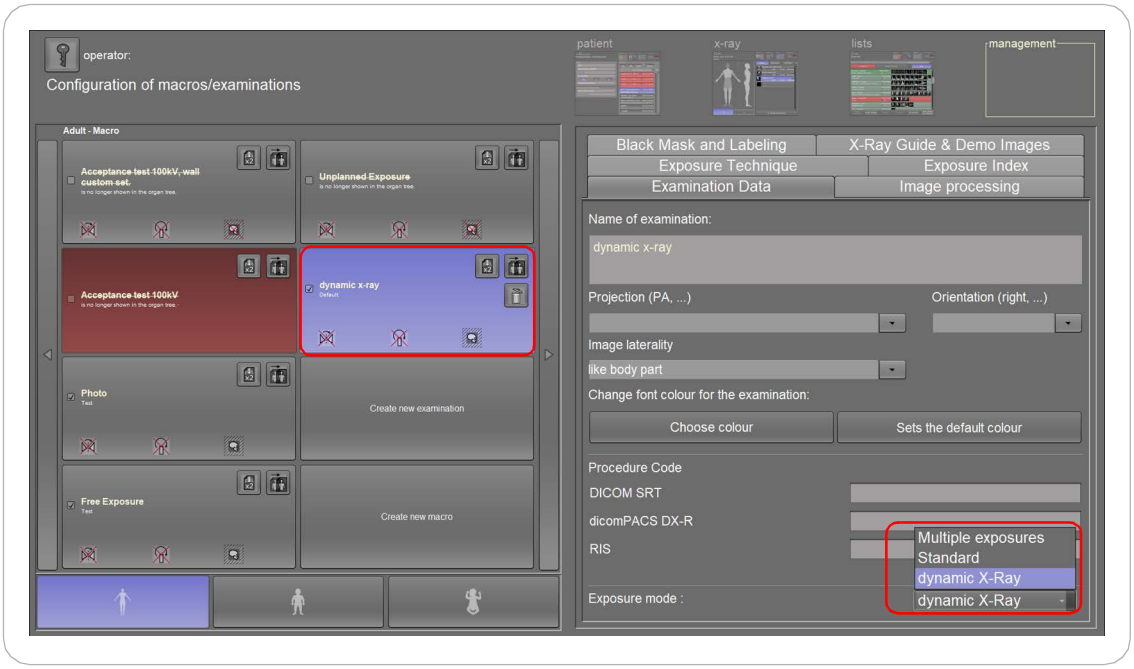


Figure 305. Change the exposure mode in the tab "Examination Data"

If an examination is selected in the X-ray view for which the exposure mode "dynamic X-ray" is stored, this is shown with the icon  .

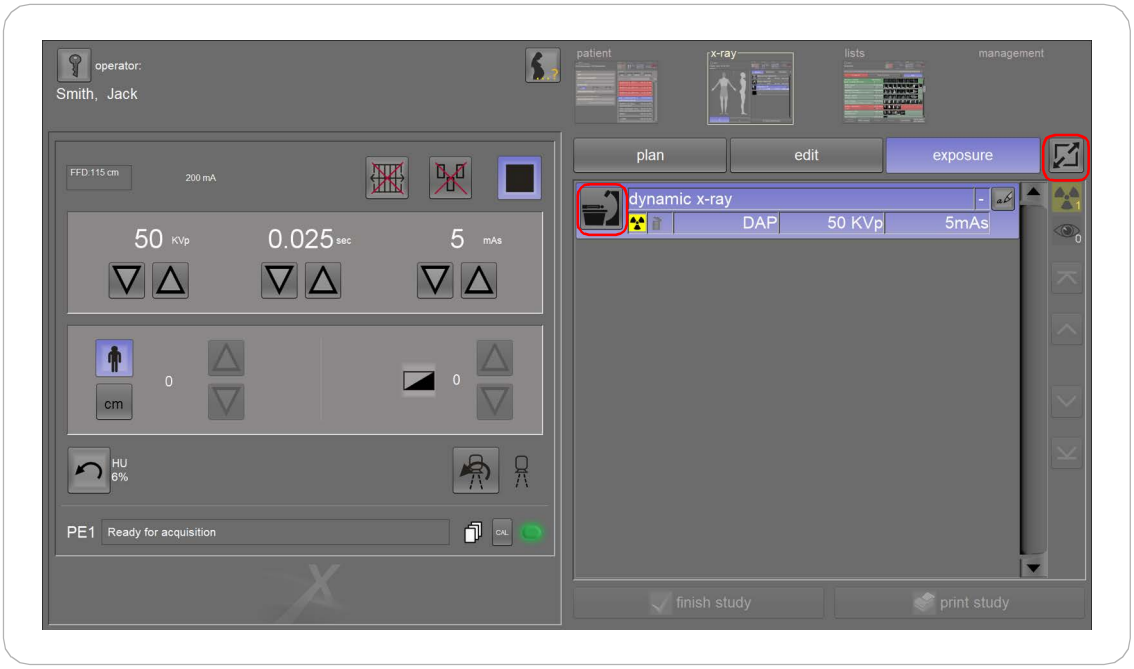


Figure 306. X-ray view

By pressing the first stage of the hand switch/foot switch (Prepare) or clicking the full screen icon , the interface for dynamic X-ray is displayed. Here, fluoroscopic examinations are performed, the images are displayed and processed.

On the interface you can choose between fluoroscopic images and single images . The single image is used to check the exposure parameters and is not archived. Before exposure, make sure that there is sufficient memory in the archive for the fluoroscopic examination.

Before the actual exposure for the dynamic X-ray, a scout examination (single exposure) is performed in which the exposure values for the dynamic X-ray are determined. The calculated values must not be changed manually after the single exposure has been taken.

After selecting the fluoroscopic examination, the exposure is started by pressing the hand switch/ foot switch. The exposure will be completed by releasing the hand switch/foot switch. If the exposure time of the generator is longer than the open time of the detector, a warning is displayed on the dynamic X-ray surface.

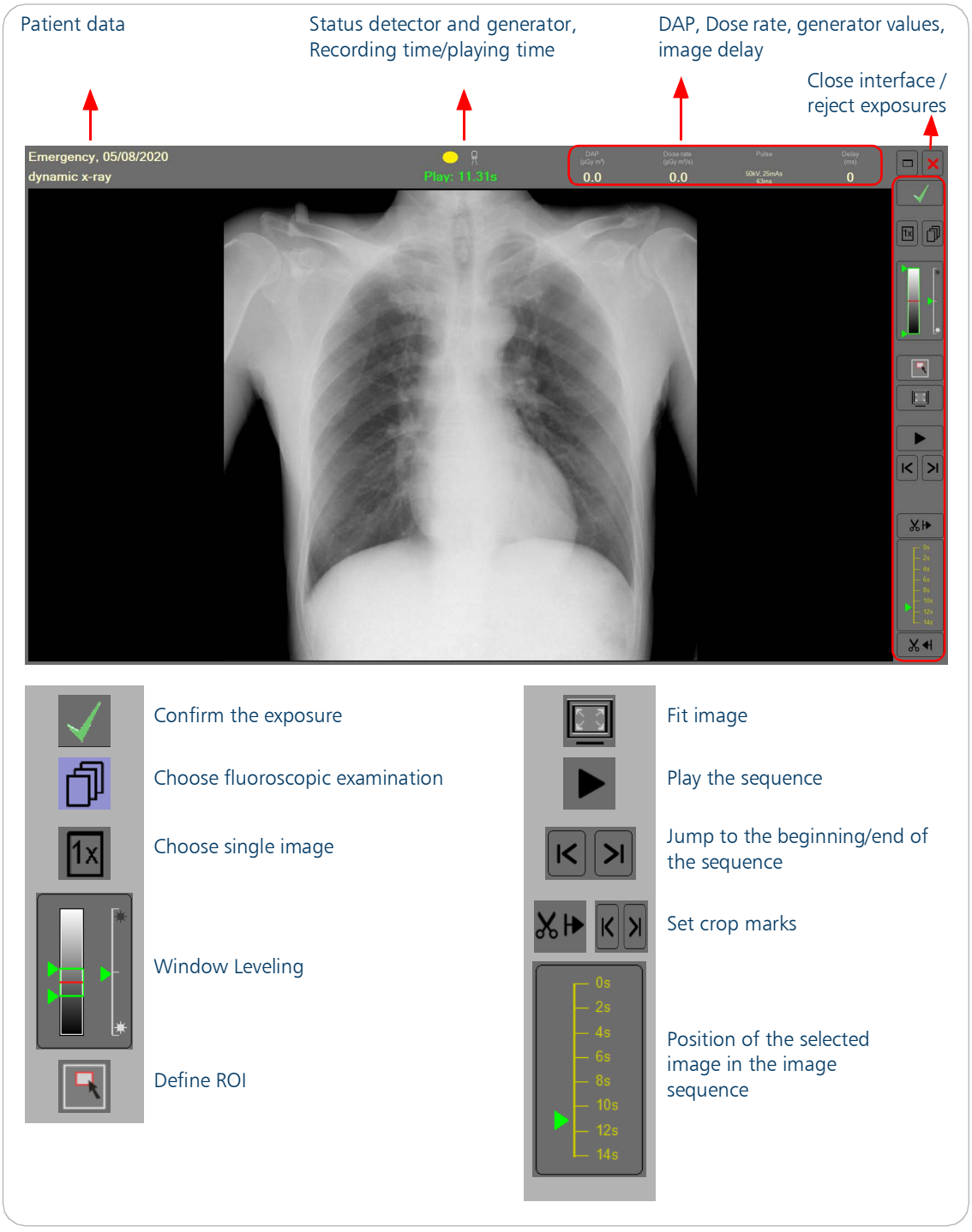


Figure 307. Interface for dynamic X-ray

During the exposure, the duration of the exposure as well as DAP, dose rate, exposure values (per pulse) and the image delay are displayed on top of the screen. The image delay time indicates the time between the X-ray pulse and the image displayed on the monitor. The longer an exposure takes, the more likely it is that image delays in *dicomPACS® DX-R* will occur.

After the exposure, it is possible to edit the image. Window level values can be adjusted, a ROI can be created and the length of the image sequence can be defined using crop marks. Used ROIs are saved with the examination.

After confirming the image sequence it then switches to the X-ray view. There the last image taken (LIH) and the total number of single images is displayed. To extend an image sequence, a new planning must be done.

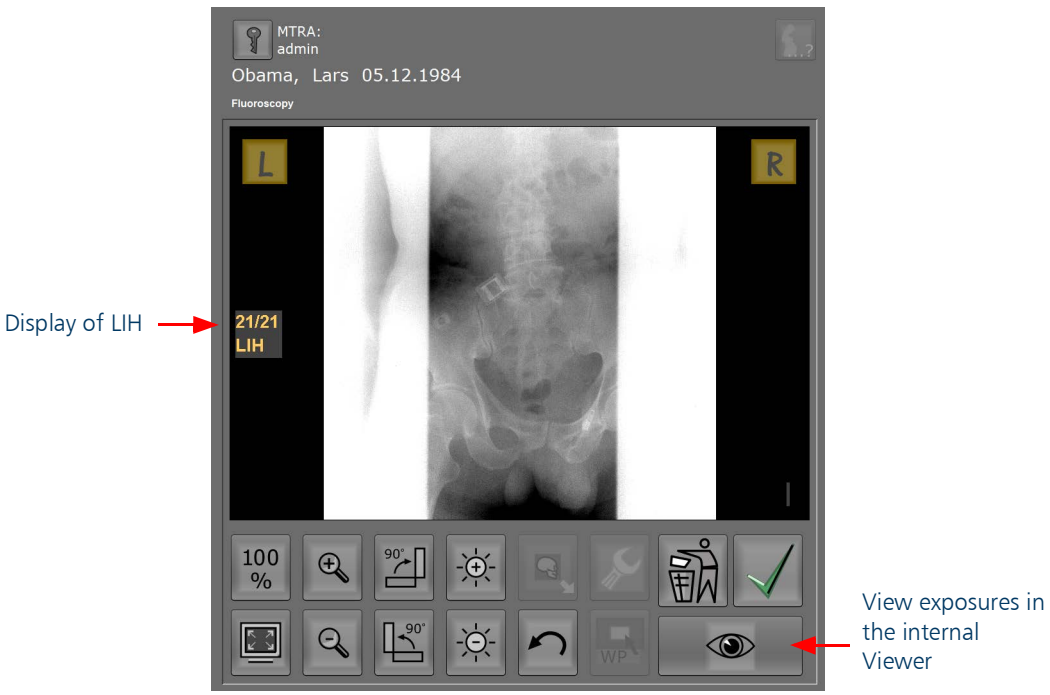


Figure 308. LIH in the X-ray view

The images can be scrolled with the mouse wheel and played in the viewer via cine loop 

. Cine loop is located in the toolbar in section "management".

If an image is rejected and thus the user interface is closed after a confirmation prompt, *dicomPACS®DX-R* automatically creates a new planning.

By default, all image data is stored compressed in one Multi-Frame DICOM.

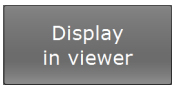
Settings concerning the storage of fluoroscopic images can be done in the support mode by users with admin rights.
There, it is possible to store all images together in one DICOM (Multi-Frame DICOM) and to compress the image data. For PACS-systems that do not support the Multi-Frame DICOMs, the fluoroscopic images can be stored as a series of individual DICOMs.

Chapter 6. FAQ

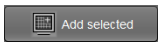
This chapter will give you some tips on how to work with *dicomPACS®DX-R*.

6.1 Compare two studies

To compare two studies in *dicomPACS®DX-R*, please proceed as follows:

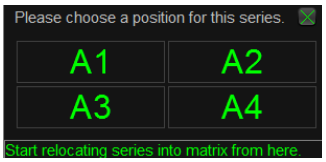
- Chose one study from the "lists view" and click on 

.
  The integrated viewer opens.
- Choose "Search for archived images"  in the section management of the toolbar in the Viewer or click "F9".
- In the window that opens (patient management) select the tab 

and search for the matching patient.
- On the right side all studies of the selected patient with examination date are displayed.
- Choose the corresponding study on the right side and click on 

in the bottom right corner.
- To compare images directly, choose a suitable allocation from the tab "grid" 

.
- By clicking on a preview image (left) you can choose in which segment the corresponding image shall be displayed (A1,A2, etc.)



Chapter 7. List of warning signs

page 9

CAUTION/ATTENTION!

EN: 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.

FR: Les mesures peuvent être prises au niveau des lignes (en millimètres) et des angles (en °, degrés). La longueur d'une ligne peut être donnée seulement en millimètres si l'image DICOM contient l'échelle de référence des pixels de la longueur qui en résulte.

page 10

CAUTION/ATTENTION!

EN: 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 215. In particular, the 5% and 95% greyscale areas must be clearly discernible.

FR: Pour tester la cohérence de ces paramètres pendant le fonctionnement, les tests de cohérence de l'écran doivent être effectués à intervalles réguliers. La régularité de ces tests figure dans le protocole d'acceptation. En règle générale, un contrôle visuel quotidien doit être effectué. Ce contrôle est décrit à la page 215. En particulier, les zones en niveaux de gris à 5 % et 95 % doivent être clairement visibles.

page 13

CAUTION/ATTENTION!

EN: *dicomPACS® DX-R* is exclusively designed for colour monitors!

FR: *dicomPACS® DX-R* est exclusivement conçu pour les écrans en couleur!

page 29

WARNING/ATTENTION!

If the generator is switched off and on again as long as you are in the planning, editing or acquisition mode of the X-ray view, the generator values must be checked for correctness.

Otherwise, standard values are used for the exposure which may result in an overexposure of the patient.

page 38

CAUTION/ATTENTION!

EN: 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.

FR: Quand les valeurs kVp et mAs sont modifiées via le masque de saisie, elles ne seront pas synchronisées avec le générateur. Ces valeurs servent uniquement à des fins de documentation.

page 43

DANGER!

EN: 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 actually applied values 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.

FR: Les valeurs affichées sur le panneau de commande du générateur (kVp, mAs, mA, etc.) sont uniquement des recommandations (indications) et doivent toujours être vérifiées avant d'effectuer une radiographie. Ces valeurs peuvent être ajustées dans le tableau de valeurs pour un générateur particulier. En cas de questions, veuillez vous adresser à votre ingénieur de maintenance pour les générateurs. Si aucune valeur de générateur n'est envoyé au générateur automatiquement, il est recommandé d'ajouter de toute urgence les valeurs définies manuellement pour chaque exposition, et ce également sur la console du générateur. L'avantage est que les valeurs véritablement appliquées sont classées avec l'image correspondante (dans l'en-tête DICOM) et peuvent être enregistrées dans un registre radiographique. C'est important pour la documentation correcte de chaque exposition individuelle.

page 43

CAUTION/ATTENTION!

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

FR: Chaque détecteur connecté doit être calibré par un ingénieur de maintenance autorisé. Le cycle de maintenance est donné par le fabricant du détecteur.

page 59

CAUTION/ATTENTION!

EN: Before the cropping function can be used, a technician has to activate the tool in the support mode.

FR: Avant de pouvoir utiliser la fonction de recadrage, un technicien doit activer l'outil dans le mode support.

page 62

CAUTION/ATTENTION!

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

FR: L'option pour accepter les expositions avec ou sans valeur de dose doit être configurée. Adressez-vous au vendeur de votre logiciel.

page 115

CAUTION/ATTENTION!

EN: 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.

FR: Pendant le processus, la distance actuelle est affichée en millimètres (mm). Si aucune échelle de référence n'a été enregistrée dans l'image (dans l'en-tête DICOM), la longueur ne sera pas spécifiée et est affichée sous forme de pixel. Seule la ligne de mesure sera tracée. Un nombre illimité de mesures peut être pris avant qu'un outil différent soit sélectionné.

page 125

CAUTION/ATTENTION!

EN: The user is responsible for the correct application of the image labels.

FR: L'utilisateur est responsable de l'application correcte des repères image.

page 125

CAUTION/ATTENTION!

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

FR: L'utilisateur est responsable de l'application correcte des repères gauche et droit.

page 134

CAUTION/ATTENTION!

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

FR: La direction horizontale et verticale fait toujours référence au support de l'écran, indépendamment de la manière dont l'image a été pivotée.

page 182

CAUTION/ATTENTION!

EN: Please note that the basic principles of X-rays by necessity cause magnification of displayed subjects by a factor that is usually known. The *dicomPACS®DX-R* internal viewer displays the images at the same size as on a film, i.e. slightly magnified.

FR: Veuillez noter que les principes de base de la radiographie causent inévitablement l'agrandissement des objets affichés par un facteur qui est généralement connu. La visionneuse *dicomPACS®DX-R* affiche les images à la même taille que sur un film, c'est-à-dire légèrement agrandies.

page 215

CAUTION/ATTENTION!

EN: 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.

FR: Après un test d'acceptation réussi, certaines valeurs doivent être vérifiées par l'opérateur à des intervalles définis. L'affichage précis des niveaux de gris doit être vérifié visuellement au moins une fois par jour.

page 217

CAUTION/ATTENTION!

EN: 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.

FR: Si le résultat du test est un « échec » et que les images sont chargées dans la visionneuse, un triangle d'avertissement apparaît. Il est possible de répéter le test mais en cas de nouvel échec, les écrans ne sont pas adaptés à des fins de diagnostic et de visionnage. Les écrans doivent être vérifiés par un ingénieur et réajustés si nécessaire.

page 225

CAUTION/ATTENTION!

EN: 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 add-on "Enigmail"). MS Outlook 2010 does not support encryption.

FR: Pour chaque destinataire d'e-mails cryptés, une PublicKey doit être demandée. Le destinataire doit avoir un programme de messagerie électronique compatible (MS Outlook 2003, 2007 ou un logiciel gratuit comme Thunderbird avec l'add-on « Enigmail »). MS Outlook 2010 ne prend pas en charge le chiffrement.

page 238

CAUTION/ATTENTION!

EN: 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.

FR: Pour utiliser des outils étendus, qui sont des outils optionnels, avec un clavier virtuel, il est nécessaire de connecter une souris au PC pour ajuster le niveau de la fenêtre.

page 251

CAUTION/ATTENTION!

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

FR: Les outils d'assemblage ont été développés exclusivement pour la fonction d'assemblage et doivent être appliqués uniquement avec les images créées dans ce but.

page 254

CAUTION/ATTENTION!

EN: The functionality “Delete Subimage“ is not reversible.

FR: La fonctionnalité « Effacer subimage » n’est pas réversible.

page 279

CAUTION/ATTENTION!

EN: Children are more radiosensitive than adults. Adopting the Image Gently campaign guidelines and reducing dose for radiographic procedures while maintaining acceptable clinical image quality will benefit patients.

FR: Les enfants sont plus radiosensibles que les adultes. Les paramètres d’exposition conçus pour les adultes peuvent résulter en une exposition excessive aux radiations s’ils sont utilisés pour de jeunes patients. Les principes « As Low As Reasonably Achievable » (ALARA) devraient toujours être suivis lors du choix des paramètres de l’équipement afin de minimiser l’exposition aux radiations du patient pédiatrique.

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Chapter 8. Appendix

8.1 FDA relevant information

Summary of the Digital Panel Characteristics

Additional details are provided in the following documents:

- Manuals of the respective flat panel detector or cassette
- Sensitometric response characteristics typical of flat panel detectors:

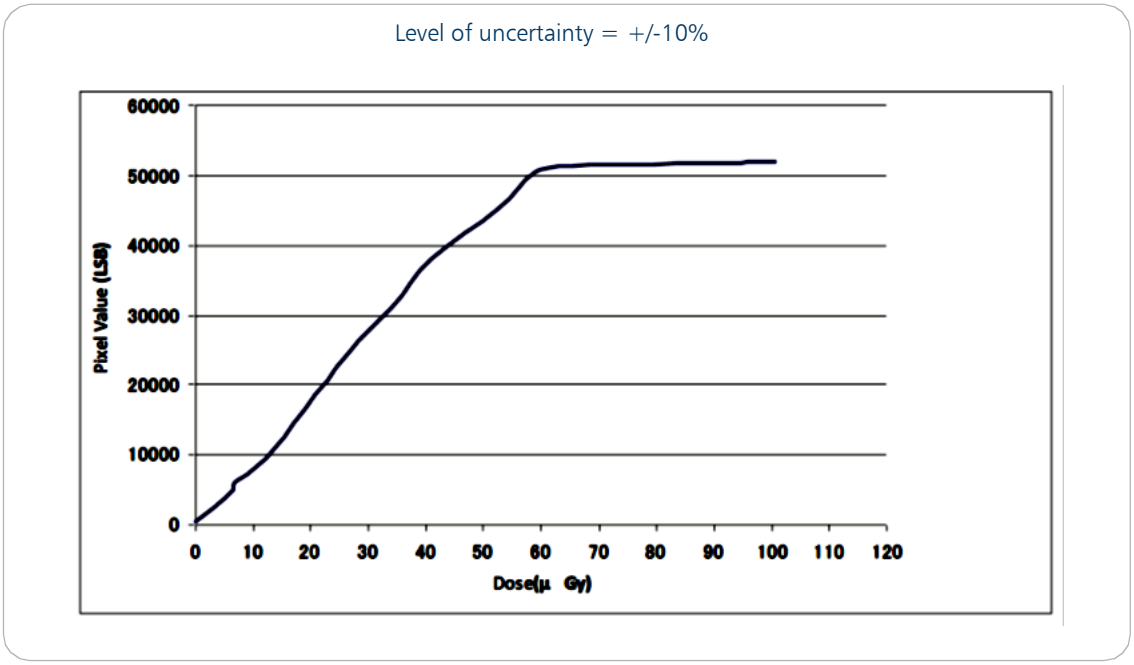

Figure 309. Response characteristics

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 six 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 six 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 12. Dose reference level

* DAP: dose area product

** AP: anterior-posterior PA: posterior- anterior***LAT: lateral

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

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

Use special care when imaging patients outside the typical adult size range.

CAUTION/ATTENTION!

EN: Children are more radiosensitive than adults. Adopting the Image Gently campaign guidelines and reducing dose for radiographic procedures while maintaining acceptable clinical image quality will benefit patients.

FR: Les enfants sont plus radiosensibles que les adultes. Les paramètres d'exposition conçus pour les adultes peuvent résulter en une exposition excessive aux radiations s'ils sont utilisés pour de jeunes patients. Les principes « As Low As Reasonably Achievable » (ALARA) devraient toujours être suivis lors du choix des paramètres de l'équipement afin de minimiser l'exposition aux radiations du patient pédiatrique.

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 are not as likely as adults to understand the need to remain still during the procedure. Therefore it makes sense to provide aids to maintaining stable positioning. It is strongly recommended 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. Whenever possible use techniques based on the lowest exposure times..

Protective shielding

Extra shielding of radiosensitive organs or tissues such as eyes, gonads and thyroid glands is strongly recommended. Applying a correct collimation will help to protect the patient against excessive radiation as well.

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.

Technique factors

You should take steps to reduce technique factors to the lowest possible levels consistent with good image acquisition. For example if your adult abdomen settings are: 70- 85 kVp, 200- 400 mA, 15- 80 mAs, consider starting at 65- 75 kVp, 100- 160 mA, 2.5- 10 mAs for a pediatric patient. Whenever possible use high kVp techniques and large SID (Source Image Distance).

The following table can be used to estimate technique factors for various body builds.* As the patient size increases, the kVp generally increases. Also depicted in Table 1 are the corresponding values of X-ray beam cross-sectional area and the estimated patient thickness in terms of water equivalence.

Age	Head	Chest	Abdomen	Extremity (Forearm)
Newborn	67 kV/2.0 mAs (110 cm^2/9.0 cm)	60 kV/2.0 mAs (140 cm^2/8.0 cm)	60 kV/2.0 mAs (140 cm^2/8.0 cm)	N/A
1-yr-old	72 kV/2.0 mAs (160 cm^2/12 cm)	66 kV/2.0 mAs (240 cm^2/9.0 cm)	70 kV/4.0 mAs (300 cm^2/13 cm)	56 kVp/5.0 mAs (35 cm^2/1.8 cm)
5-yr-old	75 kV/2.0 mAs (210 cm^2/14 cm)	70 kV/2.0 mAs (430 cm^2/10 cm)	72 kV/5.0 mAs (540 cm^2/15 cm)	60 kVp/5.0 mAs (84 cm^2/3.3 cm)
10-yr-old	77 kV/2.0 mAs (240 cm^2/15 cm)	74 kV/3.0 mAs (670 cm^2/13 cm)	75 kV/6.0 mAs (820 cm^2/17 cm)	62 kVp/6 mAs (140 cm^2/5.0 cm)
15-yr-old	79 kV/2.0 mAs (270 cm^2/16 cm)	78 kV/4.0 mAs (780 cm^2/12 cm)	78 kV/7.0 mAs (900 cm^2/20 cm)	65 kVp/6.0 mAs (200 cm^2/6.2 cm)
Adult	75 kV/15 mAs (320 cm^2/20 cm)	120 kV/2.0 mAs (1300 cm^2/15 cm)	75 kV/15 mAs (1200 cm^2/22 cm)	65 kVp/8.0 mAs (200 cm^2/7.9 cm)

Table 13. From "Pediatric effective doses in diagnostic radiology" (Walter Huada[1], Nikolaos A Gkanatsios[2], Robert J Botash[1], Ann S Botash[3])

[1] Department of Radiology, SUNY Health Science Center at Syracuse, NY, USA
[2] Department of Radiology, University of Florida, Gainesville, FL, USA
[3] Department of Pediatrics, SUNY Health Science Center at Syracuse, NY, USA

Dosimetry

The next table summarizes the key dosimetry parameters for the four types of radiographic examination for patients ranging from newborn to the adult. In each cell, the first value is the entrance skin air kerma (free-in-air) in μGy. The second term gives the energy imparted to the patient, expressed in μJ. In parentheses on the second line are the corresponding values of patient effective dose in μSv

Age	Head 100 μGy/78.2 μJ (10μSv)	Newborn Chest 77 μGy/66 μJ (19μSv)	Abdomen 100 μGy/140 μJ (62μSv)	Extremity (Forearm) N/A
1-yr-old	120 μGy/165 μJ (7.3 μSv)	96 μGy/160 μJ (16 μSv)	230 μGy/580 μJ (90 μSv)	130 μGy/9.5 μJ (0.21 μSv)
5-yr-old	140 μGy/260 μJ (5.9 μSv)	110 μGy/340 μJ (18 μSv)	320 μGy/1500 μJ (120 μSv)	160 μGy/44 μJ (0.50 μSv)
10-yr-old	150 μGy/320 μJ (4.3 μSv)	190 μGy/1100 μJ (33 μSv)	420 μGy/3300 μJ (160 μSv)	200 μGy/130 μJ (0.87 μSv)
15-yr-old	150 μGy/400 μJ (3.1 μSv)	280 μGy/2100 μJ (36 μSv)	550 μGy/5100 μJ (140 μSv)	220 μGy/240 μJ (0.92 μSv)
Adult	1100 μGy/3200 μJ (19 μSv)	150 μGy/2500 μJ (34 μSv)	1100 μGy/13000 μJ (290 μSv)	300 μGy/360 μJ (1.1 μSv)

Table 14. Dosimetry

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.

Other references for pediatric dosimetry:

- Size measurements are based on approximate mean values (averaged across males and females) from: McDowell, M.A., C.D. Fryar, C.L. Ogden, and K. M. Flegal. 2008. Anthropomorphic Reference Data for Children and Adults, United States, 2003-2006. National Health Statistics Reports, 10, 1-48. Available for download at: http://www.cdc.gov/nchs/data/nhsr/nhsr010.pdf. The weight given for the neonate subgroup is lower than the average to ensure that a broad range of sizes is adequately covered.

- These suggested subgroups fall within the age groups identified in the guidance entitled "Premarket Assessment of Pediatric Medical Devices" (http:// www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/ GuidanceDocuments/UCM089742.pdf): neonate (birth-1 month), infant (1

month-2 yrs.), child (2-12 yrs.), adolescent (12-21 yrs.). For design and evaluation of radiological devices, patient size (i.e. height, weight, thickness) is a better indicator.

- Based on reports of the lifetime incidence of cancer vs. age of exposure data, these pediatric subgroups defined by the Agency cover the region where the largest age dependence is expected for cancer risk. Risk decreases much less steeply as a function of age for individuals over 21 years old. See NAS National Research Council Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation. 2006. Health risks from exposure to low levels of ionizing radiation: BEIR VII phase 2. Washington, D.C.: National Academy of Sciences, National Academies Press.]

- The following reference gives current data for antero-posterior and transverse body diameter for pediatric patients ranging in age from 0.5 to 20 years: Kleinman, P. L., K. J. Strauss, D. Zurakowski, K. S. Buckley, and G. A. Taylor. 2010. Patient size measured as a function of age at a tertiary care children's hospital. American Journal of Roentgenology, 194, 1611-1619.

- The following reference used cylindrical phantoms with diameters of 8, 16, 24, and 32 cm to represent a neonate, 5 year old, 12 year old, and adult patient respectively: Siegel, M. J., et al. 2004. Radiation dose and image quality in pediatric CT: effect of technical factors and phantom size and shape. Radiology, 233(2), 515- 522.

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.

8.2 Protect your imaging system from cybersecurity threads

Because the Digital Radiography Systems are connected by Wi-Fi or Ethernet to the host computer containing the software, and the host computer may in turn be connected to the hospital information system, and ultimately the Internet, cybersecurity may become an issue for you. Here are some tips to keep your system and your medical images secure.

8.2.1. Required strategies: Your responsibilities

Use antivirus programmes such as:

- TotalAV

- ScanGuard Security Suite
- Norton by Sumantec
- PCProtect
- Mcafee Antivirus Plus

Keep these products up to date.

Identify and protect:

- Limit access to trusted users only: Limit access to devices through the authentication of users (e.g. user ID and password.)
- For remote access (e.g TeamViewer) set a password
- Use a correctly configured firewall (only used ports shall be available while other ports has to be blocked)

Ensure trusted content:

- Restrict software or firmware updates to authenticated code. Use only materials supplied by us four your image management software updates.
- Use systematic procedures for authorized users to download version-identifiable software and firmware from the manufacturer.

Detect, respond, recover:

- Watch for on-screen warnings of possible virus infections.
- Respond by scanning for and removing possible virus infections.
- Recover from possible virus infections by having up-to-date backups of your host computer.

8.2.2. Required strategies: Our responsibilities

We affirm our commitment to providing you with validated software updates and patches as needed throughout the life cycle of the medical device to continue to assure its continued safety and effectiveness. Please promptly apply software updates and patches provided by us, and never use image management software supplied by anyone else. Our development process utilizes the Microsoft Malware Defense Guide which can be found at:
https://technet.microsoft.com/library/cc162791#E1F
We are constantly scanning our development computers for malware. We hope you are doing the same.

A summary of our integrity controls

- Our development computers are constantly being scanned for malware, and our supplier for antivirus software automatically updates the software continuously as new threats are revealed.
- We perform daily backups to our external hard drives. These drives are then disconnected from the system after the backups.
- During software development, we disconnect from the Internet to prevent external attacks.
- Our development process utilizes the Microsoft Malware Defense Guide.

- Copies of software updates we will be sending you are individually scanned for malware. Use only materials supplied by OR Technology for your updates.

Conclusion

It is our joint responsibility to ensure your medical image software and image collection are safe and secure. We must both do our parts.

Chapter 9. Notes