

The background of the entire page is a complex, abstract fractal pattern. It consists of numerous thin, overlapping lines and shapes in shades of light blue and white, set against a dark blue to black gradient. The pattern has a sense of depth and movement, resembling a digital or organic structure.

# **digipax**

**Viewer Version 1.4.18**

**User's Manual**



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## 1 General

All digipaX illustrations (screenshots) show the program windows in Classic Style. This allows the images to be clearer in the documentation. The program is normally set to Black Style, which is more suitable for viewing medical images.

## 2 System requirements

### 2.1 Supported operating systems

The following Windows operating systems are supported by this software:

- Windows XP (SP3) / Windows XP 64bit (SP2)
- Windows Vista (SP2)
- Windows 7 (SP1)
- Windows 8.1
- Windows 10
- Windows Server 2003 (SP2) / Windows Server 2003 R2 (SP2)
- Windows Server 2008 (SP2) / Windows Server 2008 R2 (SP1)
- Windows Server 2012 / Windows Server 2012 R2

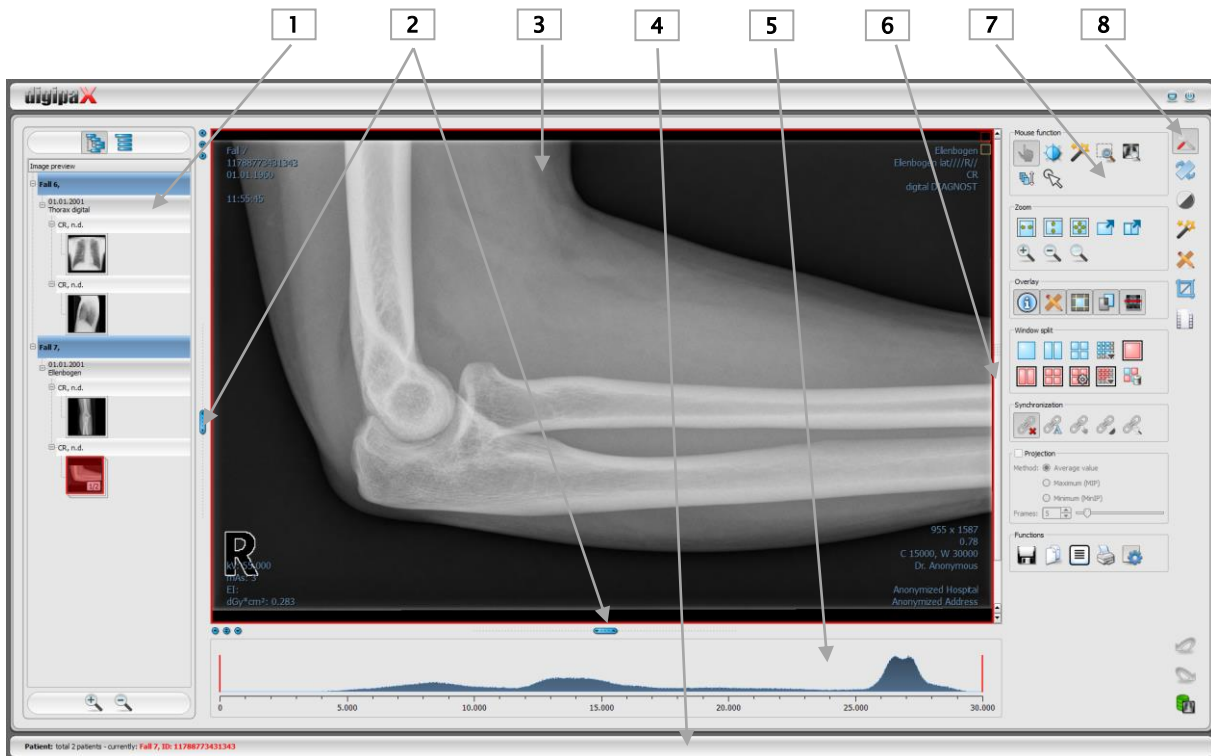
### 2.2 Minimum hardware requirements

- min. Pentium 4 CPU or comparable from 2,1 GHz
- min. 1 GB RAM
- up-to-date graphics, VGA, resolution min. 1280 x 1024
- DVD-ROM (if simple CD used, then CD-ROM is sufficient)
- for USB medium USB port 2.0

## 3 Start

The software "digipaX Viewer" will start automatically when you insert the CD, unless the auto-start option in Windows is not disabled. You can start the software by running the file "dpView.exe" manually.

## 4 Screen layout



### Screen layout and split

- 1 – **Thumbnails:** shows all images of a selected patient as a preview (tree structure with the studies and series)
- 2 – **Movable bars** for changing the image division or hiding the windows
- 3 – **Image space / viewer:** shows an image or more selected images next to each other and one below the other
- 4 – **Baseboard** with the information on selected patients and available space in hard disc storage
- 5 – **Histogram** of the active image
- 6 – **Scrollbar** for scrolling through single images of the series
- 7 – **Tools** with the functions for processing images (divided into various toolboxes)
- 8 – **Selecting** various toolboxes

#### 4.1 4.1 Image region / viewer

On the left bar the thumbnails are shown, in the middle area the selected images are presented in a large format and on the right bar the functions for processing images are available. Furthermore, there is a histogram for the current image below the image view.

#### 4.2 Baseboard

On the baseboard the information off the patient are shown. If multiple patients are selected, there are number of patients and this at the moment active patient displayed, so the one who the active image concerns.

This baseboard is seen in all parts of the program.

### 4.3 Toolbars

On the toolbars the different functions are available, like mouse functions, settings for zoom and overlay, also for image split.

On the monitors in the portrait mode the toolbars are automatically arranged in vertical positions. This setting can be also set up manually in the configuration (category Others).

### 4.4 Split bars

Between the thumbnails (on the left) and the image area as well as between the lower part of the viewer and the image area adjustable split bars are placed. By dragging these bars to the left or right or to the top or bottom the image panes can be adapted. Also, windows can be hidden in this way completely.



By using small switches the regions above and below the image (or on its left or right side) can be closed, by pressing the middle button they can be restored. Modifications of window panes remain saved after the end of the program.

## 5 Viewing images / viewer

The component of viewing images covers the areas of screen selection, image display and image handling or manipulation on image.

Both greyscale and colour images are supported. These can be presented uncompressed, RLE- or JPEG-compressed.



**There is an indication shown on the top edge of the images compressed with lossy data compression. Those images are unusable for diagnosis as possibly important information on the image could get lost due to compression.**

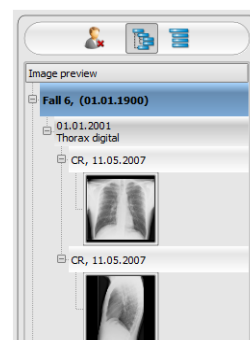
For greyscale images the information on presentation, like window adjustment, rotation and image annotations, are stored as Greyscale Soft Copy Presentation State (DICOM file). At the next opening of an image these are automatically used again.

### 5.1 Image selection

The image selection follows in a board on the left edge of a display. This is alterable and also completely hideable in its size (width) by the window divider.

The view is changeable between DICOM tree structure and list view.

In the DICOM tree structure the studies of the selected patients are presented. The patients form in each case a superordinate node. The nodes of the studies can be opened and closed and as subnodes are the pertinent series contained. Within the series nodes the thumbnails are displayed. Multi frame series are shown only as a single preview image. Multi frame series are the image series packed in a DICOM file. In the right upper corner of the preview image a number of currently displayed frame and number of the frames are shown



In the list view also information on each selected patient is displayed in a superordinate node. A list of all available images for this patient is arranged underneath of it (in each case nodes with caption and thumbnail), independently from their assignment to series and studies. The criterion for the sorting, the sorting direction and the text, which can be displayed in the node, can be set in the configuration (default: date and time of the image).

The thumbnails are marked by a red framework, even if this image is displayed in a large image view.

When stopping the mouse over a node (patient, study, series or image) information on it is displayed in the tooltip window.

The size of the thumbnails is adjustable by using two switches Plus and Minus below the tree structure. The size of the images is stored and used at the next program start.

By double-click on a thumbnail this image can be loaded into the viewer. If there is an image window still free in the viewer (by splitting images in the display area of the viewer in for example 2x2 images, more images can be displayed next to each other in the viewer), it is



displayed in this free image window. If no image window is free, the image is replaced in a current image window.

By drag & drop the thumbnails can be dragged into image window of the viewer. Also within the viewer the image can be exchanged with drag & drop in the image windows. So the user can divide very flexibly the images on his display.

By double-clicking on the node of a study the images of this study are automatically loaded into diverse windows of the viewer accordingly to modality of the images. Window split is to be defined in the configuration (see 7 Configuration).

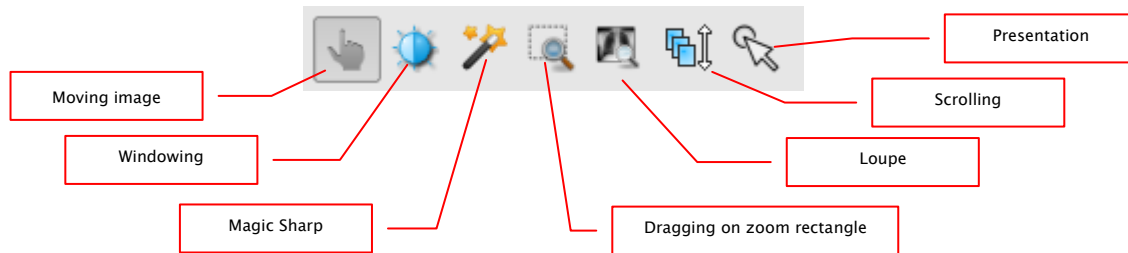
## 5.2 Image display

In the viewer, images are being shown. The viewer can be split into many windows, so that many images can be displayed next to another. Simultaneous display of 1 to 36 images is possible. These panes can be subdivided into further sections in order to present single images of the series in the one grid.

For the viewer, there are many functions for image representation available. These functions are contained in the toolbar, which can be unhidden with a button top right. These functions are described in next sections. Some of them are hidden by default. With a right-click on area of the functions a context menu opens. There, the various functions can be shown and hidden. You can shape the buttons more transparently by deactivating the functions that are not needed.



### 5.2.1 Mouse functions



In this toolbar the action for the left mouse button can be selected:

- **moving** (if display size is larger than image window) – this is a default setting
- **windowing** (brightness/contrast)
  - ➔ horizontal mouse moving: modifying window centre
  - ➔ vertical mouse moving: modifying window width

In the configuration (category Others) these moves can be also modified

- **Magic Sharp Filter** (size/sharpness)
  - ➔ horizontal mouse movement: change size
  - ➔ vertical mouse movement: change sharpening amount

For detailed description of the filter functions please refer to chapter 5.3.3.1 Magic Sharp.

- **zoom rectangle**
- **loupe**
- **scrolling**
  - ➔ vertical mouse movement: scrolling through the series
- **presentation (a simple pointer to presentation on the monitor)**

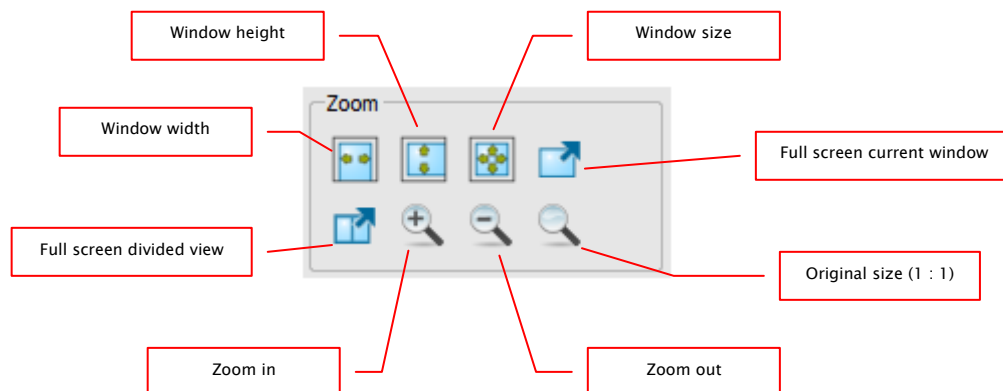
The function can be impacted by the following combinations of keys:

- Alt + left mouse button: windowing
- Alt + Shift + left mouse button: dragging on zoom rectangle
- Alt + right mouse button: loupe
- Shift + right mouse button: scrolling

Further mouse functions:

- Shift + left mouse button: marking image
- Ctrl + left mouse button: drag & drop for exchanging the images between the image windows
- right mouse button: zoom in / zoom out (during vertical mouse moving)
- middle mouse button or pushed scroll: windowing
- rotating scroll: next or previous image of the images series, study or the patient (for each setting), if existing
- Ctrl + Shift + left mouse button pressed: Magic Sharp filter
- left and right mouse button pressed: Magic Sharp filter

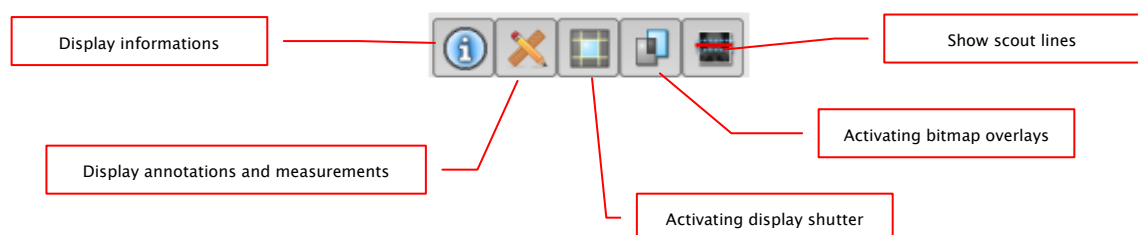
### 5.2.2 Zoom



The options for zooming images refer in each case to currently active image. According to the standard the image display in a window is initialized in this way, that the image is scaled to the window size. If the size of the window changes in this option, e.g. by division of the image, the zoom factor is adapted accordingly, so that always the full image is seen. With the exchange of the images between two windows by drag & drop, the zoom factors of the image stay the same.

By single pushing Enter key or using "Full screen current window" switch the full screen mode can be activated. The current image is now scaled to the full screen size. By pushing Shift + Enter keys or using "Full screen divided view" switch all presented windows (by division of images) are scaled to the full screen size. The full screen mode can be quitted by using the Esc key.

### 5.2.3 Overlay



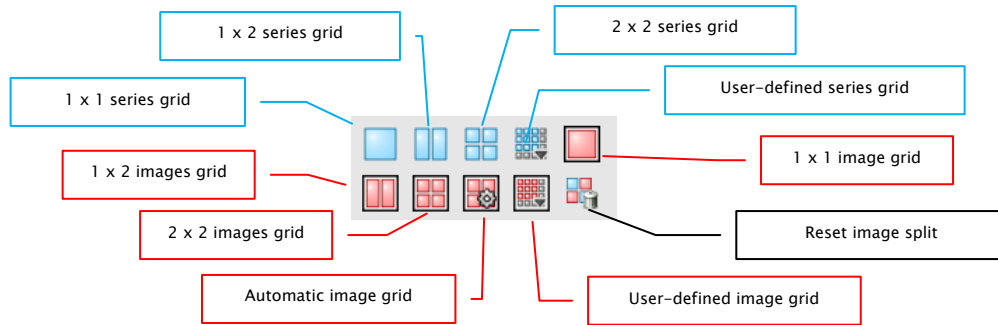
Overlay divides in the following areas:

- information (in the image corners),
- annotations + measurements (e.g. measured sections or angles),
- „display shutter“ (blanking everything outside the selection),
- bitmap overlays (overlay images)
- scout lines (presentation of the position of particular sectional images in CT und MRT series)

For each of these areas there is a switch in the toolbar, with which the area can be unhidden or hidden.

If an image is opened, in which a selection was set, or if a selection range is set by user, then the switch for "display shutter" is automatically set, so on, and user can turn this off or on using the switch.

### 5.2.4 Image split



The image window can be split into panes, so that the single series of the study can be arranged in the one grid. The window panes of the series can be subdivided with the result that the single images are presented in the one grid.

You need to use the blue switch to split the series of the study into grid. You can choose between 1x1, 1x2, 2x2 and user-defined up to 6x6 grid. In order to subdivide one of the window panes, click in the pane and use the red switch with the same functionality.

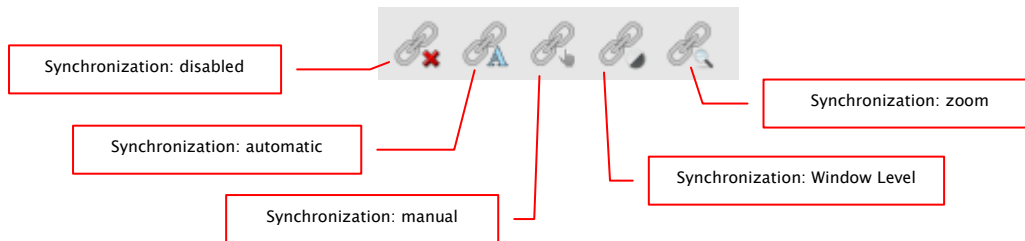


When using the switch "Automatic image grid", single images of the series are automatically arranged in the current pane. The switch "Reset image split" restores the main window. Optionally, you will find all these switches in the context menu of the right mouse button.

If the single images of the series are presented in the grid, the presentation begins with the first image of the series and the images are then presented consecutively and line by line. For the 2x2 grid, the first image is presented in the upper left pane, the next image beside it, the third image in the left bottom pane, and the fourth image in the right bottom pane. If you scroll within the series with the mouse wheel, all single images will change synchronously according to scroll direction. In this grid, always four consecutive single images are presented.

### 5.2.5 Synchronization (synchronous scrolling)

When multiple CT or MRI series, or the series of an initial and follow-up study are open side by side, scrolling in both windows can be synchronized. This feature can provide you with the following functions:

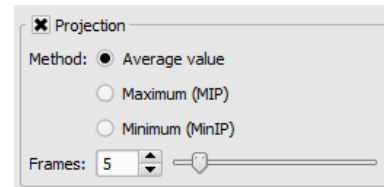


- disabled:** synchronous scrolling is disabled
  
- automatic:** the series of the same study (FrameOfReferenceUID) are automatically scrolled synchronously based on their location.  
Open the wanted series in the separate image windows, click the button „Synchronization: automatic“ and scroll through the series.
  
- manual:** the series of the same study (FrameOfReferenceUID) or with the same series description (SeriesDescription) are scrolled synchronously based on their location, e.g. the series of an initial and follow-up study.  
Open the wanted series in the separate image windows, click the button „Synchronization: manual“ and scroll through the series. Current image or current frame is a start point for synchronous scrolling. In this way the differences at the beginning the series can be accomodated.
  
- Windows Level:** Window Level settings for the series of the same study (FrameOfReferenceUID) or the series with the same series description (SeriesDescription) are set outright.  
Open the wanted series, select the appropriate method, activate the button “Synchronization: Window Level”, click in the image, set the Window Level as you wish and scroll through the series.
  
- zoom:** settings for zoom and moving for the series of the same study (FrameOfReferenceUID) or the series with the same series description (SeriesDescription) are set outright.  
Open the wanted series, select the appropriate method, activate the button “Synchronization: zoom”, click in the image, set the zoom and position as you wish and scroll through the series.

### 5.2.6 Projections

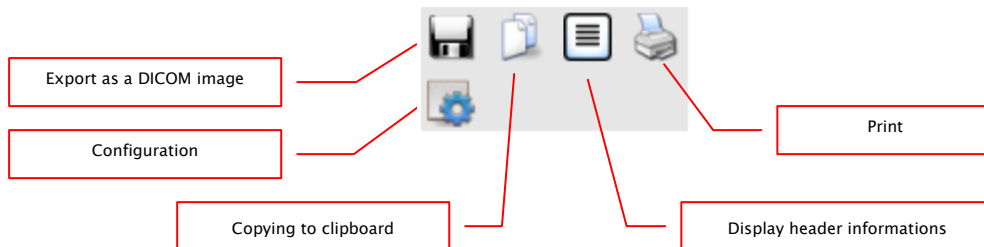
In reconstruction of images, intensity of the same pixels of the consecutive images is evaluated and from these values a new output image is generated and visualized. For example, if there are five images, for each pixel of the output image a new intensity value is calculated from the five values.

- Average intensity: an average intensity value is calculated
- Maximum (MIP): a maximum intensity value is calculated
- Minimum (MinIP): a minimum intensity value is calculated



- Frames: amount of evaluated images

### 5.2.7 Other functions



#### 5.2.7.1 Exporting images

The current image can be also saved as a DICOM file. Select this switch and afterwards the target place in dialog box for saving. The file will be saved at the desired point. For multi frame series, the entire series is exported as a DICOM file.

#### 5.2.7.2 Clipboard

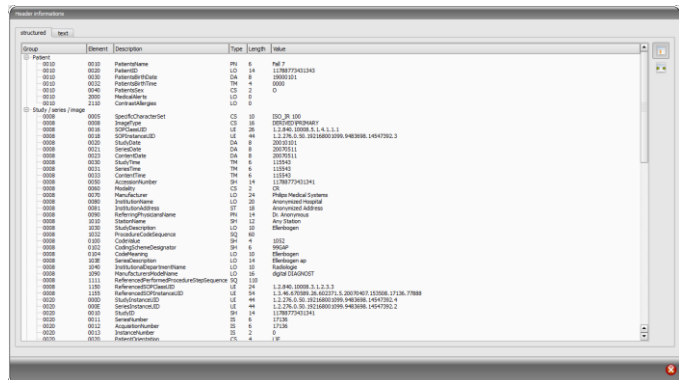
By using the switch for clipboard the current image in the current presentation form can be copied to clipboard. This means that the overlay objects (information on image, annotations and measurements as well as display shutter) will be copied in the image too, provided that they are unhidden. If clicking this button is accompanied by coevally press on the Shift key, the image will be copied in its original size to clipboard.

### 5.2.7.3 Header information (DICOM Dump)

By using a switch on the toolbar a dialog box can be opened, in which the DICOM information (tags) of the current image are displayed. These tags are structured in groups for a better overview.

All tags, also private, are shown.

A modification of the values is not possible.



In the first card "structured" of the window individual data from the header can be copied to the clipboard by means of copy function and pasted in another application (e.g. text processing). To do this, double-click the element required and select then Copy with the right mouse button. For the multi frame series, it should be noted that these series have only one header for the entire series in which the information on single images is contained.

In the second card „text“ whole parts or a complete header can be copied to the clipboard. For that, check the desired lines with the mouse or the complete header with the Ctrl+A keys and copy the text to the clipboard. From there the data can be pasted into a text file or a Word document etc.

### 5.2.8 Marking images

In the right top of each image a small red field is placed. By clicking into this field (or Shift + left mouse button into the image), a red point appears there or disappears again, if it already existed. Each image with a red point is considered as a marked one. Additionally the marking is clarified by a shading over the entire picture, since the small red point is seen sometimes badly (e.g. if more images are presented or also on diagnostic monitors). Hiding the shading can be deactivated in the configuration (category Others). At the selection of images, e.g. for printing, all marked images can be used. The marked image can be recognized on image selection bar on the left by a small red point, right in the top of the thumbnail.



### 5.2.9 Image protection (lock)

Moreover, a yellow field is also displayed under each red field. By clicking into this area the images can be protected (locked). Manipulations on images, as described here in this user's manual, do not affect the protected images. A lock symbol in the yellow field informs if the image is protected.

Protected image cannot be recognized in image selection.



### 5.2.10 Context menu

By right-clicking with the mouse into the image a context menu with important functions can be activated:

- mouse function: moving the image, windowing, dragging on the zoom rectangle, loupe
- zoom: window width, window height, window size, activating or quitting the full screen, activating or quitting the full screen divided view, zoom in, zoom out, original size (1:1)
- overlay: displaying information, displaying annotations and measurements, activating display shutter, start-up of bitmap overlays, start-up of scout lines
- image division: 1x1, 1x2, 2x2, user-defined image division
- series grid: 1x1, 1x2, 2x2, user-defined series grid
- image grid: 1x1, 1x2, 2x2, automatic, user-defined image grid
- resetting window split
- sending by electronic mail (DICOM)
- sending by electronic mail (JPEG)
- studies: list of studies of the patients and, as a submenu, each time the image series of this study (the first image of this image series is activated by activating the menu item)



**The provisions of law require that messages sent by electronic means which include information on patients or their personal data must be coded. Therefore, electronic mail software must be so configured that data is coded and only its recipient can read such data.**

**There are special extensions for electronic mail programs which provide the message coding.**

“The GNU Privacy Guard“ is the free cryptographic software. It may be downloaded and installed from <http://www.gnupg.org> site. Such installation and configuration shall be made by professional.



### 5.3 Manipulation on images

On the right side of the image display, there are tools for image processing which can be hidden or unhidden by using particular buttons. They are arranged vertically and sorted according to the topics.

For CT and MRT images as well as multi frame series, the operations on images are automatically applied for the entire image series, otherwise each time for the active image.

Below the tools, there are switches for undoing the last actions and restoring the undone actions. The actions are displayed as text in tooltips. The actions refer each time to the active image. I.e., if the image is changed, one cannot undo the actions for it considering the circumstances and the switches therefore are deactivated.

By using the last button „Restore original image”, all of the modifications performed are being cancelled after prior confirming inquiry by the system and thus the original image is being restored just as it is stored in the image archive.



For CT and MRT images, the operations on images are automatically applied for the entire image series, otherwise each time for the active image.

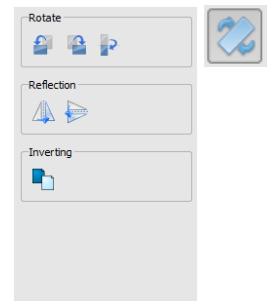
For greyscale images the modifications on the images are stored.

For colour images the modifications are not stored, but they are only temporary. I.e., if you close the program, the adjustments/modifications on a colour image are getting lost.

#### 5.3.1 Transformations (rotations, mirroring, inversions)

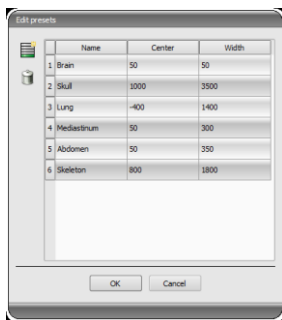
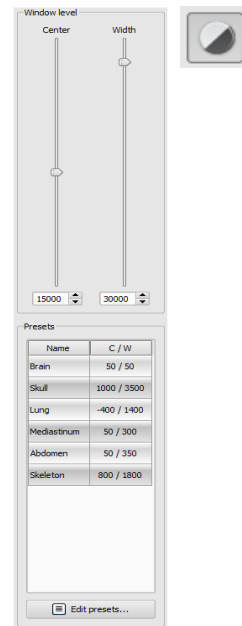
The images can be rotated at the touch of a button 90° to the left, 90° to the right or 180°. They can be mirrored horizontally and vertically and also inverted.

Each operation can be undone as well as redone by using both arrows in the bottom.



### 5.3.2 Windowing

Windowing is a usual method for the preparation of grey scale images. For colour images, windowing is deactivated. By entering window centre and window width, the grey scale range will be selected, which is to be presented. These values are adjustable each time by using the sliders or input fields. Furthermore, the settings can be used quickly from the list of presets.

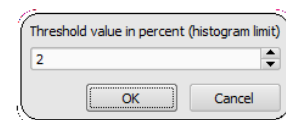


The modification of these presets or adding the presets defined by user is possible thereby via dialog box, which appears after the button „Edit presets...“ has been pressed on.

Also the contained default settings therein can be modified or deleted by user (they are not write protected).

With the automatic windowing, additional special default settings can be defined which will be then applied to the open image just by one click.

Configurable buttons 1 to 3 are intended to determine automatically appropriate values for windowing using calculation algorithm based on the histogram. For this algorithm, a threshold value must be defined. Click on the button while holding Shift key to define the threshold value for this button. In a subsequently opening dialog box you can enter values between 1 and 49. The higher is the value entered, the sharper the image will be. In this way, you can define default setting for each of the 3 buttons. With one click on the appropriate button the algorithm for calculation and the values obtained out of it for windowing applies immediately to the image.



With the button „Insert rectangle”, you can drag a rectangle on the image. From this rectangle the optimum values will be calculated and applied to the image. To do this, first click on the button and then set the rectangle with two clicks on the image. The values will be immediately calculated and applied to the image.

The next button is an interactive rectangle. Click on the button and draw the rectangle along the image. The optimum value is determined automatically inside the rectangle and displayed throughout the entire image. When you have found the appropriate representation,

click again to apply the value to the image. With the mouse wheel you can increase or decrease the rectangle size. With “Control” (Ctrl) or “Shift” keys pushed additionally, the rectangle size can be modified, either in its width or height. You can cancel the process with “Esc” key.

With the button „Whole area”, the entire visible area from the minimum to the maximum of grey levels contained in the image is being displayed.

### 5.3.3 Filters

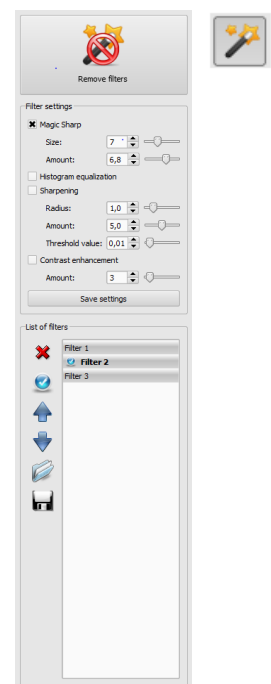
The license module must be enabled to be able to use the filters.

The available filters are Magic Sharp, Histogram equalizing, Sharpening and Contrast enhancement which may be used as single filters or in combinations. In order to use the filter, please tick the relevant box.

With the button “Remove filters” all filters are disabled and the values reset.

As soon as the filter is activated, a small icon is shown on the lower edge of the image. The filter may be deactivated by single-click on this icon and with another mouse click again activated. In this way, you can compare images with and without the filter. Double-click on the icon removes the filter.

Various filter settings may be stored in the list of filters. These filters may be then quickly applied for other images. You can export and import this list at another working station. Thus, various filter presets may be easily shared with many stations.



#### 5.3.3.1 Magic Sharp



This filter will have no effect for colour images. It may be used only for greyscale images.

The algorithm of this filter will automatically adjust image contrast and the adjustment will be made individually for partial areas of the image. In this way, the contrast will be optimized for individual partial areas of the image, which usually leads to better results than contrast adjustment to the entire image. The size of each partial area is adjusted with the parameter “Size”. This value can be set in a range from 2 to 16. The higher the set value, the smaller the partial areas of the image. The value of 5 stands for 1/5 of the image while 10 stands for 1/10 of the total image size. Thus, the higher the value, the more visible small

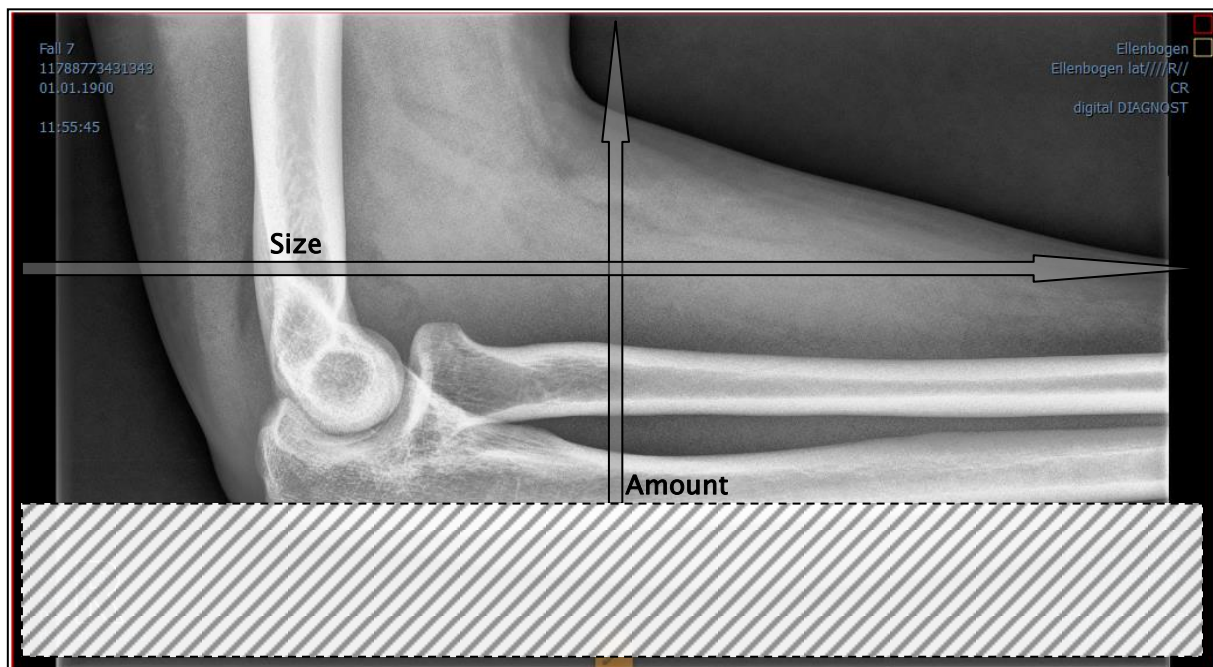
structures will become. The parameter “Sharpening amount” defines intensity of the effects. This value can be set in a range from 0.1 to 10. Values smaller than 1 lead to unsharpness, values larger than 1 increase the contrast. If the value is equal 1, the resulting image is identical as the original image

**5.3.3.2 Mouse function „Magic Sharp“**

With this function the Magic Sharp filter can be set by dragging the mouse over the image. This function is activated with the mouse functions that are described in chapter 7.2.1. The easiest way is to press right and left mouse button simultaneously. This will start only the “Magic Sharp” filter. Other filters will remain inactive.

Activate the function with one of described methods and drag the mouse horizontally from left to right in order to change the values for the size. The values on the left edge of the image start with 2 and increase to 16 towards the right edge.

To adjust the value for sharpening amount, drag the mouse vertically from the bottom to the top to change the value in a range of 1 to 10. In the lower section of the image that is cross-hatched on the graphics below, the filter is inactive. The value for intensity will increase starting from the area above the cross-hatched section. This area (approximately a quarter of the image) is not cross-hatched in the software. As soon as the cursor is in this area, the filter will be deactivated and the filter icon will disappear from the lower edge of the image. If you move the mouse cursor back to the upper area, the filter will be re-activated. Please note that whilst dragging the mouse both values change simultaneously. The further right the mouse cursor, the higher the values for size, the higher the mouse cursor, the higher the value for amount.



### 5.3.3.3 Histogram equalizing

With histogram equalizing grey levels of the areas of interest will be extended to greyscale and the less frequently used grey levels will be narrowed. Thus, the structures in the image areas of interest will be highlighted.

Tick the box to activate or deactivate this filter. This filter has no further settings.



The changes that results by use of the histogram equalizing will not be reflected in the histogram itself because in the histogram, always the values of original image are represented without the filters applied to it

### 5.3.3.4 Sharpening

With sharpening the differences in brightness are highlighted making the image “sharper”.

The sharpening is calculated in pixels. The parameter “Radius” defines how many pixels in environment should be used for sharpening calculation. Small radius will refine fine structures. Large radius will enlarge structures visible in the image. If the value is set to 0, the appropriate value will be set for the image automatically.

The parameter “Sharpening amount” defines how much the image is to be sharpened. Higher values lead to intensifier sharpening. The parameter “Threshold value” is set in order to avoid simultaneous refining smooth areas in the image. In order to sharpen all areas of the image, set this parameter to 0. In order to sharpen only the high contrast areas, increase the threshold value.

Select the image area that is to be studied. Zoom the image in this area in if needed. Start with a higher value for sharpening amount and then decrease the radius value until the structures are well highlighted. The sharpening amount may then be reduced again.

### 5.3.3.5 Contrast enhancement

With contrast enhancement the differences between bright and dark areas in the image can be yet stronger distinguished. Bright image areas are then presented yet brighter and dark areas yet darker. An enhancement factor of 1 (slight) to 25 (very strong) can be set for this functionality.

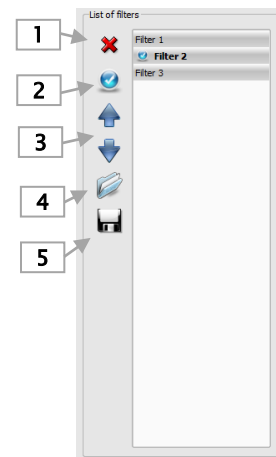
### 5.3.3.6 List of filters

With the list of filters, various filter settings may be stored and re-used easily.

In order to save filter settings, click "Save settings". A new entry will be added to the list of filters. Enter the name of the new filter. Thus, a number of filter settings may be saved in the filter list.

A filter from the list of filters may be set as the default filter. If a filter is set as the default filter, it will be automatically applied to every image unless another filter has been set for this particular image. In order to deactivate the default filter, uncheck the Default definition. With the export function you can export filter settings as a configuration file and import them to another station using the import function.

- 1 - Delete filter
- 2 - Set filter as default or uncheck the default filter
- 3 -- Move the filter in the list
- 4 -- Import the filter from a file
- 5 -- Export filter in a file



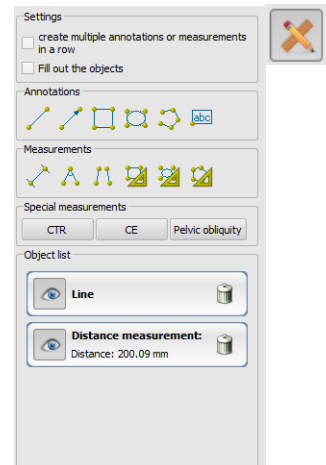
### 5.3.4 Annotations / measurements



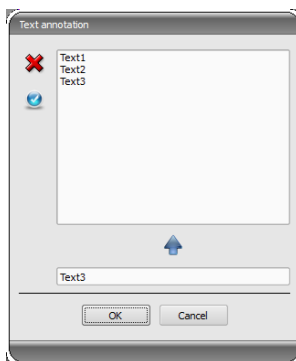
**Misalignments of length and angle measurements may be caused by modality or image acquisition!**

Evaluations are based on information for pixel size saved in the DICOM image. However, the misalignments may be also caused by an exposure - particularly if conventional radiography (CR, DX), i.e. of pelvis or ilium is considered. The distance of the exposed part of the body from the imaging plate / detector skews the presentation of length on a 2D radiograph. Also, if a scale (sphere) has been x-rayed withal, a misalignment is possible, insofar as the scale was placed not exactly at the same level with the measured part of the body at the exposure.

Under the annotations come lines, arrows, rectangles, ellipses, polygons and text. Thereby the rectangles, ellipses and polygons can be also drawn filled out. Explanations how the objects are to be drawn using the mouse, are each time displayed after the selection is made, i.e. after clicking the switch, in the right bottom corner. The drawn objects can be yet modified afterwards in all directions or relocated to get the form and to be placed in the position desired. In addition, the objects are shown in a list to the right and can be hidden or shown by single clicking the eye symbol. Particular objects can be deleted by clicking Recycle Bin icon or pressing „Delete“ key on the keyboard.



The switch “create multiple annotations or measurements in a row“ effects that the selected drawing object remains active. Then e.g. multiple distance measurements can be drawn one after the other without the need for re-clicking for every single measurement. After you have drawn all measurements you can quit this modus by double-click on the image area or pressing the ESC key.



After the text is selected, first a dialog box appears, in which new texts can be added to the list of standard texts (enter text in the input field and then press a green arrow) or the text from this list can be selected (double-click or click and Ok) or desired text can be entered (enter text in the input field and press Ok), which will be then used and placed on the image. You can specify yourself a standard entry which is then already activated, after you activate the dialog box.

Under measuring comes measuring of the sections and angles as well as measuring of the content of the area of rectangles, ellipses and polygons. The measuring of an angle can follow thereby by entering 3 or 4 points. When measuring the angles, external angle is represented in brackets.

When measuring rectangle, ellipse or polygon, the area and densities are measured as well. The actual average grey level out of original pixel values as well as minimum and maximum grey level are shown next to the figure. For colour images only a normal area measurement is done. For CT series values of these objects are expressed in Hounsfield units (HU).

During drawing the measurements current measured data are shown live. As for annotations, the drawn objects can be yet modified afterwards in all directions or relocated to get the form and to be placed in the position desired. The field with measured values can also be moved to another place in the image.

The measurements are shown in a list to the right and can be hidden or shown by single clicking the eye symbol. Particular objects can be deleted by clicking Recycle Bin icon or pressing „Delete“ key on the keyboard. All annotations and measurements can be deleted with one click on the button „delete all“ on the bottom right.

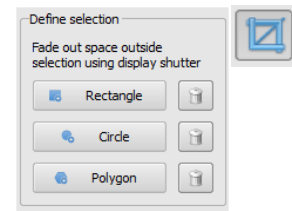


Graphic objects of third party systems or earlier digipaX versions (Version 1.4.5 or earlier) cannot be changed.

Settings for drawing the graphic objects in the overlay can be set in the configuration (category Overlay).

### 5.3.5 Display shutter

For each image, the different selections zones in the form of a rectangle, ellipse or polygon can be defined. Thereby, for each type exactly one object is possible, whereby the types can be also used together. Explanations for drawing using the mouse are displayed below the buttons, after the adequate button is pressed on.



Setting up the selection zone of a certain type replaces a potentially already existing selection zone of this type.

Everything except for the zone that has been defined in this way, can be hidden and unhidden by using the switch in the toolbar („Display shutter“ in the overlay options).

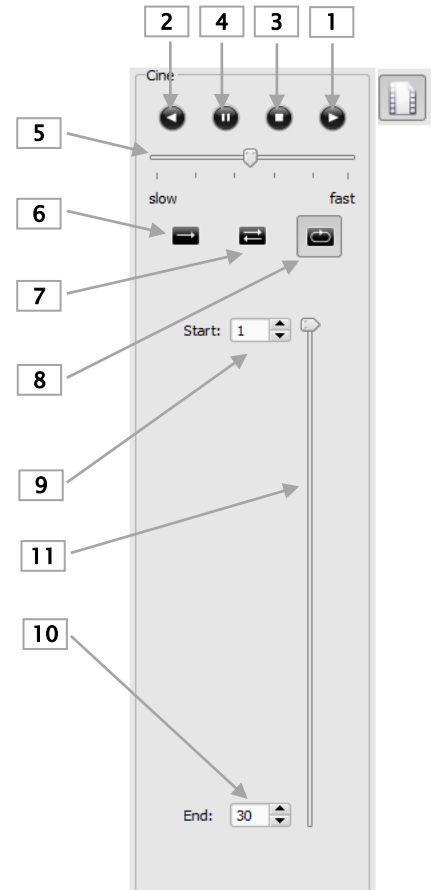
The objects can be individually deleted again.



### 4.3.6 Cine loop

With this function, the image series can be played automatically. Various control functions such as the play direction or speed are available here. The speed can be set with special controllers. With “Start” and “End” you can determine from which image of the series the play is to be started and on which one it is to be ended. With the vertical scroll bars, individual images can be also selected manually.

- 1 - Play forward
- 2 - Play backward
- 3 - End
- 4 - Pause
- 5 - Play speed
- 6 - Play once only
- 7 - Automatic play forward/backward
- 8 - Endless loop
- 9 - Start play from this image
- 10 - End play with this image
- 11 - Manual selection of individual images



## 5.4 Scout lines

By the scout line (localizer line) the cut edge of two layers (planes) and the position of particular sectional images of the CT and MRT series are presented. The position of images of any other image series in relation to the active image is thereby visualized.



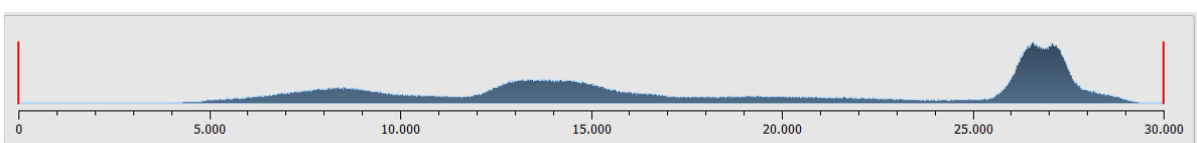
**In presentation as projection lines, they do not provide information on angle under which two layers are crossing. These lines do not indicate if two layers are perpendicular or inclined to themselves. Therefore, you can not draw conclusions to mutual position of two layers on the base of projection lines only.**

The better idea on mutual position of planes may be obtained in presentation as planes due to the 3-dimensional image. The required presentation form may be set up in configuration User::Overlay / Scout lines by setting the type in "Scout lines / Localizer" group.

Before you open a series, you should modify the image split so that you can view the particular series next to each other. Then open each series in a field. If the presentation of scout lines is activated, the scout lines will be shown automatically. Click in a series and scroll with the mouse wheel through the images of this image series. Alternatively you can use „Page up” and „Page down” keys. The position of the current image is shown in another series as a projection line or as a plane. You find the settings for the presentation of scout lines in the section Overlay / Scout lines in the chapter 7 Configuration.

## 5.5 Histogram

Below the image or the images, there is a histogram window, which displays always the histogram of an active image. By shutting down the histogram window can be also completely hidden.



For multi frame series, a histogram of a currently displayed frame is shown.

For colour images, a red, green and blue curve for the channels R, G and B of the image are displayed. For grey scale images, a blue curve (like presented on the image above) for spreading of grey scale values is displayed.

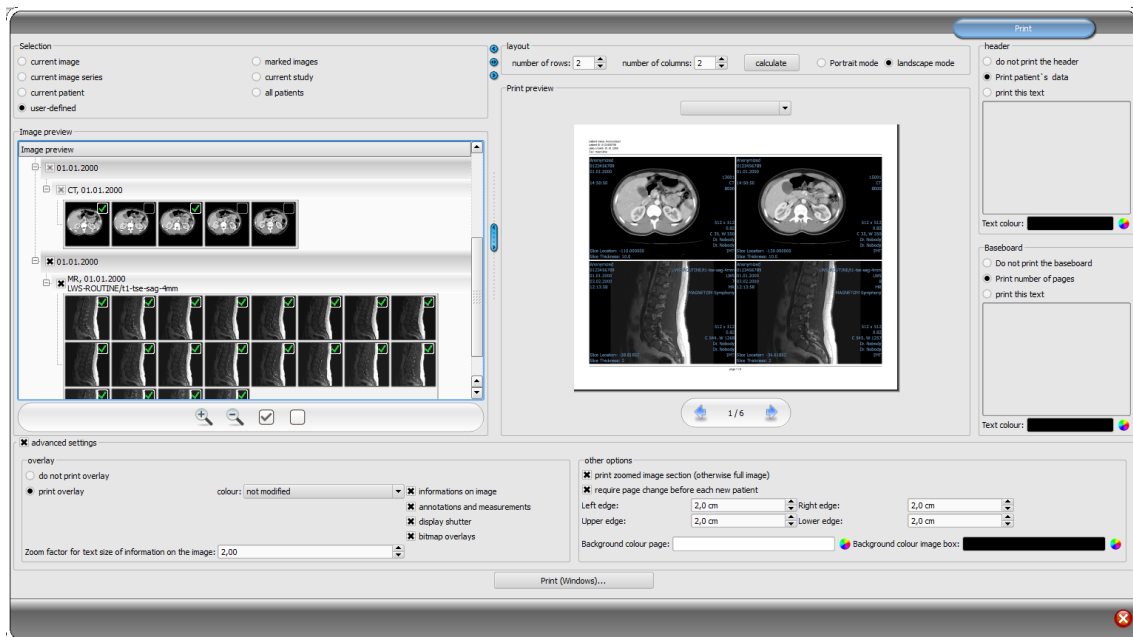
In the histogram for the grey scale images the current setting for windowing is always displayed and can be here also modified. The left and right zones of the visible window space are thereby lightly coloured, so that this is clarified. The red lines show the edges and are coincidentally the sliders, for modifying window edges. The performance of windowing can be improved with a higher histogram smoothing. The smoothing can be changed in the con-

figuration page histogram. See section 7. The window can be completely moved by clicking with the mouse into the space between the red lines and then moving using the mouse.

A zoom rectangle for zooming in the histogram can be dragged on by dragging with the mouse with Shift + left mouse button. With the right-click into the histogram the full size can be displayed again.

Settings for work with the histogram can be set in the configuration, category Histogram.

## 6 Print



### 6.1 Selection

If about printing, current image and many images can be printed at a time as well. This is determined in the group „Selection“. The „user-defined“ option allows for targeted selection of individual images, series, studies, or patients.

### 6.2 Image preview

If you have set the „user-defined“ mode in the group „Selection“, you can do targeted selection of particular images in the image preview that are to be printed out. Select simply an appropriate node for patient, study, series, or particular images. Particular frames of multiframe images cannot be selected. In this case, all frames are always printed.

### 6.3 Layout

Here you can rotate a page to landscape or portrait orientation. Multiple images per page can be printed. Number of lines and columns can be set up to maximum 6x6 in the group „Layout“. Number of lines and columns as well as page change is automatically calculated appropriately to images selected in the image preview.

### 6.4 Print preview

All changes made during setting up affect immediately the presentation in the print preview. Number of pages is currently updated. You can navigate with cursor keys between the pages. All settings are saved so that they can be re-used at the next call-up of the print components (after the program reboot as well).

The particular thumbnails can also be windowed, zoomed, or moved. Modifications of thumbnails are at once applied on the print results.

Controlling all three functions goes in the same way as for the image viewer:

- Right mouse button: zooming in / out (with vertical mouse movement)
- Central mouse button or scroll wheel pressed: windowing
- Left mouse button: moving zoomed image

You can select the paper or foil size from the drop-down list so that the desired print result is shown in the print preview. It might happen that not all formats shown here are supported by your printer. Please note that the settings made here affect only the print preview. When you start printing, you still need to select the right paper or foil size in the print dialog box accordingly to the previous selection.

## **6.5 Header**

The header, if activated, will be always printed at the top edge of the page, in a fixed defined size and fixed defined font type. These cannot be modified. Standard image information with the patient data can be printed as well as self-defined text. Colour of the text is selectable.

## **6.6 Footer**

The footer, if activated, will be always printed at the bottom edge of the page, in a fixed defined size and fixed defined font type. These cannot be modified either. Number of pages can be printed as well as self-defined text. Colour of the text is selectable.

## **6.7 Advanced settings**

### **6.7.1 Overlay**

For overlay, it can be selected, whether this is to be printed over the image or images, or not. Overlay objects can be possibly difficult seen if printed, so it can be selected, whether overlay is to be printed black, white or unmodified. Unmodified means hereby that overlay will be printed in such way, like it is presented on the monitor. Display shutter will be always presented in the set colour (configuration). Bitmap overlays will be presented in the same colour like on the screen.

Optionally, only a currently zoomed in area of the image can be printed. Otherwise, the whole image is printed.

If the images of different patients are to be printed, the changing page before each new patient can be required (recommended). In this way, it cannot come to mistaking as patient data of the patient, which belongs to the first image on the page, are always displayed. Thus on each page the correct patient data is shown.

You can adjust the text size of the information on the image by use of the zooming factor.

### 6.7.2 Other options

In other options you can define page margins as well as the colour of background of a page or background of image boxes into which the images are to be integrated.

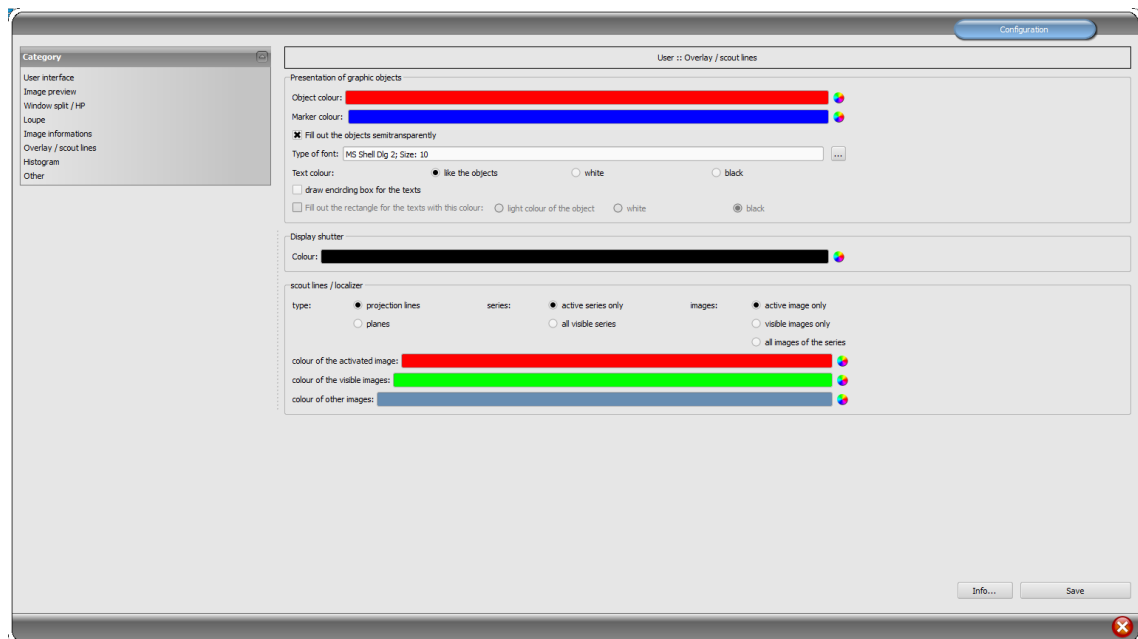
## 6.8 Print

Printing is performed by use of the button „ Print (Windows)...“ on one of the common Windows printers. The printer can be selected in the print dialog box. In the print dialog box you can also select pages to be printed if the print job contains many pages.

If you use the button „DICOM-Print...“, printing is performed on one of the configured DICOM printers. This button is only available if the DICOM-Print-Module is activated. The desired printer, film size and medium type can be selected in the print dialog box. Also the pages are printed on the selected DICOM printer.

During the preparation and transfer of print data a progress bar is displayed. If many pages are to be printed, this process can be cancelled with the button „Cancel“. After the print job is finished, an adequate message appears.

## 7 Configuration



There is a central place for the program configurations with a page for each program group. By using the switch „Info...“ information on product can be displayed.

Following settings can be made in the configuration:

- **User interface**

*Design:* different possibilities for presentation

*Position of toolbars:* for the monitors in portrait mode the placing on the left is recommended – this happens automatically or can be determined explicitly

*Toolbox height (window placing):* for the monitors in portrait mode a short toolbox and wider bottom working bar (histogram) is recommended – this happens automatically or can be determined explicitly

*Font:* setting up font size and type for descriptions of the buttons and windows as well as for tables, tips and information etc. in the program

*Symbol size:* setting up symbol size on the program buttons

- **Image preview**

*List view preview tree:* selection of tags, according to which the images are to be sorted, sorting direction and definition of a displayed text in image nodes (the same principle as for information on image)

The following tags can be used for sorting or displaying:

0x0008, 0x0016	SOPClassUID
0x0008, 0x0018	SOPInstanceUID
0x0020, 0x0013	InstanceNumber
0x0008, 0x0023	ContentDate

0x0008, 0x0033	ContentTime
0x0028, 0x0008	NumberOfFrames
0x0008, 0x0022	AcquisitionDate
0x0008, 0x0032	AcquisitionTime
0x0028, 0x0002	SamplesPerPixel
0x0028, 0x0010	Rows
0x0028, 0x0011	Columns
0x0028, 0x0101	BitsStored
0x0008, 0x0008	ImageType
0x0054, 0x0400	ImageID

*Display mode image series:* alternatively, all images of one image series are displayed in a preview tree or only one image of the series is displayed (this is adjustable separately for each type of image) – first select on the left an adequate modality, i.e. CT, and then on the right, which settings for this type of image are to be applied (all images or only the first, middle or last image of the series)

- **Window split / HP**

*Activating:* the series of the most recent study are automatically displayed in the image viewer at opening of a patient; window is automatically split by default and each series is „hang-up“ in a subwindow: when double-clicking on the node of the study, the series of this study are hang-up either and the window split is adjusted automatically

*Monitor:* when using the MultiMonitor module you specify here which monitor the option of automatic hanging up is to be activated for

*Select modality:* for each modality an individual setting can be selected

*Window split:* automatically means that the window is split automatically correspondingly with the number of the series that are to be displayed, otherwise the image viewer is split always in the lines and columns set up

- **Loupe**

*Rectangle:* usage of a rectangle loupe in the viewer with the specified pixel measures or automatic size

*Circle:* usage of a circle loupe in the viewer with the specified diameter or automatic size

*Automatic size:* width and height of the rectangle or diameter of the circle will be set for a third of a current window width or window height of the image window, depending on that which value is smaller

*Zoom factor:* zoom factor for the image cutout, which is presented in the loupe (referring to original image)



▪ **Information on image**

*Text colour:* colour with which the information in the image corners are to be shown

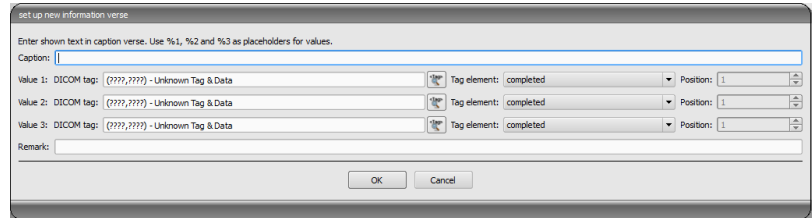
*Font type:* font type for presentation

*Zoom factor:* with it font type can be adapted (font size adapts also automatically to window size)

*Shaded:* the writ can be possibly poorly seen on the images with the white background, so with this option a shadow can be

backed – if the images are black or dark, this is not hardly seen

*Group elements:* for each type of image (modality) you can determine which information are to be shown in the overlay corners. First select the desire type and next the option „use these settings“, if the default settings are to be used. Click into the desired box, in order to determine the corner of the displaying and next the switch „new entry in active field“, in order to add an element to this box. In the caption row you can enter any desired text, which should appear on the images. Use %1, %2 and %3 as „Variables“ (placeholders). These will be exchanged by the defined DICOM tags in the display. You can also let display only a part of the tags if needed, i.e. a part of the person name or the value at the determined place for tags, which allow many values (multiplicity). By a double-click into the entry in the list fields or with the switch „process active entry“ you can delete these. Use the switch „delete active entry“, in order to remove this from the list. If you want to move or copy the entries within a list field or between the list fields, you can move these with the pressed left mouse button (drag & drop). For this, hold the Shift key pressed on, in order to move the entry. Without Shift this will be copied.



▪ **Overlay / scout lines**

Presentation of graphic objects:

*Object colour:* the colour for drawing the graphic objects

*Marker colour:* colour of markers (corner and end points, central points etc.) for editing the objects

*Fill out the objects semitransparently:* while drawing filled out image objects, these will be drawn semitransparently, if this option is activated, so that you can recognize the image behind it, otherwise they will filled out fully with the above colour

*Font type:* font type, which is to be used for text objects

*Text colour:* with the above selected colour, white or black

*Draw encircling rectangle for texts:* if this option is activated, an encircling rectangle for the texts in the above selected colour for graphic objects will be drawn; thereby these can be better read in certain circumstances

*Fill out rectangle for text with this colour:* if this option is activated, the encircling rectangle for text objects will be filled out with the selected colour (the above selected semitransparency will be also used), otherwise the rectangle will not be filled out an the image will be seen; the same colour can be used like fort he objects (lighter), white or black

Display shutter:

*Colour:* the colour, with which the hidden areas are to be overlaid

Scout lines / Localizer:

*Type:* "Projection lines" – with this option, only intersection lines of the images resp. projections of edges are presented; "Plane" – with this option the images are shown as sectional plane three-dimensionally.

*Series:* "Only active series" – with this option, only projection lines resp. planes of an active series are shown; "All visible series" – with this option projection lines resp. planes of all visible series are shown – **Note:** This option works not until the option "visible images only" or "all images of the series" is activated.

*Images:* "active image only" – with this option, only projection lines resp. planes of an active image are shown; "visible images only" – projection lines resp. planes of all visible images are shown; "all images of the series" – all projection lines resp. planes of all visible images of all series are shown.

*Colour of the activated image:* colour of the scout lines of the active image (pane)

*Colour of the visible images:* colour of the scout lines of other (inactive) panes

*Colour of other images:* colour of other (invisible) images

#### ▪ Histogram

*Shorten left and right:* with these options, the values in the left and right edge of the histogram will be set on the maximum value between them, so that the display of the whole histogram is well possible in the window. If the important areas will be thereby cut off or the values between these limits are still presented too small, the size can be accordingly reduced or enlarged.

*Sooth histogram for display:* smoothes the histogram for displaying with the set number of runs. The images will be not smoothed thereby. This is used only for better presentation of the histogram.

*Values:* on the x-axis only the values will be shown, which are actually used in the image, or all values, which could appear based on the colour depth of the image

#### ▪ Others

*Mouse function windowing:* synchronic with the below displayed histogram or transposed, in order to retain the usage from another system

*MagicSharp filter:* minimum and maximum values for MagicSharp filter can be limited (in this ways, strong tile effects can be avoided), contrast enhancement can be activated automatically with the amount defined here using the mouse function

*Scroll mode images:* images can be changed with mouse scroll or the „Page up" and „Page down" keys. This setting specifies, whether thereby only one image series can run, change also over the limits of an image series can follow and therefore all images of an study can run or even over all images of a patient, so over the limits of an study to the next study

*Presentation of zoomed images:* if this option is activated, the pixels will be zoomed in and no smoothing follows (the images operate pixelated, details can be seen better in certain circumstances); if the option is activated, the strongly enlarged images will be smoothed (the images operate milder; details can blur in certain circumstances)

*Presentation of marked images:* showing or not the blur for marked images (if not, only a

red point in the top right corner)

*Information / messages:* for some actions the tips in a small window in the bottom right monitor edge are output – display duration can be set here or these messages can be deactivated completely


*Units of measurement:* use this option to set whether the measurement values to be used are in "mm/mm<sup>2</sup>", or "cm/cm<sup>2</sup>".

## 8 Others

### 8.1 Tooltips

The most buttons, data or configuration fields contain so called „tooltips“. If you move the mouse over a field without clicking it, after short while a small help-window at the mouse position appears. In this way you receive the information on this field – action, which can be performed via this field or meaning of the configuration possibilities.

### 8.2 Exiting the program

You exit the program with the symbol  in the top right corner of the headline or with Alt + F4 buttons.